SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

Feature Scope Description

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VALIDITY

This document and all information contained within are valid to SAP EAM, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022 and subsequent Feature Packages only.

Table of Contents

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

Document History

Version	Date	Description
1.0	Jan 2023	Initial Version

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022 – Feature Scope Description

This feature scope description shows you which features are provided with SAP Enterprise Asset Management, add-on for SAP S/4HANA 2022. In addition, this feature scope description also defines the product documentation for the add-on.

The add-on is an SAP solution extension designed to enable complex maintenance processes in asset intensive organizations, through industry specific capabilities natively integrated to SAP S/4HANA functionality.

The add-on comprises the following functions:

- Action Button Functions – centrally defined functions that can be implemented in other functions.
- Barcode: Enabling barcode interaction in shop floor work execution tasks.
- Bill of Work (BOW) – to generate customer quotations based on predefined work packages.
- Conformity Check – for checking assets are compliant with predefined standards.
- Defects, Deferrals, Transfers, Splits – creating and deferring defects, and transferring and splitting quantities onto new orders.
- Electronic Work Instructions – shop floor work order execution.
- EWI FIORI App. - shop floor work order execution using FIORI App.
- Event Management Workbench (EBX) – for managing all the data relating to a maintenance event.
- Induction Workbench (SBX) – induction of a component, or end item asset, into the system for maintenance.
- Inspection Workbench (IBX) – for stripping, inspecting, and onward dispositioning of parts from an assembly or complex asset.
- Install/Confirm Parts – for review and confirmation of part numbers to be installed using a given work order.
- Labor Solution – for recording labor and attendance-related activities.
- Maintenance Planning Workbench (MPW) – provides clear visibility of capacity requirement vs. availability for short term or long-term planning.
- Maintenance Requirement Workbench (MBX) – for managing the "life-cycle" of engineering master data.
- Material Shortage Report – for viewing the status of material availability for maintenance activities in a center or facility.
- Pegging – for evaluating supplies against demands based on first in, first out date sequence.
- Planning Task List (PTL) – used for medium and long-term capacity planning.
- Sourcing and Swap – involves searching for parts to meet a demand and optionally performing an internal exchange or swap.
- Task List Elimination and Sequencing (TES) – elimination of duplicate tasks in work orders which involve complex and multi-tiered work.
- Task List Workbench (TBX) – for the creation and maintenance of component repair task lists.
- Tooling Workbench – for the management of tools through tool issue and return against maintenance orders.

- WBS Determination – facilitates the automated assignment of WBS elements to maintenance orders.
- Work in Process Report – provides a view of work in process.
- Workscoping Workbench (WBX) – allows you to define the scope of work to be carried out on an end-item.
- Periodic Estimate PEST - for creating the Periodic Estimates of the Equipment based on the usage, periodic downtimes, flight/operating schedules, so that maintenance plans can be scheduled more accurately.
- Staging Area Pick List - allows to mass process materials (supplies) for reservations and deliveries (demand) in a warehouse or storage location.
- Maintenance Planning Enhancement (MPE) - for enhancing standard maintenance plan for scheduling and reporting.
- Time Since Event (TSE) - enables the capture of key maintenance metrics in the form of a report that consolidates the Zero Measurement Documents created at the time of execution of processes such as repair, overhaul, inspect, installation.
- Logbook - for enhancing standard logbook so that maintenance technicians can record defects and operational data against assets.
- Auto Slot and Auto Packaging - enables the planner to package routine and non-routine work items (notifications) into newly created slots (revisions) or into existing slots.
- Technical Object Change Management - is a flexible framework providing the ability to trigger follow-up programs based on changes in either Functional Location or Equipment master data.
- Maintenance Program Definition Enhancement – is a suite of enhancements within the MPD framework, providing a central point of access for all the objects and functions to manage the Maintenance Plans associated with the Maintenance Programs.
- Flight Sector and Line and Transit Package Generator – is a database to store seasonal flight schedules with integration to the MRO Add-on Flight Planning App, Logbook application and other SAP Plant Maintenance technical objects such as Functional Locations, Equipment's, Measuring Points and Measurement Documents.
- SBX Induction App – is a simplified UI5 based user interface to induct third-party components for maintenance, repair, and overhaul. It allows the user to perform actions like create Notification, create Sales Order, create serial number, generate returns delivery, receive component into stock, create repair order(component), stock movement from restricted to unrestricted, issue component to repair order.
- Line Maintenance App – provides a simplified UI5 based user interface that is technician friendly and provides the required information to the line technicians to perform their job from one place. The application also provides featured to view flight schedule details, maintenance history of aircraft, logbook functionality.
- Asset Disposition App – provides a simplified UI5 based user interface to perform MRO activities on equipment which requires the asset to be stripped down, and parts "dispositioned', or removed, inspected, and a decision made about how to repair or replace the removed parts to ensure the asset is returned to service.
- Flight Planning App – provides a simplified UI5 user interface to provide an overview of all flights for any set of stations within a planning horizon.

- Work Item Planning App – provides a simplified UI5 based user interface to allow maintenance planner to view the packaged work items hierarchy and unpackaged induction notifications on a Gantt chart. It also shows work center utilization and displays capacity details based on the week, month, or day.
- EWI FIORI App – provides a simplified UI5 based user interface to process PM/CS work orders. The app is based on FIORI 2.0 architecture using FIORI elements.

About this document

This feature scope description shows you which features are provided with the add-on.

Action Button Functions

This section contains delivered actions that can be added to the configurable tool bars wherever dynamic actions are supported. The workbenches that currently support this functionality are Inspection Workbench, Event Management Workbench and Electronic Work Instructions.

Each subsection contains the relevant function module names and a brief description of the functionality.

Add Component Reservation

Function Module	Description
/AXONXAPP/COMP_MAIN_INS	Insert Order Component
/AXONXAPP/EWI_COMP_INS	Insert order component from EWI

Select the appropriate Add Part or Add Component action and you will be prompted with a pop-up window. Input the plant, operation number, and material and requirement quantity and accept, to add a new material component reservation to the work order. You can optionally specify a storage location and/or batch identifier for the new reservation.

Delete Component Reservation

Function Module	Description
/AXONMES/COMP_MAIN_DEL	Delete order components

This function is used to delete a component from a work order. When deleting a component reservation, select the component line item in the component Instruction tab or sub-screen and select the delete component action. You will be prompted to confirm before this action is carried out. Once deleted, EWI will normally refresh the screen to show the component list minus the one you just deleted.

Check Qualifications

Function Module	Description
/AXONXAPP/CHECK_QUALS_PERNR	Qualification Check
/AXONXAPP/CHECK_QUALS_OPER	Qualification Check on operation

You can use these functions to verify whether an individual has all the required qualifications, skills, and certifications to carry out an operation.

Close Revision

Function Module	Description
/AXONEBX/GET_REV_CLOSE	FM to Close the Revisions

Closes the revision line selected.

Component Issue and Installation

Function Module	Description
/AXONXAPP/MRO_INSTAL_COMPONENT	Install Component

This function is used to issue a component to the repair order, for example when issuing consumables to the repair order while carrying out the repair work. The action will call the Install/Confirm parts screen.

For further information, please refer to the Install/Confirm parts section.

Confirm Serial Number

Function Module	Description
/AXONXAPP/CONFIRM_SERNR	Confirm Serial Number in each Work Order

Calls the install/confirm part screen for a given work order.

For further information, please refer to the Install/Confirm parts section.

Create/Delete Structure Gaps

Function Module	Description
/AXONXAPP/GAP_CREATE_DELETE	Create or delete structure gap

This function allows the creation and deletion of structure gaps on a piece of equipment/technical structure.

Defect Deferral

Function Module	Description
/AXONMES/DEFER_DEFECT	Defer a defect notification

This functionality allows you to defer a previously created defect notification.

For details, please refer to the Defects, Deferrals, Transfers and Split section.

Insert Operation

Function Module	Description
/AXONXAPP/OPR_MAIN_INS	Add order operation

This action mimics the standard insert operation in a PM order. When you select the option to insert an operation a pop-up dialog is displayed to input new operation details. In this pop-up, you must enter the operation and optionally sub-operation number (which must be unique for this work order), the operation control key, the work center and plant of the operation.

Delete Operation

Function Module	Description
/AXONMES/EWI_ODROPR_DELETE	Delete order operation

Deletes an operation from a work order.

Digital Signature

Function Module	Description
/AXONMES/SIGN_DELETE	Delete digital signatures for order operation
/AXONMES/SIGN_READ_LOG	Read digital signatures log for order operation
/AXONMES/DSIGN_POPUP	Digital signature for EWI Application

Often complex asset repair requires the shop floor technician and their supervisor to sign off that the work was performed to the required specifications in the work instructions. Many companies do this on paper, with physical stamps provided to the shop floor technicians so that each person can use their own stamp and sign their name on the paper build or rebuild records. The drawbacks to this include the possibility of misplacing the stamp, forging signatures, or losing/destroying the paper record.

The digital signature function captures the operator stamp and signature as either a password or via the digital signature interface to SAP, such as a bar-code or magnetic stripe reader, finger-print scanner etc. Detailed text about the signature can be displayed and comments can be captured.

Multiple levels of digital signature are possible, for example with technicians signing each operation and then both the technician and their supervisor signing the final or milestone operation. This is controlled via the signature strategy associated to your work order type in customizing. Several "levels" of signature may be required with dependencies (e.g., technician must sign before supervisor) and a special SAP digital signature authorization group or role may be required for each level of signature.

Disposition

Function Module	Description
/AXONMES/DISPOSITION	Disposition from EWI

This function calls any disposition code, such as declare serviceable.

For further information, please refer to the Inspection Workbench section.

Document Display

Function Module	Description
/AXONMES/EWI_SHOW_DOC_DIRECT	Display document from PM/PP order PRT object

This function is used to display SAP document information record attachments with the original file. Document information records can be accessed from the work order as document PRT's, as document bill of material items, or as documents directly linked to the header material or equipment record master data.

The user can also select the display document action to display files attached to the document and open the respective file.

Insert and Delete Production, Resource or Tool (PRT)

Function Module	Description
/AXONXAPP/PRT_MAIN_INS	Insert Order PRT
/AXONXAPP/EWI_DISP_PRT	Display PRT Link Object
/AXONXAPP/PRT_MAIN_DEL	Delete Order PRT

PRTs can take the form of a material tool, other tool, equipment tool or document and can either be inserted, displayed, or deleted from a work order.

Insert Task List

Function Module	Description
/AXONXAPP/OPR_INS_TL	Add order operation by task list

This action allows you to insert a task list into an order. A window will be displayed to input the task list type, group, and group counter.

Inspection Results

Function Module	Description
/AXONXAPP/REC_INSPLOT_QE01	Call transaction code QE01 for inspection lot

Calls transaction code QE01 for inspection lot.

Labor Clocking

Function Module	Description
/AXONMES/LABOR_CLOCK	Labor Clocking in EWI

This function allows a user to book time onto an order through the operations "Clock On" and "Clock Off". To clock on or off the order operation, select the labor clocking action in EWI selection screen, enter optional confirmation text, and when clocking off optionally tick the final confirmation box. A final confirmation sets the operation to complete (CNF) so that other people cannot clock to it. Enter yield, scrap, or rework quantities if applicable.

Further information can be found in the Labor solution section.

Mod Status Update

Function Module	Description
/AXONXAPP/MOD_POPUP_NEW	Mod pop up

Updates the status of a mod on a work order.

NOCO

Function Module	Description
/AXONEBX/GET_NOCO	FM to Complete Notification

This function closes the notification selected (sets system status "Notification Complete").

Operator and Planning Comments

Function Module	Description
/AXONXAPP/EWI_COMMENT	Operator Comments
/AXONXAPP/NOTIF_PLAN_COMMENTS	Planning Comments on Notification

Users can input comments while they are working on an order in EWI, for other operators to review or add to. An example might be end of shift hand-over notes, or miscellaneous findings. Users can attach free-text notes to an order or an operation of the order at any point during the execution process. A planning comment can also be inserted in the header notification.

New comments are saved with date/time and user-ID (name) stamping. If a general user-ID is used to login to EWI on the shop floor, the personnel number that was used to login to EWI - or requested as part of the comment request - will be used for the name, date, and time stamp for audit trail purposes.

Release Order

Function Module	Description
/AXONMES/EWI_ORDER_REL	Release a work order

Releases the selected work order (sets system status "Released").

Raise Defect

Function Module	Description
/AXONMES/DEFECT	Raise defect notification

This functionality is used to raise a defect notification against an order. Additionally, an order can be created and deferred to a later date.

For details, please refer to the Defects, Deferrals, Transfers and Split section.

Record Usage

Function Module	Description
/AXONXAPP/REC_USAGE_QA11	Record usage decision via QA11

Records usage decision via transaction code QA11.

Release Revision

Function Module	Description
/AXONEBX/GET_REV_REL	FM to Release Revisions

Releases the selected revision (sets system status "Released").

Sourcing

Function Module	Description
/AXONEBX/CALL_SRC_TXN	Call sourcing transaction from EBX

Calls the Sourcing function from EBX.

For further information, please refer to the Sourcing Workbench section.

Function Module	Description
/AXONXAPP/EBX_RV_SHIFT_COMMENT	Revision shift comment for EBX

Allows you to enter text against the revision.

TECO

Function Module	Description
/AXONEBX/GET_TECO	FM for Completing the Work Orders
/AXONMES/EWI_ORDER_TECO	Technically complete a work order

Technically completes the selected work order (sets system status "Technically Complete").

Tooling Goods Movement

Function Module	Description
/AXONXAPP/GOODSMVT	Tooling Goods Movement

This function allows the issue of a tool to a work order and receiving the tool back from a work order.

Update System or User Status

Function Module	Description
/AXONXAPP/GET_NEXT_STATUS_CHK	Get Next User Status for Order

This function allows you to change the user status of an object (order or notification). It does so by reading the status profile to retrieve the allowed statuses for the object and then presents a pop-up for the user to select the required status.

Update DFPS Technical status

Function Module	Description
/AXONXAPP/UPDATE_DFPS_TECHST	Update DFPS Technical Status for Notification
/AXONMES/FLTR_TECHST_BUTTON	Filter Notification DFPS Technical Status button

The function(/AXONXAPP/UPDATE_DFPS_TECHST) allows you to change the Technical status of an object (Notification and Master Equipment). It does so by reading the status profile to retrieve the allowed statuses for the object and then presents a pop-up for the user to select the required status.

The function(/AXONMES/FLTR_TECHST_BUTTON) validates and displays the Technical status button if order status is TECO.

Note: Notification type must be defined in "Support for flight operations" in configuration node.

Workscoping

Function Module	Description
/AXONXAPP/WORK_SCOPING_CALL	Workscoping

Calls the Workscoping Workbench, to define the scope of work to be carried out on an end-item.

For further information, please refer to the workscoping workbench section.

Update Serial Number

Function Module	Description
/AXONMES/DISPO_MATNR_SERN_UPD	Option to change P/N, S/N, and equipment after disposition

This function gives a confirmation pop up to update the part number/serial number. The following updates are carried out in the background:

1. Removal quantity, part number and serial number is modified in old tracking notification and order.
2. Sourcing records are updated and with new order details, in reservation split and sourcing exchange data.
3. Embodiment record is updated for mod transferred to the new order. These changes also reflect in embodiment status report.
4. Old tracking notification and newly created tracking notification is modified with new task code and code group based on split strategy configuration.
5. An option is provided in configuration to transfer all work during part/serial update with this it will transfer all the remaining quantity to the new split order.

Shortage Status

Function Module	Description
/AXONXAPP/SHORTAGE_STATUS	Call Shortage Report for order operation

The Shortage status report displays the real-time shortages and material availability for the work order operations with respect to the requirement date through a traffic light indicator.

Barcode

The Barcode Transaction Framework is a flexible means of enabling barcode interaction in shop floor work execution tasks. The Barcode Scanning feature enables the user to easily populate data into the screen to execute a function. The Barcode framework intelligently assigns the scanned data to the correct field and once all required fields are populated, the function can be automatically executed.

Each subsection contains the relevant function names and a brief description of the functionality.

Add Order Operation

Transaction Code	Description
/AXONX/ADDOP	Add Order Operation

This function is used to add an operation to an order using Barcode. SAP screen for order input will be called after executing the T-Code. Click on the 'GO' button after entering the order number in the desired field and you will be prompted by a pop-up window. Input activity & operation short text and click on continue to save the order. The operation will be added and can be displayed in the operations tab.

Insert Task List

Transaction Code	Description
AXONX/ADDTASK	Insert Task List

This function is used to add a task list into an order using Barcode. The SAP screen for order input will be called after executing the transaction. Click on the 'GO' button after entering the order number in the desired field and you will be prompted by a pop-up window. Input task list type, group and group counter and click on continue. Select the operations to be added and click on Continue to save the order. The task list will be added and can be displayed in the planning tab.

Add Component

Transaction Code	Description
/AXONX/ADDCOMP	Add Component

The user can use this function to add a component to an order operation using Barcode. The SAP screen for order input will be called after executing the transaction. Click on the 'GO' button after entering the order number in the desired field and you will be prompted by a pop-window. Input activity, item category, material and requirement quantity and click on continue to save the order. The component will be added and can be displayed in the components tab of the order.

Release Order

Transaction Code	Description
/AXONX/REL	Release Order

The user can use this function to release an order using Barcode. The SAP screen for order input will be called after executing the transaction. Click on the 'GO' button after entering the order number in the desired field. The order will be released and saved.

Labor Clock On/Off

Transaction Code	Description
/AXONX/CLOCK	Labor Clock On/Off

The user can use this function to Clock On & Off for an order using Barcode. The SAP screen for entering order number, transaction ID & personnel number will be called after executing the transaction. Click on the 'GO' button after entering the order number, transaction ID & personnel number in the desired field. The employee clock will be set "ON" for the transaction ID of the respective order number. The same procedure shall be followed for setting the clock "OFF".

Work Order Defect

Transaction Code	Description
/AXONX/DEFECT	Work Order Defect

This function is used to create work order defects using barcode. The SAP screen for entering order number will be called after executing the transaction. Click on the 'GO' button after entering the order number and you will be prompted by a pop-up window for choosing the notification type. Saving after entering the defect hours will successfully create a new defect order with notification.

Defer Defect

Transaction Code	Description
/AXONX/DEFER	Work Order Defect

This function is used to defer a work order defect using Barcode. The SAP screen for entering order number will be called after executing the transaction. Click on the 'GO' button after entering the order number and you will be prompted by a pop-up window for entering the offset. A new maintenance plan will be scheduled, and a new notification saved.

Install Component

Transaction Code	Description
/AXONX/INSTALL	Install Component

This function is used to install a component under an equipment. The SAP screen for entering order number and transaction ID will be called after executing the transaction. Click on the 'GO' button after entering the order number and transaction ID and you will be prompted by a pop-up window for entering the equipment number and component material. Clicking on the Continue button will install the component under the equipment.

Print

Transaction Code	Description
/AXONX/PRINT	Print

This function is used to print the header and operation details for a maintenance order using Barcode. The SAP screen for order input will be called after executing the transaction. Click on the 'GO' button after entering the maintenance order number in the desired field and the print command will be sent to the maintained printer.

User Status Update

Transaction Code	Description
/AXONX/USTAT	User Status Update

This function is used to update the user status for a maintenance order using Barcode. The SAP screen for order input will be called after executing the transaction. A new window to set the user status will pop-up. After setting the desired user status click on the continue button. The order will be saved with updated user status.

Order Operation Confirm

Transaction Code	Description
/AXONX/CONFIRM	Order Operation Confirm

This function is used to confirm the operations in a maintenance order using Barcode. The SAP screen for order and transaction ID input will be called after executing the transaction. The maintenance order confirmation screen will open. Enter desired values in the fields and click on the Save button to confirm the operation.

Technically Complete Order

Transaction Code	Description
/AXONX/TECO	Technically Complete Order

This function is used to technically complete a maintenance order using barcode. The SAP screen for order input will be called after executing the transaction. Enter the maintenance order number and click on 'GO'. The order will be technically completed and saved.

Bill of Work (BOW)

Overview

It is a common business requirement within the MRO business to produce a quote for a maintenance package based on a customer inquiry. These are normally developed before the actual work package is created within SAP and certainly before any maintenance orders exist. These quotes are sometimes carried out fully within SAP or in other cases are done based on cost data from SAP with the actual quotation done externally. In either scenario, the Bill of Work (BOW) component facilitates the process of gathering work cost information for both materials and labor.

Bill of Work generates SD inquiries and quotations based on the cost information held in various maintenance-related objects such as revisions, notifications, documents, and task lists.

In the case of Hierarchical Task Lists (HTLs), if more than one HTL is incorporated in the inquiry or quotation, and those HTLs contain the same executable task list (also known as general task lists) then BOW can eliminate the duplicate executable task-list.

Quotations can either be created directly with reference to a contract or the contract can be derived from an event notification. The contract is used to determine item pricing for the applicable materials in the quote.

Selection Screen

The input screen is split into header area, contract determination and main area. The contract determination screen area is only available for the quotation creation process. All fields on the selection screen are included in the search for relevant work items.

Header Area

This section contains plant, which is a mandatory field.

If a functional location or equipment is specified in the header area, then the work requirements selected in the main area (notification or revision) must refer to the same functional location/equipment, otherwise no data will be displayed. Similarly, if a work center is entered in the header area, and a task list is entered in the main area that does not contain that work center, then also no data will be displayed.

Contract Determination

This section is only displayed when the quotation radio button is selected. Quotation can refer to a contract either at header level or at item level, based on the copy control settings in sales and distribution configuration. The system will copy data from the contract (source document) to the quotation (target).

Main Area

The Main Area contains a series of criteria for selecting work to be included in the inquiry/quotation

- Existing Work Requirement
    - Revision: All notifications in the selected revisions. For each notification, it will determine the task list.
    - Notification: For each notification, it will determine the task list either directly from the notification or from the maintenance plan item
- Work Requirement Master Data

- o Document Information Record - for each DIR it will determine all the task lists which object is linked to the document info record.
        - o Task Lists - Direct task list selection.
    - Layout Selection: Determines the list format, which can include the list column structure, sort criteria and filter conditions.

It is recommended that you only use a single type of work requirement (i.e., use notification, DIR, task list individually and not together in the same selection).

Create Inquiry

Upon execution, task list information and cost information will be retrieved based on the selection criteria entered in the main area.

- If the check box is set on the selection screen to create a new inquiry, a new inquiry will be created and then displayed.
- If an existing inquiry number has been entered, then all information related to this inquiry will be retrieved.

A summary of the Bill of Work is presented in ALV format.

Inquiry Display

The costing information is held against the inquiry document number in a table /AXONBLM/QUOTE.

In addition, the inquiry document can be viewed through the SAP transaction VA13.

To view the inquiry via BOW, select the Use Inquiry check box, enter the inquiry number, and execute to display the screen.

Create Quotation

On execution, Bill of Work is displayed with group number and operations, and a quote proposal will be created (depending on whether the create quotation check box was set on the selection screen). For more information on the quote proposal, please refer to the subsection titled 'Determination of Work Package Material, Header Material, Labor and service materials for Quotation'.

When the transaction is run, Bill of Work will determine the available quotation schemas as maintained in the configuration. The quotation schema controls various attributes of the quotation.

Manual Addition/Deletion of a Material into Quotation Proposal

It is possible to add a new material (labor, service, material) by selecting the header material line and clicking on the insert row icon. To remove a material, select the header material row that is to be removed and click on the delete row icon.

Once the save button is selected, the quotation will be created and displayed in the ALV grid.

Determination of Work Package Material, Header Material, Labor and Service Materials for Quotation

The work package material is entered on the selection screen of BOW. If the work package material is entered, the resulting quotation has a three-level structure and if the work package material is left blank the quotation will have a two-level structure.

This three-level structure consists of the following components:

- Work Package (excluded from the two-level structure)
- Work Requirement
- Labor/Material/Service for work requirement

The header material can be maintained in a document information record representing the work requirement. The assignment of the quotation and billing-related data to the DIR can be done via the maintenance requirement workbench.

Labor material determination is based on the master table accessed via transaction /AXONX/LABOUR. The system will identify and propose the labor material in the quotation based on the combination of plant, work center, control key and activity type in the task list operation.

Service material determination is based on the master table accessed via transaction /AXONX/SERVICE. The system will identify and propose the service material based on the service master in the task list operation.

Other materials (e.g., consumables) are proposed directly from the task list operations.

Quote Structuring

Work Package Material on Selection screen	Levels in Quote	Material Determination	Billing Method Determination
Yes	Level 1: Work package	Entry on Selection Screen of transaction /AXONX/BOW	Determined from Schema
	Level 2: Work Requirement	From the service material maintained in DIR in quotation and billing tab else a text item	Determined from the billing method maintained in the DIR else defaulted from billing method Level 1 material
	Level 3: Labor/Material/Service for the work Requirement	Determined based on the labor/material and service maintained in the task list. A material determination is executed for labor based on data maintained in transaction /AXONX/LABOUR and service based on /AXONX/SERVICE	Defaulted from Level 2 material
No	Level 1: Work Requirement	From the service material maintained in DIR in quotation and billing tab else a text item	Determined from the billing method maintained in the DIR else defaulted from quotation schema

	Level 2: Labor/Material/Service for the work Requirement	Determined based on the labor/material and service maintained in the task list. A material determination is executed for labor based on data maintained in transaction /AXONX/LABOUR and service based on /AXONX/SERVICE	Defaulted from Level 1 material

Quotation User Status

At the time of quotation creation, the system will automatically set the initial S\status (example: CRTD). Status can be controlled by clicking the configurable buttons:

1. Release quote to customer
2. Accept quote
3. Reject quote – with "Reason for rejection"

The user can also set a status "Partially Rejected". Partial rejection can also be done by selecting a reason for rejection in the quotation proposal.

Integration with Notification

During the quote creation using the notification in the work selection criteria the user status in notification is updated based on configuration settings.

Based on the status of the quote, the notification is updated depending on configuration settings.

Display Quotation

If an existing quotation number has been entered, then all information related to this quotation will be retrieved. A summary of the Bill of Work is presented in ALV format.

The quotation document can also be viewed through transaction code VA23.

Costing in BOW

The method used by BOW to calculate the costs of a task list is like standard SAP order costing for labor and materials. For labor, the costs are arrived at by multiplying the work (e.g., in hours) by the rate specified in the activity type in the task list operation. For materials, the costs are arrived at by multiplying the standard price of the material components in the task list by the required quantity.

Note: For BOW functionality to work, it is therefore prerequisite that any task list that is included in BOW must be fully maintained with accurate labor and material component data, and the underlying costing relevant master data (activity types, material prices etc.), must also be maintained.

APIs Delivered

API Name	Functionality Description
/AXONBLM/BOW_CONFIG_READ	Read BOW Configuration
/AXONBLM/BOW_HEADER_CRT	Generate new BOW ID
/AXONBLM/BOW_HDR_MODIFY	Update/Delete BOW Header Data
/AXONBLM/BOW_PAYER_ CREATE	Create BOW Payer.
/AXONBLM/BOW_PAYER_MODIFY	Modify Payer Data.
/AXONBLM/BOW_WORKGROUP_C	Create Work Group.
/AXONBLM/BOW_WORKGROUP_U	Update Work Group
/AXONBLM/READ_BOW	Read BOW data
/AXONBLM/BOW_READ_	Read BOW Worklist data.
/AXONBLM/BOW_WORKLIST_SAVE	Save BOW Worklist data.
/AXONBLM/BOW_OPR_GET	Get BOW planned operations.
/AXONBLM/GET_WORK_DETAIL	Read Work Detail Data
/AXONBLM/BOW_WORKDETAIL_SA	Save BOW Work Detail
/AXONBLM/BOW_GET_ITEM_CATE	Get BOW Item Category
/AXONBLM/BOW_QUOTE_CREATE	Create Quotation
/AXONBLM/BOW_WRAPPER	BOW Wrapper.

Conformity Check

Overview

Maintenance and Engineering departments, after-market support organizations and third party Maintenance, Repair and Overhaul (MRO) service providers - as well as any organization which services, repairs and overhauls complex equipment such as used in the aerospace, power generation, oil and gas, nuclear, transportation, construction, utility and telecommunications industries – typically perform MRO activities on equipment which requires the asset to be stripped down, and parts removed, inspected, and a decision made about how to repair or replace the removed parts to ensure the asset is returned to service. Multiple considerations must be considered by the inspector or certified personnel when declaring a part as serviceable.

Conformity Check can be triggered during sentencing of parts or during release to service to check those multiple considerations in the background before presenting the results to the inspector or certified personnel to decide.

Conformity Check is triggered in the background by multiple events in the add-on and is an important part of the Declare Serviceable function. Conformity check can be triggered when a part is dismantled/ disassembled in the Inspection Workbench (IBX), during installation of a serviceable component or during release to service of an asset from the Induction Workbench (SBX).

Parts validation check can also be triggered in standard configuration control workbench (CCM2)

The two key components of the solution are:

- **Conformity Check**: Here, you can set up rules in configuration to check if a part or complex asset is in conformance according to several defined variables.
- **Work Status Check**: Here, you can define which work items should be checked as complete. The following items can be checked for each work type:
    - Activities/operations within an order/network.
    - Defect notifications associated with a work type.
    - Open reservations against the work type.
    - Inspection lots in the work type.
    - Open orders (system status not "CLSD").

Events Triggering Conformity Check

The Conformity Check can be triggered by the Electronic Work Instruction (EWI), Inspection Workbench (IBX), Induction Workbench (SBX) and standard SAP transaction IE4N during installation of a part number.

Conformity check within Electronic Work Instruction (EWI)

In EWI, you can configure an Instruction with an action to execute a serviceable disposition, including the conformity check.

You can do this if there is no necessity for your organization to use the entire inspection workbench functionality but would still need certified personnel to sentence parts before they can be declared fit for service and then installation.

You can also customize EWI to perform installation for the part declared serviceable or alternately use standard SAP transaction IE4N. If the equipment being installed back has been customized (in the equipment category) with a Conformity Check rule, then, this too will trigger the defined checks.

Conformity Check within Inspection Workbench (IBX)

Inspection Workbench is utilized to strip and disassemble parts from an end item complex assembly. A part can be stripped and declared as serviceable without sending the part for repair in IBX. A part can also be stripped, sent for repair/refurbishment, and then declared serviceable. The result of this is the part would be brought into serviceable inventory.

You trigger conformity check during declare serviceable in IBX if the disposition code has been customized with the conformity check rule. You can also configure the conformity check rule to check minimum life during part dismantle/disassemble in the Inspection Workbench. If a part being dismantled/disassembled has less remaining life than the superior assembly minimum life builds standard, the dismantling will be set to open loop.

The Conformity Check rule can also be configured to check if a mandatory repair scheme or modification has been completed (mod status check). If it has not, then the system can be configured to issue an error, in which case the inspector will not be able to dismantle the part as serviceable.

Installing a Serviceable Part with Transaction IE4N

The Conformity Check rule is determined depending on the equipment category of the part number being installed, in the case of serialized parts, or based on the material type in the case of non-serialized parts. Depending on the rules (error or warning), you can run a simulation in transaction IE4N to trigger the conformity check report and identify if the part can be successfully installed. This is the same conformity check as performed in EWI.

Conformity Check – Release to Service

When an end item asset has been completely assembled, you will need to declare the entire assembly as serviceable and release it to service. The Conformity Check rule you assigned in customizing will be used to perform this check.

If the Minimum Life Check (referred to below) has been activated for the Conformity Check rule, the system will check for the class maintained in customizing in the end item notification, sales order, or sales contract (in this order).

Only when an end item has been released to service, can the relevant release forms be generated and printed out for the customer and the relevant authorities.

Conformity Check via Transaction Code /AXONX/CCHECK

The Conformity Check can also be triggered from transaction code /AXONX/CCHECK, for example on a complex asset or aircraft.

This transaction will execute the Conformity Check rule assigned to each equipment category in the equipment hierarchy and will generate a log after execution.

The Conformity Check will be executed when equipment number (complex asset number) or functional location number (aircraft number) is entered along with end item event notification number in the End-item Notification field in the initial screen.

Conformity Check Components

Check MPL

If Check MPL is activated for the check rule, the system will check the part number to be installed (or planned to be installed in exchange scenarios) has been defined as a variant for the appropriate node in the Master Parts List (MPL).

Mod Status Check

The mod status check verifies that all workscoped modifications are embodied for the equipment. You will need to create, embody, and track the embodiment status of service bulletins or directives from authorities or OEMs via the Maintenance Requirement Workbench (MBX) to activate this check.

Please note that the report does not track embodiment statuses for modifications which are just applicable to a part number/equipment. The modification should have been planned for embodiment (i.e., an embodiment notification or operative maintenance plan should exist) before it is displayed in the report.

Mod Parts Check

To activate this component for conformity check, you would need to create, embody, and track the embodiment status of service bulletins or directives from authorities or OEMs via the Maintenance Requirement Workbench. Also, you would need to set up the as-allowed structures for your organization utilizing SAP's integrated Product and Process Engineering Workbench (iPPE).

When this check is activated, it will check if the part number for the equipment is equal to the post-modification part number for an embodied modification. The post-modification variant is created from within MBX.

For example, when the Conformity Check is performed on an equipment with part MPL-02 (a pre-modification variant), and the rule is set to ERROR if mod parts check fails, then you will not be able to declare the equipment serviceable or install the part back to its superior hierarchy. However, another equipment with part MPL-03 (which is the post-modification variant) will be able to be declared serviceable and installed back.

Target Mod Standard Check

To activate this component for conformity check, you would need to create, embody, and track the target embodiment status of service bulletins or directives from authorities or OEMs via the maintenance requirement workbench and utilize build orders to track the re-assembly of a complex asset.

The target mod standard check validates that a part meets the target build standard as defined in the build order reservation (part number) that the part being checked is currently sourced to. The part number must either match, or be a valid alternate of, the target builds part number.

Minimum Life Check

To set up the minimum life check, the add-on uses SAP classification. The user can assign the class to the end item notification, sales order, or sales contract for the component or complex asset. First, create a class using SAP transaction CL02 and maintain at least one characteristic in the class.

Then, assign the class created for minimum life check to the object (end item notification, sales order, or contract) using SAP transaction code CL20N. It is advisable to create one class ID for all class types. More than one characteristic can be maintained in the class assigned.

Based on the characteristics maintained in the 'Minimum Life Check' class, the system will read the value of the characteristics maintained on the end item notification, sales order, or contract (in this order) to determine the minimum build to achieve life.

For the part(s) or equipment conformity check is being performed on, the system will identify the measuring point with the same characteristic you maintained in the 'Minimum Life Check' class. The system then identifies the maintenance plan for this measuring point. From the maintenance plan

identified, the system gets the next due call for this plan, and then identifies the planned counter reading for this due call (based on expected usage).

The system deducts the last recorded counter reading (from the measurement document) from this planned counter reading to give the remaining life.

This value is then compared against with value maintained in the end item notification, sales order, or contract.

If the value in the end item notification, sales order or contract is more (i.e., the build to achieve life is greater than the remaining life on the equipment), then the check is deemed to have failed.

Structure Gap Check

The Structure Gap Check is usually activated for checks performed during installation of a part. The system will check if the equipment/part number being installed has a corresponding gap to fill in the technical structure (as maintained).

Custom BAdI Check

If Custom BAdI check is activated, customer code will be triggered.

Work Status Check

The Work Status check will identify any open work items (as per the configuration) for the equipment being checked.

Configuration Check Workbench (CCM2)

Standard CCM2 transaction is enhanced to perform part validation based on MPL data in mod document, embodiment status and interchangeability configuration.

Defects, Deferrals, Transfers, Splits

Overview

The 'Defects, Deferrals, Transfers and Splits' functions are a set of related enhancements to SAP work order processing which collectively support the following business scenarios:

- Raising a defect or service notification on a PM order. You may optionally raise a corrective action PM order with the notification or defer the defect as it is being raised.
- Deferring a pre-existing defect PM order.
- Splitting an order, creating a new PM order, and transferring a partial quantity of in process parts, and the split-off work to the new order.
- Performing a subcontract exchange from a PM order, with full integration to the purchasing documents used to manage the vendor interaction.

Depending on the business event being requested, the system will:

- Create a PM or CS notification
- Insert operations into the same or an alternative order
- Create a PM or CS order
- Create a maintenance plan (for deferral), with optionally a second plan for terminating event
- Create secondary (deferred) notification(s) and order(s)

Main Screen

The main screen is subdivided into notification and order, and reference object sections at the top, with values defaulted from the originating notification and/or order. Both the bottom half of the pop-up and the title bar change dynamically depending on the function selected.

At the bottom of the pop-up screen is an attachment button. Clicking on this displays a task bar, allowing you to create an attachment, note or external document (URL) for this defect.

Defect Tab

You can use the search help key or press F4 (SAP search help) to identify the cause code and ATA code. The other fields are free text to enter a description of the defect.

There is also an actions sub-section within the problem section on the right of the screen. Depending on the configuration of the deferral, split and transfer strategy, here you have a tick box for defer notification and create order.

Defect – Tasks Tab

If order creation is allowed and the create order check box in the defect tab is selected, the defect-tasks tab is displayed. This screen is divided into 3 sub-screens: resolution – operations, resolution – long text and resolution – components. Each sub-screen has an expand/collapse toggle next to the name to simplify the views.

You can use the search help key or press F4 (SAP search help) to identify the PM/PS reference element. This field enables a logical connection between maintenance order and network operations or WBS elements.

You can add or delete rows from the task list by clicking on the respective icon.

You need to maintain at least one row of data in the operation table control before the resolution – long text sub-screen will open for free text entry. To maintain long text for other rows, double click the operation number on the operation table control.

The resolution – components sub-screen allows you to add components to the corrective action work order operations.

Defer Tab

If the defer notification check box is selected, the defer tabs will appear.

On the defer tab, description and repeat are mandatory fields. Description is free text, and you can select repeat using the search help key or press F4 (SAP search help). The selection of 0, 1, or 2 will affect the tabs that you will see and use to enter data. This is explained further in the description of the Defer function.

Defer – Final Tasks Tab

The defer – final tasks tab is divided into 2 sections – scheduling at the top and task list for selection at the bottom. The user will be required to enter offset for the maintenance package/cycle. The task list fields are mandatory if deferring defects without creating an order. If you tick the create order checkbox, the tab screen for defer – final tasks will change to display the order list (operation task list).

Defer – Repeating Tasks Tab

This screen is divided into 2 sections – scheduling at the top, and task list for repetitive maintenance at the bottom. Unit, measuring points and description are defaulted per configuration. Enter offset and cycle for maintenance. Task list fields are mandatory for deferrals with repeating tasks. The create order tick box (in defer tab) is grayed out and cannot be ticked in the defer tab screen. This is because with a repetitive procedure the maintenance orders must be generated from the maintenance plan controlling the intervals and cannot be created directly in the defect screen.

Transfer Quantity Tab

This tab contains details of the transfer strategy, source and destination order and transfer quantity, all of which have predetermined values where appropriate. There is also a description field where it is possible to enter free text.

Subcontract Exchange

If the initiating function is Subcontract Exchange (described below), the screen is like the Transfer Quantity screen in the Order Split function, and works in a similar way, with the following additions:

- Select the modification indicator if the same physical part is being reworked by the vendor.
- In the exchange material field, specify the material number of the exchanged/modified part(s).

  Note: The part number specified here must be a valid alternate part number of the original part number.

Functions

Defect

Defects or non-conformances can arise during maintenance execution due to variances against the process plan, or quality inspection findings that do not meet the required product or process specifications. In these cases, it is necessary to raise a defect notification to record the problem, with the option of:

- Creating a corrective action work order immediately.
- Creating a corrective action work order later, perhaps following an engineering or technical review of the defect and corrective action required.
- Deferring the defect until a later date or time or until the equipment has reached a measurement counter value or operating life, normally based on an engineering or technical evaluation of the impact of the defect on the normal operation of the equipment.

The steps to create a defect are outlined below:

- Create defect notification,
- Determine if the defect requires immediate corrective action or can be deferred,
- In case of immediate corrective action required, create a PM work order.

The Electronic Work Instructions initial screen allows you access the Defects, Deferrals, Transfers and Splits functionality. Using the order number and operation, call the Raise Defect function to raise a defect. The defect notification type is defined in customizing. If more than one defect notification type is applicable, then you will be asked to select one.

Task list selection, operation data input, and source order data to copy are all defined in customizing. Order operations/tasks cannot be manually edited for repeating tasks. These must always reference a task list.

Task list operations and components may be manually changed but PRT assignments cannot be manually changed; if a task list operation is deleted, the component and PRT assignments for that operation are also deleted.

The task list operations are copied into the work order for corrective action or final tasks without maintaining the reference back to the original task list. This is the only way to allow manual edit of the task list operations and components following copy into the work order. As a result, if a task list is included twice its operations will be copied in again, even if they were not changed on the order between the copies.

Defect information, including orders and maintenance plans, can be created, or displayed via the defect screen. Changes to defect information should be performed via the underlying standard SAP transaction for the object in question (notification, order etc.) or via separate action calls (in the case of EWI).

Defer

The Defer screen can be accessed through EWI by entering the defect order number and selecting the defer function.

Deferrals can use single cycle/multiple counter maintenance plans. If orders are to be created for deferrals based on a plan, then the maintenance plan is immediately scheduled, and calls are automatically released as notifications. Deferred defects are scheduled out as far as the final corrective action event, if applicable, or as far as the scheduling lead-time, for open repeating plans.

New orders/notifications are always created for repetitive deferrals (i.e., not one-off deferrals). Quantity or serial number selection and copy of work from original order is not supported with repetitive deferrals.

- The **repeating indicator** controls whether the corrective action is a one-time final event (single work order), a repetitive process, or a combination of repetitive inspection and final corrective

action. This is what determines which of tabs repeating tasks and final tasks automatically appear.

- The **deferral split and transfer work strategy** controls not only the repeating indicator, but also how corrective action work is formulated, the corrective action order type and deferral authority.

The following section describes the possible deferral repeat indicators and the outcomes of each case after entering the value and pressing the Enter key:

- **0 – One-time event to fix defect**: The defer – final tasks tab will appear,
- **1 – Repeating process (at maintenance interval):** The defer - repeating tasks tab appears.
- **2 - Repeating process with terminating event (at maintenance limit)**: Both defer – repeating tasks and defer – final tabs appear. Please refer to the below for explanation on how to use these tabs.

Split Work Order

Using the order number and operation, call the Order Split function to split an order. The defect notification type is defined in customizing. If more than one defect notification type is applicable, then you will be asked to select one.

- The **defect** tab allows you to create a notification to record the original reason or cause leading to the need to split the work order.
- The **defect – tasks** tab is normally the default and allows you to manage the tasks to go onto the order which is receiving the split work. Activities or operations on this tab are typically based on outstanding tasks from the existing order.
- The **transfer quantity** tab manages the portion or quantity of the parts on the original order being split or transferred to a new work order. In the case of serialized parts on a PM order, the list of serial numbers being repaired is shown so that they can be selectively transferred or split to the new work order.

The operations listed in the resolution – operations table (in the defect – tasks tab) are populated from the existing order that have yet to be worked on. Therefore, operations can be split to another destination order. It is possible to also copy the current operation, the current operation plus outstanding tasks, or all tasks from the current work order, based on the deferral, split and transfer work strategy customizing. Alternatively, if the deferral, split and transfer work strategy is set up not to copy work from the existing order, then the operation list will initially be empty. It is also possible to manipulate the activities proposed onto the new split work order by either:

- Searching for and including a specific task list (click on task list button).
- Manually editing the operations, text, or material components in the dialog.

Split Quantity onto New Order

From the serial numbers (populated from the object list in the order) listed in the transfer quantity tab, you can select one or more to split or transfer to a new destination order/operation. Once the selection is made, select the Recalculate Operations for Transfer action and the system will recalculate the amount of time required for the operations of the source order found in the defect – tasks tab which are available to be transferred in the new order. The user will get a prompt to confirm. Click Yes and Save.

The following processes are executed in background:

- A new tracking notification is generated.
- A new work order is generated with the required operations.
- The quantity is received back to stock from the source order and issued to the new split order.
- The work hours in the new order are distributed proportional to the quantity of parts split.

Subcontract Exchange

The Subcontract Exchange function is built on top of the Order Split function and is invoked by a separate button on the EWI initial screen called Subcon Exchange. Subcon Exchange is used to fully align the PM repair order processing with the ADSUBCON processes that are used to handle the stock movements and vendor liability elements in the subcontracting process.

Using the order number and operation, call the Subcon Exchange function. The defect notification type is defined in customizing. If more than one defect notification type is applicable, then you will be asked to select one.

Subcon Exchange handles complex scenarios, over and above the partial scrap at vendor and partial receipt scenarios handled by the standard Order Split function as described above. Subcon Exchange is used in scenarios where the subcontract vendor either modifies the same physical part to a new part number, or exchanges the part for a physically different part, which may or may not be a different part number, in either full quantity or partial quantity. During physical and modification exchange valid materials can be restricted based on interchangeability code.

The Subcon Exchange function works in 2 modes:

1. Physical exchange (full/partial quantity) – a physically different part is returned by the vendor, with a different material and/or serial number.
2. Modification (full/partial quantity) – the same physical part is returned by the vendor, with a different material number.

In the case of physical exchange, or partial quantity modification, a new order (split order) is created using the Order Split functionality as described above.

The Subcon Exchange does not create a new order in the case of full quantity modifications, since the same physical part is being returned and the original order is therefore updated with the new part number, as necessary.

To initiate a Subcon Exchange, enter the repair order number (from which the external repair has been initiated), into the EWI initial screen and press the Subcon Exchange button. Proceed to select a notification type (as in Order Split).

In the case of serialized part(s), specify the serial numbers to be exchanged. In the case of non-serialized parts(s), specify the quantity to be exchanged.

On saving, a new order and tracking notification is created, and the specified parts are transferred to the new order. The subcontract PO is split – the main item becomes statistical, and two new sub items are created for the partial quantities.

The original repair order is also updated, and partial components are transferred to the new order.

Relationships between Tabs and Functions

The following matrix shows which tabs are displayed when selecting each function:

		Tab					
		Defect	**Defect – Tasks**	**Defer**	**Defer – Repeating Tasks**	**Defer – Final Tasks**	**Transfer Quantity**
Function	**Defect**	✓	✓				
	Defer	✓	✓	✓	✓	✓	
	Transfer/Split	✓	✓				✓
	Subcontract Exchange						✓

Special Split Scenarios

Split with Sub-Contracting (Partial Scrap at Vendor)

This scenario applies when multiple repairable items on the same repair order have been sent to a third-party vendor for external repair (for example via the ADSUBCON process) and a partial quantity of those items are subsequently scrapped by the subcontractor. In this case it is necessary to split the original repair order to reflect the fact that it will now ultimately only deliver the remaining (not scrapped) parts back to serviceable stock. The externally scrapped parts must be split onto a new order, which can itself then be scrapped via the normal process (scrap disposition).

In this case, since the split occurs while the parts are still located at the vendor's facility, the Split function also splits the subcon PO by marking the original PO line item as "statistical" and creating two sub-items representing the split quantities on the two underlying repair orders.

During Order Split with Subcontracting, the Split function performs the following steps:

1. Creates new tracking notification and new repair order
2. Split quantity is received back from original order (header) to stock
3. Split quantity of parts is transferred to a new batch
4. Split quantity of parts is issued to new split order (header) with new batch
5. PO Split takes place for the relevant quantity.

Split with Sub-Contracting (Partial Receipt)

This scenario applies when multiple repairable items on the same order have been sent to a third-party vendor for external repair and a partial quantity of those items is subsequently returned by the subcontractor. At this point, the partial quantity received must be moved onto a new order to reflect the fact that these parts will now continue through the remaining operations on the order and potentially be made serviceable while the remaining quantity is still under repair at vendor. A new order is required here to move the partial quantity to a new batch, which can then be distinguished from the old batch which remains at vendor. The key difference between this scenario and the partial scrap at vendor scenario described above, is that at the point in time when the split function is invoked, the same material/batch exists in two places – on the original repair order (the partially received quantity), and in the vendor stock (the remaining quantity). Note also that the split applies

to the partial quantity already delivered, and therefore it is not possible to perform a "Partial Receipt from Subcontracting" Order Split for a quantity greater than the quantity already received back from the vendor.

The "Partial Receipt from Subcontracting" scenario takes place in the following context:

1. A repair order has been created from the Inspection Workbench (IBX)
2. Sub-contracting control key is used (for more details refer to SAP Documentation)
3. Parts are returned from the repair order (header) to stock
4. Parts are transferred to vendor via ADSUBCON
5. Partial quantity of parts is received back from vendor via ADSUBCON
6. Partial quantity of parts is issued back to the repair order (header)
7. Split Order action from EWI and choose option "partial receipt" for partial scrap scenario
8. Declare new split order as serviceable (for initially received partial quantity) against the split order
9. Receive remaining repaired quantity via ADSUBCON from vendor
10. Declare remaining repaired parts as serviceable against the original order.

The following movement types are triggered during the split process:

1. Goods return from original order to stock (e.g., sales order stock)
2. Batch to batch transfer posting
3. Issue of part to new split order with new batch.

Include Modifications during split

Depending on the configuration of the deferral, split and transfer strategy, the Order Split function can transfer open modifications (unexecuted mod task lists) from the source order to the split order. This can either be defined as automatic, or subject to a user decision.

Modification notification should have been included in the source order. If user decision is defined in the configuration, a popup will be displayed to select and accept the relevant mods function to include embodied mods during split.

A new embodiment record will be created for the transferred modification(s) against the split order in the modification embodiment table (/AXONXAPP/DRWEMB).

Electronic Work Instructions (EWI)

Overview

The Electronic Work Instructions (EWI) solution provides a customer-defined layout for online display of work instructions, supporting the execution of repair and work orders in a single user-friendly operator portal. EWI displays work orders and related information in a fully configurable view, with all relevant information available to the operator to perform shop floor work execution tasks. Information displayed is configurable, based on sets of "instructions" to represent typical electronic work instruction data from the work order (components, text, drawings, tools, inspection results etc.). As well as a user-friendly display of work instruction data in electronic form, EWI allows shop floor operator input via single-click action buttons and codes to make capture of shop floor data in a full screen terminal device as efficient and accurate as possible.

Through EWI, shop floor-based and workshop mechanics, technicians and lead mechanics can record work performed and display work instructions. EWI is intended to work in one of the following two modes:

- As a configurable layout for job cards and SAP work instruction data, to support recording of shop floor events and input of these events by clerical assistants or production technicians and supervisors after the event, OR
- As a real-time electronic work order display and event capture tool, in the hands of or close to maintenance technicians as they perform work on the asset or component.

It is assumed that that a robust wired or wireless network is available in the workshop environment. This tool is not intended for use by line or field maintenance technicians who are occasionally offline.

EWI update features include updating status and labor (including job clock on/off based on the Labor Solution), management of work orders and notifications on the shop floor such as raising defects or splitting work orders, management of shop floor material including installation or removal or exchange of components and equipment, and recording shop floor findings such as comments, serial numbers, inspection results, equipment measurements etc. strip and Inspection Workbench dispositions, such as declare serviceable can be called from within EWI. Sometimes, during the disposition the material number and serial number may not be recognizable. As a result, the repairable disposition may be done with an incorrect part number or serial number. A function is available in EWI to update the material number and / or the serial number in the repair order. This functionality is therefore only supported after a Repairable type of disposition.

In fact, any SAP or web application function, action or transaction can be linked to the EWI screen based on the configuration set up and user's authorization profile.

EWI Layout Schema

The layout schema controls the layout and configuration of the EWI and the version of the layout and is maintained in configuration.

The EWI layout schema defines a unique set of instructions, rendered in successive sub-screens from the top of the screen, which contain critical information and input requirements for an operation within a work order. Each instruction is uniquely defined and linked to the EWI layout schema. The basic rule is that if a different group, plant, area, or cell require a different layout, then create and assign a new EWI layout schema.

Selection Screen

The EWI Selection Screen consists of 3 screen areas:

- **Work Order Information** – Here, you can enter the work order and operation you want to call EWI for. EWI displays detailed information for one operation at a time, with summary information for the work order (operation list).

- **Labor Clocking Information** - The fields available relate to the specific user accessing EWI. The personnel ID is the personnel number of the person doing the work and likely to post confirmations, labor, signatures etc. The personnel number should be set up in SAP Human Capital Management (HCM) as a basic employee master record with at a minimum their name.

- **Display of Multiple Work Orders** - This lower section of the screen is only used if you wish to display multiple work orders in the EWI work order hierarchy at the same time, perhaps because you jump back and forth between several work orders during execution and do not wish to exit/restart EWI each time. The fields in this part of the screen all result in work orders for the selection being read and proposed into the order number input field.

Selection Screen Actions

On the initial screen, the user can select one of six actions from the toolbar as follows:

1. **Raise Defect** invokes the dialog to raise a defect notification and/or work order from the first input work order (order number field) and operation.

2. **List Defects** looks for all existing defect notifications raised for the first input work order and operation and lists them in an ALV report.

3. **Defer Defect** works if the first work order input is a defect order itself. In this case the work order input is being deferred, and the defects screen is called to add deferral information such as future date or maintenance plan interval.

4. **Split Order** allows the first input work order to be split into two separate work orders, based on the split strategy.

5. **Labor Clock** invokes the labor clock procedure to the first work order and operation input.

6. **Subcon Exchange** invokes the dialog to exchange the material at subcontractor. Please refer to the Actions Button Functions section for further information on the capabilities of these actions.

Main Screen

Hierarchy Area – Top Left Order Operation Overview Sub-Screen

This area displays the work order list and operations for each work order, in a hierarchy. It is primarily used for quickly navigating, by double-click, to other operations or related work orders while within the EWI main screen. Work orders, their operations, and any notifications assigned to either the order header or to an operation are displayed in the hierarchy. In addition, any sub-orders, whether as a PM sub-order relationship or a defect work order created with reference to the main order, are also shown in the hierarchy. The user can also expand or collapse any hierarchy "node" by clicking on it, as well as Expand All and Collapse All buttons.

Header Area – Top Right Order/Operation Header Sub-Screen

This is the top-right area where up to four instruction sub-frames are displayed. Generally, header instructions are displayed here (e.g., order header, notification header). If there is more than one separate header area instruction, they are stacked up on top of each other. Each instruction can be collapsed by clicking anywhere along the sub-frame heading bar.

Main Area – Lower Portion Details Sub-Screen

The user can set any instruction to be displayed in this main sub-screen. Instructions here normally display, and allow user input of, operation/task data - such as components, tools, documents, inspection results and characteristics, operation long text, documents or sub-operations, Shortage status, etc.

Main Toolbar

The main toolbar in EWI contains the following functions:

- **Refresh** icon causes the entire screen to be reloaded for the currently selected work order and operation in the EWI order hierarchy. Any changes to the SAP data, whether performed by the current user or another user in another session, will be reflected into the screen. If any changes were made to the data in the current session that were not saved prior to pressing the Refresh button, the user is prompted to first Save.
- **Print Form** icon calls the standard SAP transaction to print either the PM/CS work order forms, as defined in the SAP system as either SAP script or smart form layouts.
- **Personalize** allows the end user to save any table layouts that have been created. Settings are saved into the SAP system against the user's unique user-ID.
- **Log** displays the message log, of all actions and events that have taken place during the EWI session. It is only available in "administration mode" and used mainly for troubleshooting.
- **Legend** (last icon) displays a legend explaining each icon in EWI.

EWI Instructions

An Instruction is a sub-screen or frame within Electronic Work Instructions, which contains information for the shop floor operator to view or update. This instruction defines what data is read (e.g., order header, operation, components, tools, shortage status etc.) and the layout format (screen ID, table-grid,   columns etc.). Instructions are assigned to one of the 3 main screen areas in the EWI Layout Schema - either the hierarchy area (left), the header area (upper right), or the main area (lower right).

Instruction Tool Bar

The Instruction Tool Bar sits at the top of the EWI Instruction and can contain specific action buttons.

Instruction Type

The instruction type denotes what "type" of instruction is being sent to populate the sub-screen or screen area within the EWI portal. The available instruction types are fixed, but the assignment of instruction types to individual Instructions is configurable. Examples include:

- **Hierarchy** - a tree structure like windows explorer.
- **Screen** - a two-dimensional screen normally created first in SAP screen-painter which contains discrete fields, labels, and attributes for the screen fields.
- **Table** - a table-grid screen normally created first in SAP as an ALV-layout which contains pre-set columns, each column specifying the field content for each row of the table of underlying data, plus basic layout, or format attributes of the data within each row and column.
- **Text** - a long-text screen.

Standard Instruction Elements

In addition to the instruction type, instructions are defined according to predefined elements that control which data is retrieved, how it is presented to the user, and how any changes the user makes are updated in the underlying work order data. A set of standard instruction elements are delivered with the add-on, which can be used in individual instruction configuration as required. The instruction elements consist of mapping methods screens, structures and update function modules, key examples of which are listed below.

Mapping Methods

The standard delivered mapping methods are defined in the class
/AXONMES/CL_EWI_ORDER_MAPPING:

Method	Method Description
MAP_CHAR_REQ	Map character requirements to EWI application
MAP_CHAR_RES	Map character results to EWI application
MAP_COMPONENT_OVERVIEW	Map order component overview to EWI (table)-Obsolete
MAP_MEASUREMENT_DOC	Map measurement doc to EWI application
MAP_NOTIFICATION_HEADER	Map order notification header overview to EWI (table)
MAP_NOTIF_CAUSE	Map notification cause to EWI application
MAP_NOTIF_TASK	Map notification task to EWI application
MAP_NOTIF_LTEXT	Map notification long text to EWI application
MAP_OBJ_LIST	Map object list data to EWI application
MAP_OPERATION_ON_FOCUS	Map order operation data to EWI application (table)
MAP_ORDER_COMPONENT	Map order component to EWI (table)
MAP_ORDER_DRAW	Map order draw data to EWI application(table)
MAP_ORDER_HEADER	Map order header data to EWI application (for order in focus)
MAP_ORDER_HEADER_LONGTEXT	Map order header long text data to EWI (for order in focus)
MAP_ORDER_OPERATION	Map order operation data to EWI application (table)
MAP_ORDER_OPERATION_HDR	Map order operation data to EWI (for operation in focus)
MAP_ORDER_OPER_DRAW	Map order operation draw data to EWI application (table)
MAP_ORDER_OPER_LONGTEXT	Map order operation long text to EWI (for order in focus)
MAP_ORDER_OPER_TOOL	Map order operation PRT data to EWI application (table)
MAP_ORDER_OPR_PM	Map order operation data to EWI application (table PM)
MAP_ORDER_SUBOPR	Map order sub-operation data to EWI application (table)
MAP_ORDER_SUBOPR_PM	Map order sub-operation data to EWI application (table PM)
MAP_ORDER_TOOL	Map order PRT data to EWI application (table)
MAP_ORDER_HEADER_EWITEXT	Map order header EWI text data
MAP_ORDER_OPER_EWITEXT	Map operation EWI text data
MAP_ORDER_INSP_LOTS	Map operation inspection lots
MAP_ORDER_OPR_DSIGN	Map Digital signature details
MAP_PRT_DRAW	Map PRT data to DRAW
MAP_NOTIF_PLAN_COMMENT	Map notification planning comment to EWI application
MAP_ORDER_NOTIFICATIONS	Map order notifications
MAP_MOD_DOCUMENT	Map mod document related to the order
MAP_NOTIF_ACTVT	Map notification activity to EWI application
MAP_NOTIF_ITEM	Map notification item

| MAP_NOTIF_ITEM | Map notification item |
| MAP_SHORT_STAT | Map Shortage Status |

Screens

The standard delivered screens are defined in program /AXONMES/EWI_SCREEN:

Screen Number	Description
100	screen 100 PP_HDR1
200	Electronic Work Instructions: Operation Header
400	screen 400 PM_HDR1
500	screen 500 PM_HDR2
600	screen 600 PM_REFURB
700	Screen 700 PM_REFURB
800	Electronic work Instruction. Work Order Notification Header
1000	Electronic work Instruction: Operation Header PM
1100	screen 1100 PM_HDR3
1200	Electronic work Instruction: Operation Header PM
1300	screen 400 PM_HDR1
1400	Defect notification details
1500	RO Order Header
1600	Real time Shortage report ALV Display

Structures

The standard delivered screen structures and table types are defined in the /AXONMES/EWI and /AXONXAPP/ name space:

Structure Name	Description
/AXONMES/EWI_CHAR_REQ_T	Inspection specifications – inspection lot characteristics
/AXONMES/EWI_CHAR_RES_T	Inspection results characteristics level
/AXONMES/EWI_DEFECT_MAP	Defect notification type mapping table
/AXONMES/EWI_DEFECT_MAP_T	Table type for defect notification mapping structure
/AXONMES/EWI_HIER_TREE_T	EWI hierarchy tree nodes
/AXONMES/EWI_LABOR_MAP_T	Table type for EWI labor mapping structure
/AXONMES/EWI_MEAS_DOC_T	Table type for EWI measurement documents
/AXONMES/EWI_NOTIF_CAUS_T	Table for causes
/AXONMES/EWI_NOTIF_TASK_T	Table for tasks
/AXONMES/EWI_OBJ_LIST_T	Table with object list data
/AXONMES/EWI_OPR_T_PM	PM order data
/AXONMES/EWI_OPR_USRFLD_T	User fields for operations

/AXONMES/EWI_OPRCOMP_T	Table of components
/AXONMES/EWI_OPRHDR	Order operation
/AXONMES/EWI_ORDHDR	Work order header data
/AXONMES/EWI_ORDOPR	Order operation
/AXONMES/EWI_ORDOPR_T	Order operation table
/AXONMES/MODSTAT_T	Table for mod embodiment status
/AXONMES/NOTIF_HDR	Fields on EWI screen header
/AXONXAPP/EWI_DRAW_T	Assignment document list
/AXONXAPP/EWI_TOOL_T	Tool list
/AXONXAPP/HDR_TEXT_T	Header text
/AXONXAPP/INSPLOT_DET_T	Table type of inspection lot details
/AXONXAPP/OPR_TEXT_T	Operation text

Please note this is not a definitive list of all delivered structures.

Function Modules

The standard delivered function modules are defined in the /AXONMES/EWI and /AXONMES namespace:

Function Module Name	Description
/AXONMES/EWI_COMMENT_HDR_UPD	Updates the header text
/AXONMES/EWI_COMMENT_OPR_UPD	Updates the operation text
/AXONMES/EWI_COMP_MAP_MULTI	Order components mapping – multiple records
/AXONMES/EWI_HDRTXT_MAP	Operation text update
/AXONMES/EWI_NOTIF_LTEXT_UPD	Update the notification long text
/AXONMES/EWI_OPER_MAP_MULTI	Order operation mapping – multiple records
/AXONMES/EWI_OPER_MAP_SINGLE	Order operation mapping – single record
/AXONMES/EWI_OPERMAP_MULTI_PM	Order operation mapping – multiple records
/AXONMES/EWI_OPRTXT_MAP	Operation text update
/AXONMES/EWI_ORDHDR_MAPPING	Order header mapping
/AXONMES/OPER_MAP_SINGLE_PM	Order operation mapping – single record

Please note this is not a definitive list of all delivered function modules.

EWI Actions

Action Buttons

The action buttons that are assigned to the EWI Instructions are defined in configuration. Action buttons can call any function module or transaction code and contain the necessary parameters to call the defined function/transaction. Action buttons can be configured to display either in change mode, or display mode, or both. In addition, a check function can be specified, which can hide the button based on flexible conditions.

Action buttons can also be assigned as child buttons to a group button. This is useful for example in terms of defining logical groups of buttons, or if more buttons are required on the Instruction Toolbar than will fit on the screen. Action buttons grouped under a group button appear as drop-down options under the group button.

For a full list of delivered action button functions, please refer to the Action Button Functions section.

Event Management Workbench (EBX)

Overview

The Event Management Workbench (EBX) is a flexible tool providing a "one stop shop" for all key information relating to a maintenance event, or shop visit, including the ability to carry out follow up functions directly from within the work bench. The primary data objects addressed by the work bench are therefore projects, sales documents, induction notifications, and revisions. For any of these, it is possible to generate reports and complete pre-defined actions. EBX also provides the facility to define custom reports and invoke custom actions according to individual requirements.

Event Management Workbench (EBX) includes the following features:

- Supports mass completion of notifications, orders, revisions, and projects.
- Displays all linked documents related to notification, orders, revisions, and projects.
- Supports conformity check for equipment/functional location.
- Supports flexible data presentation and action button assignment.
- Displays detailed overview of forward exchange requests under 'Reservation Exchange Record' tab.

The following transactions are utilized in this section:

- /AXONX/EBX: Event Management Workbench
- /AXONX/WIP: WIP Transaction Code for EBX
- /AXONX/EBX_POOL: Component Pooling Workbench
- /AXONX/TOW: Technical Object Management Workbench

Schema

The EBX Schema (set up in customizing) controls the behavior of the Event Management Workbench.

Selection Screen Layout

The layout of the selection screen (and available selection fields) depends on the transaction code used to call EBX.

Tab Configuration

The EBX schema, also dependent on the transaction code, determines the tabs that are displayed in EBX. It is possible to configure filter values for each Tab defined, as well as the type of tab display. Tabs can either be ALV grids or ALV trees, depending on configuration.

Action Buttons

Action buttons can be configured to perform specific actions on the presented data. For information on the predefined set of action functions, please refer to the Action Button Functions section.

Tool Bars

Each tab provides a configurable toolbar, which can invoke various functions on the data contained in the respective tabs.

Selection Screen

There are 4 available selection screen layouts, which dynamically affect the displayed criteria, and therefore the reports that can be called in the subsequent screens:

- Event based – containing selection criteria relating to a maintenance event (project,

notification, revision)

Location based – containing selection criteria relating to a location (plant, storage location, work center)

- WIP based – containing selection criteria relating to work in process (plant, work center, work order)

Note: The available selection screen layouts are configured against the calling transaction code:

Transaction Code	Selection Screen Layout
/AXONX/EBX	EVENT BASED LOCATION BASED
/AXONX/WIP	WIP BASED
/AXONX/EBX_POOL	POOL BASED
/AXONX/TOW	Technical Object Based

Authorization Group

This functionality allows you to define authorization groups for your EBX Layouts. Authorization groups are used to control access to similar objects using authorization profiles.

Standard EBX Reports

The following table shows a list of the delivered reports in EBX that can be configured into the EBX framework:

Report Name	Description
/AXONEBX/GET_NOTIF_DETAIL	Notification details
/AXONEBX/GET_NOTIF_DETAIL_TREE	Notification details for tree display
/AXONEBX/GET_ORDER_DETAIL	Displays orders
/AXONEBX/GET_PART_ONOFF	Part on/off details
/AXONEBX/GET_PROJ_DETAILS	Project availability details
/AXONEBX/GET_PROJ_TREE	FM to get project data and build project tree
/AXONEBX/GET_REVISION_DETAIL	Get revision details
/AXONEBX/GET_REVISION_TREE	Revision details for tree display
/AXONEBX/GET_UNPLN_MATREQ	Unplanned material requirements in EBX
/AXONEBX/REAL_SHORTAGE_REPORT	Real Time Shortage Report
/AXONEBX/STOCK_OVERVIEW	Stock overview report
/AXONEBX/STRUCTURE_GAPS	Structure gaps report

/AXONEBX/STRUCTURE_GAPS_TREE	Structure gaps report
/AXONEBX/WIPD_REPORT	Test the FM for WIPD report
/AXONEBX/NOTIFLIST	Pooling notification list
/AXONEBX/RESEXC	FM for reservation exchange table
/AXONEBX/STOCKLIST	FM for stock list
/AXONEBX/CREATE_NOTIFICATION	FM to create notification
/AXONEBX/FIND_SOURCE	FM for source find

Report & Selection Screen Matrix

The below matrix describes the reports that are supported by the different selection screen layouts:

		Layout			
		Event	**Location**	**WIP**	**Pooling**
Report	/AXONEBX/GET_NOTIF_DETAIL	✓			
	/AXONEBX/GET_NOTIF_DETAIL_TREE	✓			
	/AXONEBX/GET_ORDER_DETAIL	✓			
	/AXONEBX/GET_PART_ONOFF	✓			
	/AXONEBX/GET_PROJ_DETAILS	✓			
	/AXONEBX/GET_PROJ_TREE	✓			
	/AXONEBX/GET_REVISION_DETAIL	✓			
	/AXONEBX/GET_REVISION_TREE	✓			
	/AXONEBX/GET_UNPLN_MATREQ	✓			
	/AXONEBX/REAL_SHORTAGE_REPORT	✓			
	/AXONEBX/STOCK_OVERVIEW		✓		
	/AXONEBX/STRUCTURE_GAPS	✓			
	/AXONEBX/STRUCTURE_GAPS_TREE	✓			
	/AXONEBX/WIPD_REPORT			✓	
	/AXONEBX/NOTIFLIST				✓

	/AXONEBX/RESEXC				✓
	/AXONEBX/STOCKLIST				✓
	/AXONEBX/CREATE_NOTIFICATION				✓
	/AXONEBX/FIND_SOURCE				✓

Induction Workbench (SBX)

Overview

The Induction Workbench (SBX) is an easy-to-use workbench to induct a component or complex asset for maintenance, repair, or overhaul.

The Induction Workbench allows you to perform the following actions via one transaction code:

- Create Notification
- Update notification
- Create sales order
- Create serial number
- Generation of returns delivery
- Receive component into stock
- Creation of repair order (component) or array of end item work orders (complex assets) with/without sales order
- Create repair order through execution of repairable disposition
- Create strip and build orders
- Create new project definition/WBS/network
- Customer policy Link
- Move stock from restricted to unrestricted
- Issue component to repair order
- Issue component to internal repair
- Create subcontract purchase order
- Call Workscoping Workbench
- Raise defect
- Create revision
- Release to service
- One step induction
- Print work order
- Support forward exchange scenarios (exchange, sale, loan, or return) for components.

The creation of the end item batch or equipment is subordinate to the above actions (the first time a batch/equipment is input). Depending on the configuration, several the above steps can be performed against one notification action (One step induction).

The creation of operative network, sub-networks and creation or extension of project WBS (complex asset scenarios) is triggered via standard SAP business transactions (sales order save).

The Induction Workbench actions will be displayed in the action box on the right-hand side of the create / change notification screen. Different actions will be presented depending on the configuration of the notification type.

SBX Actions

Create Notification

The Induction Workbench can be used to induct a single component or multiple components. Start by creating an (induction) notification in the relevant SAP transaction (IW21 or IW51).

Update Notification

Prepares an existing notification, generated from a dismantled component, to allow it to be processed by the Create Repair Order (Execute Repairable Disposition) function.

Create Sales Order

In third party scenarios, the sales order is used to track the work progress, and as a basis for billing and invoicing the customer once the maintenance is complete.

Upon selecting this action, the system will invoke a pop-up where you can maintain the WBS element, contract number, service material and valuation type for the end item part. SBX also warns if the PO number entered already exists in the system.

Depending on the service item, a project and network may be generated automatically from the sales order via SAP assembly processing, and the high-level workscope can be defined via the variant configuration on the standard network.

Create Serial Number

This action will provide a pop-up window to maintain serial number(s). Serial number profile for the repairable material will need to be maintained beforehand.

A new batch will be created for parts that are being inducted for the first time (serial number input does not exist in stock). If multiple serialized parts are inducted, one batch will be created for each part. If the serial number input is already in stock, the most recent master batch will be retained for the returning part. In scenarios where the part is being inducted into a different plant as to the prior visit, a new batch will be created. The equipment number created for the part being inducted will be displayed in the main screen.

Create Returns Delivery

When creating a returns delivery, a pop-up window with data populated whilst creating the sales order will be displayed.

You will also be prompted to enter the serial number(s) of the part(s) to be inducted, if these are not already maintained in the equipment records.

If the creation of the return's delivery is not successful, check that the sales order is complete according to its incompletion procedure.

Receive Component into Stock

By selecting this action in the notification action box, part(s) will be received into stock against the returns delivery and a material document will be generated.

Create Repair Order

This action is used to create a single repair order for the inducted component(s).

In component scenarios where the main order is a refurbishment order, additional orders can be created as sub-orders to the main refurbishment order. A sub-order is a standard PM order and is intended to replace the main refurbishment order in all subsequent process steps throughout the repair process. This is useful in multiple component repair scenarios, where partial quantities of the inducted quantity may require different treatment (for example partial quantity repairable, partial quantity scrap). In this case the sub-order, as a standard PM order, can be split (via the Order Split function), and the corresponding main refurbishment order is updated at key points throughout the process.

Create Repair Order without Sales Order

Creates a repair order without reference to a sales order (for an internal component repair scenario).

Create Repair Order (Execute Repairable Disposition)

Creates a repair order by executing a repairable disposition on a previously existing notification (e.g., a component dismantle notification).

Create Strip and Build Orders

This action will create strip and build orders for a complex asset inducted in a previous step. The action triggers a background job which performs the function. Orders are generated based on the operative network created from the sales order. For this reason, before you can create the strip and build orders, the project generated during the creation of the sales order must be released via the relevant SAP transaction code (CJ20N).

Create New Project Definition/WBS/Network

This action will create a project based on the standard project assigned to the service material in the notification (allocated in transaction CN08).

Customer Policy Link

The Customer Policy Link action button can be used to search for policy documents linked to the customer specified in the induction notification. This button presents a pop-up listing all relevant policy documents and the user can select whichever is required for this maintenance activity. The selected policies are then linked to the event (induction notification).

Move Stock from Restricted to Unrestricted

The add-on provides the notification action box item Move Stock from Restricted to Unrestricted, to be executed prior to issuing components to the sub-order. This action allows the goods issue to be carried out on unrestricted use stock, as opposed to blocked stock as required by the standard refurbishment (RAS) process.

Issue Component to Repair Order

This action is used to issue end item component(s) to the repair order before work can commence. If the sub-order process is used, then the component(s) are issued to the sub-order, rather than the main refurbishment order. The component(s) will need to be in unrestricted use stock, which is carried out as per the above action.

Issue Component to Internal Repair

In an internal component repair scenario, this action is utilized to issue the component to a repair order.

Create Subcontract PO (Purchase Order)

If the repair order contains an external operation that generated a subcontract purchase requisition, the PR generated from the work order will be converted into a purchase order using this action. The part and work order can then be tracked using the SAP ADSUBCON transaction.

Change Workscope

Calls the Workscoping Workbench for the current event (notification). Please refer to the Workscoping Workbench section for further details.

Raise Defect

In SBX, defects can be raised immediately during the induction process if it is known at an early stage that the inducted parts do not meet the required product or process specifications. In these cases, the defect notification can be raised in SBX to record the problem.

Further information on raising defects can be found in the Defects, Deferrals, Transfers, Splits section.

Create Revision

This function can be used to create a revision, which can be used to group the maintenance orders for an event.

Release to Service

Selecting this action will close the induction notification for the component, and trigger the conformity check, which performs various checks according to the configuration.

One Step Induction

This action can be configured to create a sales order, perform a returns delivery, receive the part(s) into stock, create a repair order, issue the part(s) to repair order and create a subcontract PO (if task list control key is set to external) all in one step.

Work Order Print

Prints the repair order in the current event.

Planning Notification

Notification types can be designated as Planning Notifications in the customizing. This allows forward material planning based on the planned demands specified in the planning notification. Planning demands are created as components in the planning notification. These material components can be reserved in this way for a future maintenance event.

Planning notifications can be a stand-alone notification for the event, the induction notification for the event, or any other work notification for the event (e.g., routine work, defect etc.)

The notification header is extended to show the component list, that will be the list of reserved parts. This extension to the SAP standard notification header screen is available via a consulting note. The following fields are available in the planning notification:

- Item - Item number is an auto-generated numbering field to provide unique sequence for planning demand component.
- Material Number - A mandatory field, user inputs the demand component.
- Function Identifier: This field represents FID for the component.
- Special Stock Indicator: In some cases, stock of materials must be managed separately for reasons of ownership or location. This field is utilized to represent the type of stock.
- Quantity - Quantity of the component parts is entered here.
- Reserved Quantity - This field represent quantity of the component part that has been reserved/sourced against the component.
- UoM – Field represents the Unit of the Measure for the reserved quantity.

Integration with Sourcing

The Sourcing Workbench considers reserved parts as potential supplies to be sourced to the actual disposition demands, based on the sourcing strategy configuration. The Sourcing Workbench can display the planning demand list from the planning demand table *"/AXONXAPP/PLNDMD"*. This allows

the sourcing of planning demands from the sourcing workbench.

If the Planning notification is set as completed, or deleted, then all the sourced planning demands are unsourced. In this case, the planning notifications will not be determined for the event of actual build order demand adjustment via disposition, sourcing, or order sync job.

Forward Exchange Notification

The forward exchange notification provides a way to manage the process of providing an exchange part for a customer in advance of receiving the faulty part. The faulty part is returned later as a payback for the replacement supply. Planning notification has following additional fields to support forward exchange processes:

- Requirement Type: Requirement category controls the business process of shipment of serviceable part, receipt of unserviceable part, sourcing requirements prior to shipment and creation of event/disposition notification for the returned part.

- Requirement Category: Advance Planning of material requirements for a customer can be of one of the four categories depending on the business process of shipment of serviceable part to customer and receipt of the returned part material from the customer.

- Quantity Withdrawn: It gets updated based on the goods issue for forward exchange notification.

- Confirmation Status: As the situation will often change between the points when material is supplied to the field and when parts returned, hence a confirmation with actual requirement type is required before receipt of material (check whether is sending the material or receipt).

- Return Quantity: It gets updated based on the goods receipt for forward exchange notification.

Planning Comment

This functionality is used to enter comments while creating the notification. Upon clicking the button, a description screen is displayed where the user can enter text related to the work to be carried out.

Mass Induction

The Mass Induction Workbench allows the user to induct multiple part numbers and create induction notifications for each of them in one screen. Each induction notification can be processed further to create work orders using a repairable disposition. The Mass Induction Workbench has its own transaction code /AXONX/MASS_INDUCT. The notification type that gets created for each material is determined based on the configuration maintained in material schema for each inducted material. It is therefore not necessary to enter the notification type in the mass induction screen.

Inspection Workbench (IBX)

Overview

Airline Maintenance and Engineering departments, Aerospace After-market Support organizations and third party Maintenance, Repair and Overhaul (MRO) service providers - as well as any organization which services, repairs and overhauls complex equipment such as used in the power generation, oil and gas, nuclear, transportation, construction, utility and telecommunications industries - perform MRO activities on equipment which requires the asset to be stripped down, and parts "dispositioned', or removed, inspected, and a decision made about how to repair or replace the removed parts to ensure the asset is returned to service.

The Inspection Workbench for complex assemblies and components is for technicians and inspectors on the shop floor who will remove and/or receive the stripped parts, for inspection and disposition. These may be parts that have been removed off aircraft, engines, or other complex assemblies, in addition to third-party receipts from customer or partner organizations, either under warranty or for a repair service. IBX provides a simplified user interface that is technician-friendly and provides all required information to do the job in one transaction.

Disposition consists of noting whether a part removed is repairable – internal and external, serviceable, remove from service (scrap or return-as-is), hold (pending a decision from the customer and/or engineering department), material review bay (MRB) hold and remove from hold. Two separate modes for removing parts from an assembly prior to the disposition are supported:

- Simultaneous remove and disposition - input by the same person in one step,
- Separate removal (disposition unknown at time of removal) and then a subsequent disposition step.

In addition, parts can be removed with reference to:

- The as-maintained (functional location and equipment hierarchy) structure of the complex asset being processed.
- The as-allowed configuration as defined in SAP's integrated Product and Process Engineering workbench (iPPE).
- A simple assembly based on a bill of material (BOM).
- Manual input of material number (and serial number if serialized) in the disposition screen.

In cases of part removal with reference to a technical structure, the total quantity removed for a given node in the structure is compared to the original quantity. In the case where no as-maintained structure exists, it is possible to dynamically build up the as-maintained structure during the part removal process.

The Inspection Workbench also allows decision support for selection of Service Bulletins (SB), Airworthiness Directives (AD), Engineering Modifications (mods), Engineering Repair Schemes (Repairs), Technical Orders (TO, TCTO) and other pre-determined repair, inspection, or work tasks on the part or complex assembly - to embody. These mods or repairs can be selected using the Maintenance Requirement Workbench mod applicability rules or repair document classification. This selection can automate the inclusion of associated repairs (i.e., tasks, task lists etc.). This Inspection Workbench includes configuration checks in cases where the technical as-allowed and/or as-maintained product structure is stored within SAP, and automatically generates the required back-end transactions resulting from each disposition, such as movement documents, measurement

documents, notifications, service orders and equipment, as well as notification, batch, and valuation type updates.

Dispositions are fully customizable in this tool allowing the implementation team to determine and configure the checks, inputs and updates required and the end user to simply select from a set of pre-defined disposition codes suited to the specific organization's requirements. This Inspection Workbench is intended for base or depot-maintenance scenarios such as aircraft hangar, component repair or complex asset overhaul, for example a transmission, engine, train or complex piece of construction or mining equipment; it is not intended for field or line maintenance scenarios where parts are generally not stripped down and dispositioned - they are simply swapped.

Disposition execution can be restricted based on the disposition requirements maintained in the Maintenance Requirement Workbench against the component of the MPL node. A visual indicator is provided in the tree nodes in the IBX structure navigation panel to show disposition requirements from the WBX Disposition Requirement view prior to disposition.
Auto disposition functionality is provided to perform the disposition automatically when user selects the part from IBX tree and presses the disposition button, this is controlled through 'Disposition assignment to IBX schema' configuration.

Initial Screen

Use transaction code /AXONX/IBX to call the Inspection Workbench. The default screen is always the search criteria, for users to input search data and process accordingly.

The top-left area of the initial screen will display a configurable logo.

The system will determine the main event notification(s) based on the entered selection criteria.

For all the fields, a combination may be entered, in which case the system finds the main notification(s) that match all search criteria input, displaying a message if no main notifications were found for the search criteria.
The IBX selection screen is provided with a check box of 'Load Work Order View 'and if selected it navigates directly to the work order view.

Main Screen

The work area screen is composed of three areas:

1. **Primary navigation area** at top-left with work list or selection criteria
2. **Secondary navigation pane** at lower left with the following views: Business Document, Revision (planning), Product Structure, Bench Location (this is grayed out in the initial screen)
3. **Main work area** at the right which changes according to technical object selected and data input in search criteria

The application toolbar is dynamic and customizable according to the scenario or schema associated with the main or end item notification currently being processed. The fixed toolbar above the application toolbar contains a button which shows the legend, i.e., what each icon within the various business document and technical structure views signifies as well as a button to hide or display the hierarchy. Clicking on the Hide or Display Hierarchy button will enlarge the main screen area to the whole screen (affecting the left navigation panes).

Primary Navigation Area

The primary navigation or upper-left area initially displays the main or end item notifications per the selection criteria and default view for the scenario - list of main notifications or last ten notifications

processed by the user.

The Inspection Workbench primary navigation area can display and process more than one component or end item - third party/RAS order, complex assembly or part removed from a complex assembly or aircraft - at a time, including a mixture of end item notifications from different scenarios.

The following buttons are available:

Open Folder
Performs a new selection as outlined above under initial screen and displays the new selected main notifications in place of the currently selected ones.

Display Notifications
Shows the list of selected main notifications, i.e., all end item component, complex or aircraft notifications from induction, ordered in sequence of notification number. When the user selects a notification from this list (via double-click) the business document display in the lower-left screen area is reset to the selected main notification. If the selected main notification is for a different schema or scenario (e.g., a third-party component notification vs. a complex asset notification) then at the same time the application toolbar might change.

Recent List
Upon clicking this icon, IBX will show the last ten notifications previously processed by the user.

Show Selection Criteria
This icon displays the current search lists' selection criteria and any associated objects (e.g., Work Order, Revision, Sales Order etc.)

Secondary Navigation Area
The secondary navigation pane or lower-left area is populated based on the main notification selected in the primary navigation area and the default view assigned to the schema (normally the business document view).

The secondary navigation area shows business documents for just the one selected main notification. For all other main notifications that are displayed in this primary navigation area, you must select one (double-click) to display its data in the lower-left screen area. All subsequent Inspection Workbench processing is carried out for the one selected main notification.

The lower-left screen area also has a fixed toolbar, like the primary navigation window.

Expand/Collapse
Select this icon to see the hierarchy from a single node or collapse all nodes in hierarchical document or technical structure displayed in this screen area.

Sales View
Shows the business document view, i.e., the flow of business documents from the selected main item notification through sales order, delivery, receipt, end item networks and work orders, and all associated removed components, their removal notifications and equipment records, plus any notification actions and removed part repair work orders. Please note that this view shows removed parts only, not parts which have not yet been dispositioned and still reside in the as-maintained structure.

Revision View

Shows all component removal notifications and work orders assigned to the maintenance package or revision from the selection screen, or from the revision associated with the main or end item notification from the primary navigation view.

Product Structure View

This button has a drop-down list for:

- **As-maintained** - which shows the functional location hierarchy, together with any installed equipment in each functional location in the hierarchy, together with any sub-ordinate equipment hierarchies - all to multiple levels of the structure - together with a single level only explosion of any equipment bills of material for equipment in the hierarchy or installed at a functional location in the hierarchy. The as-maintained structure shows parts that have not yet been removed only, essentially the opposite of the business document, store location or revision views. If no higher-level assembly was input on the selection screen the entire as-maintained structure for the selected end item notification is shown; otherwise only the structure below the higher-level assembly input on the selection screen will be shown. If an equipment or functional location was selected on another view before navigating to the as maintained, then only the structure below the previously selected equipment or functional location will be shown. Equipment that has been previously removed from the as maintained, creating structure gaps in SAP, will be shown as an extra "gap" node with the quantity of parts removed from that node in the display. A position field is provided for serialized equipment in the lower table control of the IBX Update Structure UI which updates into the equipment master record once saved.

- **As-allowed** - The as-allowed structure shows the master parts list (MPL) from the illustrated parts catalog (IPC, modelled in iPPE). The as-allowed structure is normally per end item equipment model (e.g., aircraft type) and shows the engineering structure with allowed manufacturer part numbers at each level of the structure based on configuration options such as mod or engineering order status. Only the MPL structure below the node which maps to the functional identifier of a previously selected equipment or functional location will be shown in cases of pre-selection. The total quantity of parts allowed for a position and the total quantity of parts previously removed are also displayed when this information is available.

- **Bill of material** - which shows the product structure from bills of material for the material number associated with the selected main notification from the primary navigation screen area, or for the material or a component removal notification if selected from the business document view in the secondary navigation area. Bills of material may be used to store product reference structures where insufficient data is available to manage the as-maintained or as-allowed structure. The total quantity of parts allowed for a position and the total quantity of parts previously removed are also displayed when this information is available.

- **Disassembly View** shows a combination of the 'As-Allowed' and the 'As-Maintained' view. This view will show all the MPL nodes/variants in the As-allowed view and under each MPL node variants, the corresponding technical objects, (equipment and BOM items), are displayed. The disposition grid allows the user to update the data on the equipment and equipment BOMs. It also allows missing parts/equipment from MPL variants to be created. Structure elements that are copied to the disposition grid are:
    - Equipment
    - Equipment BOM
    - MPL variants
  The below actions can be executed on the disassembly view tree:

a. All the immediate children of the selected tree node can be copied to the disposition grid.
b. The select function can be enabled using the drag and drop as well as disposition selection from the IBX toolbar.
c. Auto grouping of multiple equipment's with same material and FID during adoption to the disposition grid. These equipment's are grouped together into a single row in the disposition grid. Auto grouping can be switched on in schema configuration.

Bench Location View

This button allows the user to go to a view which shows all selected material and serial numbers of combinations that have been previously removed and are now ready for inspection - via the two-step removal and disposition process. The material/serial number combinations are organized by storage location.

Conformity Check

Calls the conformity check for the object selected in the secondary navigation area.

Find

Provides the functionality to search for a given part, serial, text etc. in the above views in this navigation pane.

Find Next

Finds the next item

Select All Components

This is a very important button for mass dispositions from the product structure views. It is often the case that an assembly (e.g., as-maintained equipment hierarchy or bill of material assembly) is completely stripped down to its constituent parts and the list of parts, shown in the product structure as "children" of the assembly node, all require simultaneous disposition. Rather than individually selecting each child part or equipment in the product structure view and disassembling individually, the select-block button automatically selects all children of the currently selected node, to one level down the product structure, causing any disposition or the disassemble button to process all children parts or equipment in one step.

Disassemble

Select this button or drag and drop any node or a series of multiple selected nodes from the lower left panel product views to this button to "Disassemble". This moves the selected nodes from the lower left secondary navigation pane to the right-hand side mass disposition screen, for disposition information including the disposition code to be input. As an alternative to pressing this button, it is possible to drag nodes onto this button or to press any of the disposition codes from the application toolbar instead. In the latter case, the same set of selected product structure nodes are copied across to the main work area this time with the chosen disposition code defaulted in.

Object Navigation within Secondary Area

If you double-click on an object in the secondary navigation area hierarchy, then based on what the object is, the Inspection Workbench will determine what view to call up into the main work area (right screen area). The table below highlights which views are called up according to what object in the secondary navigation area hierarchy is double-clicked.

Object in hierarchy	Lower-left view	Resulting action (on double-click)
Sales order	Business document view	Calls up transaction to show sales order (*VA03*)
Main (end item) notification	Business document view	Calls up the notification overview screen in the main work area showing the visit information in the top-half and three tabs in the lower half: the removal notification attributes (partner, damage codes, reference technical object etc.), the notification actions or Disposition History, Object List, and disposition per object
Serial number /material number	Business document view	Equipment details screen showing equipment serial number information, classification, and measurement readings (e.g., hours/cycles)
Equipment / serial number	As-Maintained	Inputs the equipment details double clicked upon into the mass input screen on the right main screen area
Work order	Business document view	Calls up the work order details screen in the main work area showing work order information (header attributes, visit details and operations) in the upper half and details of any task-lists associated with a chosen Modification, SB/AD or Repair Scheme in the lower-half
Strip/Build order	Business document view	Calls up the order in display mode (*IW33*)
Work order	Revision view	Calls up the work order (packaged or unpackaged) in display mode (*IW33*)
Removal notification	Business document view	Calls up the removal notification overview screen in the main work area showing two tabs in the lower half: the removal notification attributes (partner, damage codes, reference technical object, removal quantity etc.) and the notification actions or Disposition History
Action log	Business doc.	The notification tab for object list is activated in the right-hand main work area where the object(s) and corresponding dispositions are displayed
Material number/serial number: stock type	Bench location view	Inputs the equipment details double clicked upon into the mass input screen on the right main screen area

The primary and secondary navigation views in the Inspection Workbench cannot be further customized, unlike the main work area as outlined below.

Main Work Area

The main work area to the right of the screen displays the component notification (single part or unit repair) screen or the complex assembly mass disposition/removal screen, with the corresponding application toolbars, depending on Inspection Workbench scenario or Schema of the selected end item notification.

This area also changes according to the current "view" when you double-click on a node in the hierarchy displayed at the lower-left screen area. You can also change the current "view" of the main work area by double-clicking on a node or using any of the application toolbar buttons, as outlined in the sections on primary navigation area and secondary navigation area, above.

There are five main work area screens that have been defined as part of the Inspection Workbench and are listed below:

- The End Item Work Area view
- Component Notification view
- Mass Disposition or Removal view
- Equipment Details view
- Work Order view
- End Item Work Area View

For the End Item Work Area view, the main area shows a compilation of information from the end item work order, sales order, and repair status in two panes. The lower panel displays the repair notification and disposition history. The Inspection Workbench Schema can be configured, if required, to add tabs/sub screens to this view.

You can change the repair notification directly from this Inspection Workbench screen by clicking on the "Change Notification" button which calls standard transaction code IW52 for the end item notification. You can navigate to other standard SAP objects if you double-click on fields within this area as outlined below:

- Double-click on equipment or functional location field, calls transaction code IE03 for the equipment number
- Double-click on material or service fields, calls transaction code MM03 for the material
- Double-click on customer number, calls transaction code VD03 for the customer
- Double-click on notification number, calls transaction code IW53 for the notification

Component Notification Work Area View

The main work area Component Notification view shows important information about the selected notification in a single view, with customizable tabs. Likewise, the Inspection Workbench Schema can be configured, if required, to add additional tabs/sub screens to this view.

Mass Dispositions/Removal View

This view is called to input data for one or more parts being removed from a technical structure and assigned a specific disposition. Removal actions can be performed with reference to the end item (sales order notification) and additionally, in the case of complex assembly overhauls, with reference to a lower-level assembly previously removed from the end item.

You will be able to view the relationship in the repair order hierarchy view in the secondary navigation area (lower-left screen area). The lower-level component removal notification will be underneath and indented from its own higher-level component removal notification.

The application toolbar here as well is dependent on the Inspection Workbench Schema assigned to

the notification, plant, and sales order type.

The mass disposition/dismantle view can be initially populated via two methods:

- Input information directly to the work area disposition/removal view; or
- Select one or more nodes from one of the three product structure views, revision, or bench location view

To populate the mass disposition work area after selecting one or more nodes in the product structure or business document buttons in the secondary navigation pane, there are three easy to use options:

- Select the disposition button in the application toolbar and all selected lines are copied into the main work area and automatically assigned the relevant disposition code
- Drag and drop selected line(s) to the disassembly button and all selected lines are copied into the main work area with blank disposition code
- Select the disassembly button and all selected lines are copied into the main work area with blank disposition code.

To select all components of an assembly, click on the select all components icon in the secondary navigation area. When you do this, all the lower-level items for the node get selected and populated into the work area. To unselect all nodes chosen by select all components, click a blank area within the secondary navigation area.

The view that Inspection Workbench will display is to be dependent on the node you select:

- If the user selects node(s) when in the Product View, either the As-Allowed Configuration or Bill of Material, and the quantity at the node selected is more than one, IBX will populate one-line item of the main work area with the proposed disposition/removal quantity. In these cases, the user will need to input the serial number(s) (for serialized parts) in the serial number pop-up.
- If the user selects node(s) when in the Product View, either As-Allowed Configuration or Bill of Material, and the quantity at the node selected is one, the system will populate the one-line item in the main work area and automatically update the serial number for the part as well.
- If the user selects node(s) when in the Product View as Maintained, and the quantity at the node selected is more than one, the system will display separate nodes for installed equipment in the product structure view for parts still installed in the structure (dismantled parts will be visible as structure gaps). IBX assumes that when you selected quantity more than one, you are requesting the same disposition code and repair action for all selected equipment under the same installation point. IBX will combine the selected equipment into one-line item in the main work area with quantity equaling the sum of all selected equipment. Serial number(s) of the parts will be automatically populated into the serial number pop-up.
- In the Bench Location view, if the user selects one or more items, the system will copy these across to the main work area with one-line item per part number/equipment. IBX will assume that you want to repair all such selected equipment as a set in one repair order. Serial number(s) of the parts will be automatically populated into the serial number pop-up.
- IBX will validate that the number of serial numbers in the main work area lines are equal to the number of serial numbers in the pop-up. The user will not be able to proceed if the quantity is not equal. The serial number pop-up appears if the user changes the quantity in the main work area to more than one. The user can manually call the serial number pop-up by double clicking on the serial number field as well.

In the mass input screen, the field Floc(s)up Equip/FID represents the superior node in the As-Maintained (functional location or equipment hierarchy) or As-Allowed (Master Parts List) structure where the assembly or part is being dismantled or installed. Depending on the scenario this represents a superior functional location, superior equipment, or the functional ID (FID) field from the superior node in the iPPE Master Parts List structure (As-Allowed configuration).

The superior assembly field on the mass disposition screen is defaulted based on the selected object to disposition from the As-Maintained view (in which case this is a superior equipment or functional location), the As-Allowed or MPL view (in which case this is a superior MPL assembly position), or the Bill of Material (in which case this is the superior or next higher assembly part number). This information is recorded on the removal notification for audit purposes. In the case of superior equipment, functional location or MPL assembly, this value can also be used to determine the section, which in turn can be used to determine the correct build order to assign replacement or installed part reservations against.

The superior node can be mapped to a build section or zone in transaction /AXONX/SECTION. The build section or zone is used to determine the specific build order for a complex asset based on the removal point of parts being stripped in the Inspection Workbench. To use this field, one of the functional location hierarchies, equipment hierarchies or master parts list structure must be set-up in your system.

On the mass disposition screen, the install part number input field is provided in case the replacement part is different to the removed part, such as in the case of applying a modification which changes the part number allowed. If left blank, the install part is the removed part. If you want to input a different install part there, there is a value search-help provided which lists all part numbers allowed for a superior position in the master parts list (MPL) structure – based on the superior assembly/MPL superior position field input on the same row, as mentioned above.

Revision and Maintenance Event Builder (MEB) Integration
The Inspection Workbench processes end items which are inducted with a sales order. It can also work in scenarios without a sales order. The secondary navigation pane sales document view still works, even if there is no sales order, provided there is a revision.

The sales order view in the secondary navigation pane can still be utilized to recognize business documents. In this scenario, the system identifies documents assigned to a specific revision instead. Users will receive an error if there is neither a sales order nor revision. However, if both the values are populated, then the revision which would derive a "tighter" selection will be used instead.

When a disposition is executed, before a part removal notification and/or a work order is generated, the Inspection Workbench will check first if the superior (selected) notification or the end item notification is assigned to a maintenance revision. If it is, and the disposition is of a "closed loop" kind and the repair is being performed in the same plant as the part removal, then the system will automatically assign the newly created notification and PM order to the same revision. The order created will be assigned MEBS system status as per orders created via MEB (Maintenance Event Builder) which would not allow user-defined system status other than via MEB.

When the user clicks on the revision button in the secondary navigation pane, the system will always find the end item notification which is assigned to the revision and display it at the top of the view.

In the background, when the user dispositions a part, the system will create a notification for the part/serial number upfront. This notification is then packaged into the revision identified from the end item notification or the superior notification. The same notification is then used for the dismantle process of the part.

IBX Tree Structure - Multiple Induction Notifications

The tree structure in the IBX primary navigation area can show multiple induction ("Event') notifications packaged into the same revision. This scenario may arise in a component maintenance environment where multiple components are inducted for repair in the same time slot.

When revision is entered in the IBX selection screen, in the top left header notification area all header notifications (Induction notification/routine or routine) that are packaged into the revision will be shown. The data in the sales order view is determined according to which header notification is selected in the primary navigation area.

In the search criteria, if the same revision number exists in more than one plant then IBX will display a plant selection window and the user can select the required plant.

If multiple induction notifications have been packaged in the same revision, all packaged induction notifications will be loaded when IBX is accessed using revision. The user can select the required notification from the top left of the IBX main screen to continue processing with that notification.

Equipment Details

If you double click on the serial number in the secondary navigation panel sales document view (lower-left area of the screen), standard inspection workbench will display the equipment details screen in the top panel and the measurement points/documents created for the equipment in the lower panel of the main work area. The lower panel will also have a tab for characteristics data which will detail out the class and characteristic(s) the equipment has been assigned. The sub screens/tabs here can be altered as well.

Work Order View

You call the work order view into the main work area by double clicking on an order (parent, child, or sub orders) in the secondary navigation pane node hierarchy or by entering the work order number in the initial screen of the Inspection workbench.

The left screen area of the 'Order Details' screen is divided into two panes:

- Order Hierarchy tree displaying Superior Order, Child Order and Sub Orders (if any).
- Repair Schemes/Modifications (SB/AD/EO) available that can be applied for the part number.

Within the Order Hierarchy tree, you can call an Order to be displayed in the Inspection Workbench main work area by double clicking on the work order number.

The main work area for Work Order view in standard IBX is a composite of two screen areas with:

- General, Visit Details, Operations tabs in the top panel.
- Header, Operations, Component, Tools, Document and Part Progression tabs in the lower panel.

Selection of mod and Repair Schemes

All available Service Bulletins, Modifications, Technical Change Orders, Regulatory Directives etc., commonly, and collectively referred to as engineering orders for the part number or serial number and repair schemes are displayed in the IBX work order view. There is an option in IBX configuration which will determine how engineering orders and repair schemes are proposed for incorporation into removed part repair orders, within the work order view screen.

You can set IBX to propose only Engineering Order/Repair schemes which are planned embodiments. In Maintenance Requirement Workbench, this would mean that applicable technical objects would have had embodiment notifications or operative maintenance plans generated for them (have an

embodiment status of 00 or 01). This configuration option would be pertinent for embodiment of service bulletins or modifications onto parts dismantled/to be dismantled in IBX.

In the event a work order has been generated for the planned embodiment notification, you should maintain the work order in the Inspection Workbench mass input screen to prevent another dismantle notification and item work order from being generated for the same equipment in IBX.

The following buttons are available in this section:

Task List Filters

Used to filter the list of available repair/mods by company, customer, or priority. There is a target build standard filter in IBX to filter mods based on target build standard, which will filter and list all mods that need to be included to reach the target build standard.

Incl. Eng. Order or Repair

This is a parent button with the following child buttons:

- Workscope all operations
- Workscope mandatory operations
- Include selected operations in workscope
- Exclude document from workscope

Used to assign an Engineering Order or Repair Scheme to the work order. All the selected operations listed in the Engineering Order or Repair Scheme will now be transferred into the work order and the embodiment status for the Engineering Order or Repair Scheme will be updated.

Update prev. embodied Eng. Ord

This is a parent button with the following child buttons:

- Found Embodied
- Not Applicable
- Not Embodied
- Remove from Order (Unworkscope)

Used to update the Repair Scheme or Engineering Order status for a part to either found embodied/not embodied or not applicable. This function also provides the ability to remove the embodiment of the selected Repair Schemes or Engineering Order for the serial number.

Unworkscope

The IBX Remove from order function triggers a report which highlights the impact (on surrounding transaction data objects) of removing the selected mod from the workscope (i.e., removing it from the work order).

Depending on the processing state of the work order, several subsequent transaction data elements may be affected:

- Identify which build orders are affected by the mod
- Identify any related mods that were workscoped at the same time
- Identify which part demands should be changed
- Identify which sources of supply are affected
- Change source of supply OR change Repair order workscope

To carry out this process, select the Remove from Order selection in the dropdown screen in the left-hand side of the workbench. Select row and click on Remove from Order and enter embodiment Status

"01".

Confirm New Part Number pop-up

The confirm new part number pop-up in repair order workscoping allows users to select the target build standard part number based on the part progression data of the mod.

Depending on the configuration, the user would be presented with this pop-up when workscoping a mod containing part progression information into an existing repair order. The part numbers presented will be the post mod part numbers from the mod. The user can then review the list and select the required post-mod part. The return part number (negative reservation line) in the Repair Order is then updated with the post-mod part number to reflect the fact that the Repair Order will now ultimately deliver that post-mod part into serviceable stock.

Enhanced Work Order Workscoping View

This button is available for specific mod/filters based on configuration. The button is used to launch the enhanced workscoping view screen.

Enhanced Workscoping View Screen

Enhanced workscoping view screen is useful for identifying all the possible workscope tasks for the work order part in a single screen and perform workscoping collectively as a result. The left side hierarchy pane has two nodes.

- Requested Workscope
- Applicable Workscope

Requested Workscope

List out documents for the effective technical object/part number based on the policy document(s) linked to the induction event. It is derived from the 'Workscope data table' (/AXONXAPP/WRKSCP) and requires Task Based Workscoping (TBW) data model. The Requested workscoping is further divided into two sub nodes.

- Repair Workscope
- Modification Workscope

Applicable Workscope

List out documents that are already derived in the work order workscoping screen area based on existing filter configuration but excludes those that are already present in the Requested section. If document is applicable or requested, it would be shown only in 'Applicable Workscope' hierarchy node. The Applicable workscoping is further divided into two sub nodes.

- Optional workscope
- Mandatory workscope

Top Panel for Work Order View
This panel contains 2 tabs:

The **General tab** contains order, notification, and sales order details. Here, if there is more than one task list for the order, the first task list counter number will be defaulted in the top panel. The accounting indicator will indicate if the work for the order is billable, under warranty or non-billable. If quantity removed is more than one, then the quantity field and UOM will be displayed instead of the serial number field. You can double click on the Order, Serial or Material Numbers, and call the appropriate transactions in display mode.

The tab also contains an Order Split button. When there is a need to split the work order, for example because the outcome of the inspection/repair differs for certain quantities, it is necessary to split the partial quantity along with any relevant transfer of workscope from the original order to the newly created split order.

The **Operations Overview tab** has buttons where you can:

- Change an operation
- Delete an operation
- Change the order (by calling transaction IW32)
- Call Electronic Work Instructions (EWI) by clicking on the Instructions button (transaction /AXONX/EWI). You will need to select an operation line item before clicking on this button.
- Create a purchase requisition for externally processed operations.

To change an operation, you select one-line item before clicking on the Change Operation or Delete Operation buttons. You can include further columns for display by selecting the Change Layout button. You can further define fields for quantity, value, date.

Create Purchase Requisition through IBX (Subcontract Repair Process)

Subcontract Repair processes typically utilize repair orders with external operations representing the subcontracted work. These external operations generate purchase requisitions which then feed into the standard SAP ADSUBCON process.

For example, this add-on introduces the "Group Batch" concept, designed to enable multiple quantities of serialized parts to be processed on the same line item in the Subcontract PO, and provides the facility to automate the goods movements associated with receiving the subcontracted part(s) from the repair order into stock during outbound processing, and subsequent re-issue back to repair order during inbound processing.

These functions are triggered by the Create PR function in the IBX work order operation screen. To navigate to this, the individual will be required to select the repair order generated after disposition (containing the external subcontracting operation, for example with control key PM02), select the subcontract line item in the operations tab and finally click on Create PR.

To make use of the above functionality, it is necessary to set the reservation relevance/generation of purchase requisition field in the subcontract component reservation to "Never", so that the purchase requisition is not generated automatically on order Save, but instead is generated by the function described here, which also triggers the other enhancements.

To carry out the above procedure, go to operations tab and add a line item with an externally processed control key (e.g., PM02) for subcontract process. Add the external processing operations in the external tab, add a third line item in the components tab. Afterwards, click on the third line added and click general data tab. Change the PR generation drop down to never and material provision indicator to "S Material to Subcontractor". Now, go to the operations tab and while selecting the subcontract line item click on actual data and select the PR generation drop down to Never. Finally, click on Save.

Lower Panel for Work Order View

The lower panel has configurable tabs showing details of the selected Engineering Order, including:

- Repairs/mod header data
- Repairs/mod operations

- Repairs/mod components
- Repairs/mod tools
- Repairs/mod documents. Double clicking a line item here will call the original document (if any) for the document information record.
- Repairs/Part progression. (When a mod is workscoped to the repair order, based on the part progression data maintained, the negative line reservation is updated with the To-Part.)

Click on the change layout icon to select and display other columns than those displayed. The 'Display Task List' icon will call the related transaction codes depending on the type of task list that has been selected.

Policy Filters

In IBX it is possible to filter mods and repair schemes based on customer policies. In the IBX work order view, select the filter "customer policy EO search". Customer policies will be displayed in the policy tab.

Dispositions

Disposition are conditions of a part as assigned by an inspector. The disposition of a part will determine further work/maintenance/overhaul (if any) that needs to be done to restore it back to a serviceable condition. Some parts are removed from a Next Higher Assembly (NHA) to reach a part beneath it. These parts are usually dispositioned as serviceable and moved to the marshalling area for kitting/assembly later. Dispositions can be done in one or two steps. A one-step disposition means that the part is dismantled, received and a decision taken on what to do (repair, scrap, re-use as is) in one step. Technically, the part receipt and repair order are generated simultaneously.

A two-step disposition means that the part is dismantled and received to an inspection bench area. Then, with a second step, the inspector decides what to do with the part (e.g., generate a repair order).

In these cases of two-step remove/inspect, the first disposition will be "Unknown Disposition". The parts removed will be shown in the bench location view for a second disposition to be done. There are seven disposition types of the inspector can select from:

- Repairable
- Serviceable
- Remove from Service (Scrap)
- Hold, which includes Customer Hold, Engineering Hold, MRB Hold
- Remove from Hold
- Unknown Disposition
- Rework

All popups (except embodiment status update and conformity check) during the execution of the disposition, can be consolidated and presented at once to the user.

IBX can handle disposition of single or multiple parts with the same function identifier (FID) onto the same repair order / tracking notification. Upon execution of the disposition, target build determination is executed individually once for each unique part number in the disposition group. The tracking notification holds the information of all dispositioned parts (as notification items) and type of part removal (planned or unplanned). A demand is created for each unique part number within the repair order.

Repairable Disposition

Repairable dispositions create a component repair order or a purchase order for the part or set of parts being repaired, including external operations in the case of subcontract or outside service work.

Note: The creation of purchase order (for subcontracting) is only supported for repairable dispositions, that are dismantled into plant stock.

The removed part is repaired and may or may not be routed back to the same end item equipment – out of cycle or long lead time component repairs are exchanged with another available part which meets the as-built configuration standard. The removed component can consume existing material requirements on the order or create new requirements based on configuration. If the reservation search is enabled within the configuration, then the user will have an option to choose the valid existing requirements considering interchangeability strategy linked to end item notification. The operation on which the build order reservation is created, is determined based on configuration for the disposition code.

In component repair scenarios, the Induction Workbench also creates a repair work order, this time for the end item part.

During a repair disposition procedure, it is important to know if the part being removed is being sent back to the same assembly or end item equipment ("closed loop") or if it is being replaced or exchanged with another part and the repaired equipment goes back to stock ("open loop" or "exchange"). If the part is scrapped, or the part number changes it must be open loop.

Otherwise, the decision is normally based on the lead time of the repair – if the lead time of the part repair is longer than the allowed turn-around time for the superior assembly's components to be repaired =, then, an open loop strategy is recommended. Otherwise, a closed loop strategy is enough.
For life limited parts, a minimum life check can be carried out during the initial repair disposition. This is required for example, when a removed part might be repairable in time to fit back onto the same superior assembly such as an aircraft engine (closed loop) but the remaining life on the part is less than the minimum life build standard of the engine. For this reason, the part should be repaired on an open loop basis – and a replacement part sourced with a minimum life that is greater than the minimum life builds standard of the engine.

During the minimum life check, the minimum build life standard of the superior assembly or engine is determined by value maintained in the classification characteristic on the end item notification, sales order, or sales contract (in this order) to determine the minimum build to achieve life. The remaining life of the part being repaired is determined by system identifying a measuring point with the same characteristic and locates a maintenance plan for this measuring point for the dismantled part. The system will then get the next due call for this maintenance plan, find the planned counter reading for this due call, and deduct the last recorded counter reading (against the measurement document) for this equipment to identify remaining life.

Then, if the part has less remaining life than the superior assembly minimum life builds standard, it is automatically removed as open loop. However, if the part has more remaining life than the superior assembly minimum, then it is removed as closed loop.

The difference between open and closed loop repairs is that for closed loop the removed equipment item is automatically sourced back to the same superior assembly or end item equipment, by the pre-populated sourcing table. Open loop or exchange repairs must be sourced by the user, a transaction whereby the user finds suitable alternative equipment to meet the demand for the replacement part. Please refer to the Sourcing and Swap section for more information on sourcing.

Remove from Service Disposition

Part is not repairable and needs to be removed from service or scrapped; an alternative part is required to re-assemble the asset.

In Inspection Workbench configuration, you can put checks in place so that a valuable part is not scrapped before it is reviewed by the Material Review Board (MRB). To do this, you assign a pricing condition that will determine the minimum value of the part number as per the valuation type that would require IBX to disposition the part to MRB Hold automatically. Set the disposition as MRB relevant and assign the pricing condition in the disposition code. This pricing condition should be assigned a value in the sales contract at the end item level. All parts dismantled/disassembled for this end item will be reviewed with this value when the disposition is executed.

Serviceable Disposition

Part is good and can be routed directly back to the end item for rebuild without further review. Parts with these dispositions will be moved to the marshalling area.

Any disposition, but especially serviceable dispositions, can invoke a configuration and conformity check. This checks the part number vs. the applicable or planned modification standard, the remaining life of the part vs. the minimum build standard of the end item or higher assembly, and outstanding defects recorded during the repair, among other things. The disposition can only be completed (e.g. made serviceable) if all errors from the conformity check are resolved. The successful completion of the disposition can result in up to three forms being produced.

Part modification option can be selected using Upmod functionality. The part number in the Upmod dialog presented during a serviceable disposition can be restricted based on the interchangeability strategy in the end item notification. The below mentioned events are related to serviceable disposition:

Strip as Serviceable

During strip as serviceable done in Inspection Workbench, the system will check the technical structure setting defined for the IBX schema. In the IBX schema, you can set to strip from an existing technical structure in the system for the complex asset, or strip when the technical structure for the complex asset does not exist in the system or to dynamically build the technical structure as parts are stripped.

Declare Inventory as Serviceable

The user will encounter this scenario when there is a need to a remove part from storage location (without an associated work order and inspect/refurbish the part and then declare it as serviceable. This will be done from the bench location view in Inspection Workbench. The notification for the part in storage location will be updated with the task (maintained in disposition code customizing), cause code with reason for removal (with value maintained in disposition code in customizing) and serviceable task being completed (TSCO).

Declare Part Being Repaired as Serviceable

This scenario can be executed from Electronic Work Instruction (EWI) or Inspection Workbench (IBX). The part which is currently being repaired is now ready to be declared serviceable by the Inspector as part of the repair cycle.

In IBX, when you dismantle a part and sentence it as serviceable, you can propose the same part number to be installed back. Alternately, IBX allows you to maintain another part number. The user can use search help from IBX at the install part number field to identify parts. The add-on allows the user to look up MPL materials based on the superior node entered.

The Declare Serviceable component will also determine if any Repair Schemes or modifications are being embodied to the part/equipment. During declare serviceable, a popup will be displayed for the user to select the embodiment status from the F4 list.

If the disposition code allows for part up-mod process, the user will be prompted to maintain the new up-mod part number. This is because when a part is stripped as repairable, the user would not know yet that the part number must be changed. So, the component repair order, part receipt and issue in the background and build order reservation are all created for the original part number. With this feature during Declare Serviceable, you are now able to change the original part number to the required modified new part number when the part is being sentenced as serviceable.

To do this, the user can enter the new part number manually or by pressing the F4 key in the pop-up window.

The part numbers proposed in the search help option would be part numbers which are post-modification part numbers in the as-allowed structure for the technical structure. There is also an option in the search help which proposes part numbers which are of the same FFF class for the original part number.
If the user would like to declare the same part number as serviceable, then select Ignore Up-mod or Cancel button to proceed with declare serviceable process.

Like the strip as serviceable scenario, the equipment status will be updated to SRVC (serviceable) and the part is moved to the serviceable storage location maintained in customizing. The component notification task will be updated, and component repair order will be technically completed.

Unknown Disposition
The status of the part is not yet known. In general, a second disposition is made once the part is fully inspected. The initial, or unknown, disposition only updates the equipment status/location, as-maintained structure and creates the removal notification, leaving all subsequent steps to the second disposition.

Hold
Part is in a hold-state (including MRB Hold) if it is pending customer approval, engineering department or MRB review. Disposition Hold is dependent on the manual selection of the Inspector during the dismantle/disassemble. It can be configured to be more specific to Customer Hold, Engineering Hold or MRB Hold, depending on the business process at the MRO facility.

The MRB Hold disposition code, however, can also be triggered automatically by the Inspection Workbench if Remove from Service (Scrap) disposition code is configured to be MRB relevant and has a pricing condition maintained. The sales contract for the end item complex asset will also need to have a value for this pricing condition maintained. So, when the Inspector tries to set a disposition of Remove from Service, IBX checks the standard/moving average price of the part for the valuation type against the value in the pricing condition maintained in the sales contract. If the value of material is more than the value maintained in the sales contract, the part will be automatically dispositioned as MRB Hold. So, the Material Review Board would have to confirm that the part cannot be refurbished/repaired and needs to be "removed from service" before any further action undertaken. The user can also set in configuration that an MRB notification is created during this process to track parts put into MRB Hold.

Remove from Hold
Parts that have been put on Hold can be removed from service (scrap) or put back into repair process under work in process status. Inspectors can select this disposition only if the part has been

dispositioned as Hold or MRB Hold before-hand. Once the Material Review Board decides that the part can be repaired, the inspector can select the option to put the part back into the repair process. This will continue with the standard repair process.

Stock Types

IBX supports many standard stock types in dispositions, including Plant Stock, Sales Order Stock ("E" Stock), Customer Stock ("B" Stock), and Project Stock ("Q" Stock).

An IBX repairable disposition code configured with Q Stock, for example, will be able to generate non-valuated inventory in "Q" stock based on configuration defined for the following –

- Stock indicator
- Material movement type

While performing the disposition from the structure the system will first search for the WBS that is available at sales order (created during the induction process), determine WBS for disposition and subsequently generate non-valuated inventory in "Q" stock with reference to the event WBS. The process is similar for other stock types, for example "E" stock with reference to the event sales order.

Disposition of Sets of Equipment/Parts

Inspection Workbench allows you to disposition a set of equipment or parts (non-serialized) using one component notification. You select sets or multiple equipment/parts from the product structure view in the secondary navigation pane.

This can be done by selecting a node in the BOM view, equipment BOM view or as-maintained view and then clicking on the Select All Components push button. IBX will propose (highlight) all the nodes directly beneath only (not all the nodes).

Once the equipment/parts are highlighted, select a disposition in the Inspection Workbench application toolbar. The selected equipment/parts are moved to the mass input screen on the right. The disposition field is open for change, so you are still able to make any changes if necessary. Each equipment will be displayed on separate rows in the mass input screen.

You can process the equipment/parts separately or as a set/group. By processing them separately, Inspection Workbench will create a component notification and component repair order for each row (i.e., equipment/part per disposition).

To process as a set, select the rows you would like to be grouped together, and click on the Group Serial Number Set push button. The system will combine all the rows where the material, plant, disposition code, valuation, section, functional location/superior equipment/NHA which are the same as each other.

Quantity in each of these combined rows will be the sum on all rows which were grouped. Serial number field will be set to first serial number value with "* * *" leading and display only. To view the serial number, users can double click on this field. The system will prompt with a pop-up displaying all the serial numbers from the combined rows to allow you to make entries/changes to serial number(s).

Click on the Ungroup Serial Numbers Set push button, the action performed above will be reversed. The serial number group or set will be restored to one serial number or equipment record per row.

When you process this set of equipment/part numbers, there will be one single dismantle/disassemble notification for the entire lot with all serial numbers being dispositioned listed out in the object list of the Component Notification created.

IBX will trigger creation of only one component repair order per set of serial numbers/part numbers with one batch for each serial number and one goods movement performed for each serial number during dismantle/disassemble. You can check the multiple equipment/parts in the component repair objects tab.

It is important to note that there will be only one reservation for the whole quantity in the Build/Strip Order that is used to reference during dismantle/disassemble of the parts. The batch field in the build order will also be blanked out if you dismantle a set of parts/equipment. The reservation is further split with batch details and serial details in a custom table. This occurs during primary disposition of the set.

In cases of secondary disposition (e.g., Hold, Scrap from Hold, Scrap after Repair, Declare Serviceable from unknown primary disposition etc.) a batch number will already exist for the equipment. Here, the same batch number will be re-used in the goods movement and there will be no updates to the equipment's master batch assignment. In the event there are changes to valuation type, this will be updated accordingly by IBX into the master batch accordingly.

Disposition of Non-Serialized Parts

IBX allows you to disposition non-serialized parts. You select part from the product structure view or as-maintained view in the secondary navigation pane.

This can be done by selecting a node in the Equipment BOM view or depending on the configuration of the IBX Schema directly in the as-maintained view. Once the parts are highlighted, select a disposition in the Inspection Workbench application toolbar.

The selected parts are moved to the mass input screen on the right. Check and change the quantity for disposition. The disposition quantity field is open for input.

When you process disposition for non-serialized parts, there will be one single dismantle/disassemble notification for non-serialized parts being dispositioned listed out in the object list of the component notification created.

The following table depicts the events that are generated as part of a disposition action. The generated events are described in sequence from top to bottom in the first column and are represented in grey color. The multiple disposition combinations are described in the first three rows: starting from primary disposition (blue color), secondary disposition (red color) and tertiary disposition (green color).

1st Disposition	2nd Disposition	3rd Disposition	Create notification (component removal)	Create or update As-Maintained structure	Post first disposition goods movement (e.g., strip, receive)	Generate repair order	Post second disposition goods movement (e.g., issue to order)	Trigger Upmod functionality (change in part number and/or serial	Post third disposition movement (e.g., material to material transfer)	Post Fourth Goods Movement (For non-batch managed with different target valuation type for serviceable)
Repairable	Serviceable		1	1	1	1	1	2	2	2
Repairable	Remove from Service		1	1	1	1	1		2	2
Unknown	Repairable	Serviceable	1	1	1	2	2	3	3	3
Serviceable	nil		1	1	1					
MRB Hold	Remove from Hold (Scrap)		1	1	1				2 (Scrap)	
MRB Hold	Remove from Hold (Repair)	Serviceable	1	1	1	2	2		2	3 (Serviceable)
MRB Hold	Remove from Service		1	1	1				2	
Remove from Service (Scrap)	nil		1	1	1		1			
Hold (Customer Hold)	Remove from Hold (Continue Repair)		1	1	1	1	1		2	
Hold (Customer Hold)	Remove from Hold (Scrap)		1	1	1	1	1			2
Hold (Engineering Hold)	Remove from Hold (Continue Repair)		1	1	1	1	1			
Unknown Disposition	Repairable		1	1	1	2	2			
Unknown Disposition	Remove from Service		1	1	1		2			
Unknown Disposition	Serviceable		1	1	1				2	2
Unknown Disposition	Hold (Customer Hold, Engineering Hold, MRB Hold)	Remove from Hold (Scrap)	1	1	1		2		3 (Scrap)	
Unknown Disposition	Hold (Customer Hold, Engineering Hold, MRB Hold)	Remove from Hold (Continue Repair)	1	1	1		2			

Material Schema Integration

Different categories of parts (e.g., rotables, consumables) have different processing rules assigned to them via the Material Schema concept (e.g., Sourcing relevance). This concept is extended to include a full suite of options for "Removal Method" and "Install Method", designed to cater for many different use cases.

Material schemas facilitate the various Removal and Install methods through a complex asset overhaul process, including:

- With/without PM structure update
- With/without Structure Gap update
- With/without Goods Movement

The A&D Industry typically utilizes the concept of as-maintained or as-built structure to ensure the integrity check for an asset and its associated critical modules/and tracked parts (whether serialized or non-serialized).

In IBX and EWI, the material schema of the parts being dismantled and installed can determine different handling, as required. The following combinations of Removal/Install Methods are possible:

Removal Method	Supported Installation Method
Goods Receipt only	Goods Issue only
Dismantling without Goods movement	Full CCM Control with no Goods movement
Dismantling with Goods movement	Full CCM Control with Goods movement
Dismantling with Goods movement and no Goods Issue to Repair Order	Full CCM Control with Goods movement
Dismantling without Goods movement and no Goods Issue to Repair Order	Full CCM Control with no Goods movement
Dismantling with good movement without Structure gap	Installation with goods movement without structure gap
Do Not Dismantle	Do Not Install
Dismantling without Goods movement without structure gap	Installation without goods movement without structure gap

The above Install/Removal methods can also be used in combination with/without configuration check.

1. **Goods Receipt**: Only Goods receipt only infers that in the event of removal of component, a material movement will take place to receive the component into stock, but no technical structure update will occur.
2. **Dismantling without Goods movement**: Dismantling without goods movement infers that in the event of removal of component from the technical structure, no material movement will take place.
3. **Dismantling with Goods movement**: Dismantling with goods movement infers that in the event of removal of component from the technical structure, a material movement will take place to receive the component into stock i.e., normal repairable disposition will take place and a material document will be posted.
4. **Dismantling with Goods movement and no Goods Issue to Repair Order**: This removal method

infers that in the event of removal of component from the technical structure, a material movement will take place (Material Document will be posted) to receive the removed component into stock, but in the case of a repairable disposition, the component will not be issued to the repair order. In such cases the part can be issued to the repair order manually using transaction code MIGO as and when required. The removal from the technical structure will still create a structure gap.

5. **Dismantling without Goods movement and no Goods Issue to Repair Order**: This removal method infers that in the event of removal of component from the technical structure, no material movement will take place to receive the component into stock and in the case of a repairable disposition, the component will not be issued to the repair order.

6. **Dismantling with Goods movement and without Structure Gap**: This removal method infers that in the event of removal of component from the technical structure, a material movement will take place to receive the component into stock, but no structure gap will be created on dismantling.

7. **Do Not Dismantle**: Do not Dismantle infers that in the removal of the component will be blocked.

8. **Dismantling without Goods movement without Structure Gap**: This removal method infers that in the event of removal of component from the technical structure, no material movement will take place to receive the component into stock, and no structure gap will be created.

Special Topics

Beyond Economic Repair

You can configure dispositions (disposition codes) to perform Beyond Economic Repair (BER) checks to determine whether a repair on a component is economically viable. You will need to maintain the percentage to calculate BER at the IBX schema level. The system will then calculate the cost of the material at the appropriate valuation type multiplied by the BER percentage and compare it against the planned costs of the repair order at header level. You will then be prompted by either warning or error message, depending on the configuration setting for the disposition code.

Quality Management

Inspection lots can be generated off the goods receipt document that is generated from the dismantle business transaction. The part dismantled does not move to work in process until a usage decision has been made for the inspection lot. The usage decision can be entered from Inspection Workbench by double clicking on the inspection lot in the left navigation pane or from a pushbutton. This takes you to transaction QA11 wherein the inspector can select a follow-on action from the configured usage decisions. This follow-on action, if accepted, moves the part out of storage into work in process (goods issue to the order). From here, it is standard IBX. If rejected, the follow-on action can be configured in such a way that scrap disposition is triggered from it.

APIs Delivered

API Name	Functionality Description
/AXONIBX/PERFORM_GROUPING	Grouping of disposition items.
/AXONIBX/PERFORM_UNGROUPING	Ungrouping of disposition items.
/AXONIBX/READ_DISPO_DATA	Reads the disposition data, serial numbers and messages
/AXONXAPP/EWI_PERFORM_DISPO	Reads the disposition data, serial numbers and messages

Install/Confirm Parts

Overview

Install/Confirm Parts is a function which allows the user to review, and in some cases, amend, and confirm the part numbers to be installed using a given work order (production or service/maintenance order). After confirmation, it allows installation of the serialized and non-serialized parts to the given structure. It can be called from the Electronic Work Instructions, as well as other components.

The Install/Confirm Part step will affect the structure gap update, conformity checks and as-maintained structure depending on the configuration.

This function has a dialog, in the form of a pop-up window with an SAPGUI editable table control display which contains part number and serial number (in case of serialized parts) data for all materials maintained.

This pop-up displays the part number and serial number(s) issued to or proposed for the work order in question. The user can review and, in most cases, edit or input the serial number for serialized components issued to the order, with restrictions.

The installation notification can be closed automatically once the technical object is installed. Refer PCN-XXX-XX)

Install/Confirm Parts Screen

The Install/Confirm Part screen is where the installation activity is done. Depending on whether they are sourced, the components (serialized as well as non-serialized) relevant for as-maintained processing will be listed in this screen. The operation will be confirmed followed by installation of the part.

The Material Schema for the material which is to be installed is determined (either based on attributes of the material, or via custom logic defined in the delivered BAdI). Once Material Schema is determined, part installation will take place based on the install method configured in the Material Schema.

The screen is divided into 3 sections:

- The **Order Detail** section at the top display's header information based on selection made via the EWI screen.
- The **Installation Point**, which defaults to equipment number, but the user can also select Installation point by Functional Location. The Get Inst. Loc. button allows the user to propose an installation location by trying to find a matching structure gap for the install part number.
- **Serial Numbers** section either contains pre-existing details of sourced components or will be blank, depending on whether anything has been sourced to the work order. The following actions are possible from this screen:
  - **Close**: Exits pop-up without saving. Confirmation message will be displayed if changes were made in the screen.
  - **Install**: Creates or updates the as-maintained or as-built structure.
  - **Confirm**: Confirms serial number(s) in the pop-up without creating as built. This updates a pre-defined user status (e.g., "Serial number confirmed" on the equipment record.
  - **Adjust Over-sourced demand:** Button is dependent on the Layout schema

configuration. It presents a popup to adjust the over sourced quantity, such that, the sourced quantity equals the demand quantity. The installation process validates the selected demand for sourcing which is over-sourced and adjusts the sourcing data to identify the actual installation parts and payback the remaining parts to supply stock segment. If the 'Over Sourced' Indicator is set for the selected demand for installation, then the installation process cannot continue until the over sourcing demand is adjusted. If the installation parts fulfil the demands quantity, then message appear on the save button and the remaining available sourced parts are automatically unsourced after the full demand quantity has been installed.

The following tabs are found in the serial numbers section, depending on the configuration of the serial number profile:

Manual Confirm Tab

The table in this tab will initially be empty but the user can enter details of any materials that they wish to issue to the order that are not sourced to a reservation on the order.

Withdrawal During Install Tab

This tab will display a list of sourced parts for the work order, either serialized or non-serialized. The removal of the component creates a demand, and a supply is proposed automatically (closed loop scenario) or manually (open loop scenario) using the Sourcing Workbench.

The user will be able to install the parts through the selection of a row and clicking the Install button.

Installation based on Material Schema

Different categories of parts have different processing rules assigned to them via the Material Schema concept. This concept includes a full suite of options for removal method and install method, designed to cater for many different use cases.

Material Schema facilitates the various Removal and Install methods through a maintenance process, including:

- With/without PM structure update
- With/without Structure Gap update
- With/Without Goods Movement

Installation scenarios account for valid interchangeable parts, including the determination and consumption of structure gaps, based on reading embodiment records and related post-mod part information from /AXONXAPP/DRWMPL, considering the interchangeability strategy.

For every removal method, there is a corresponding install method. So, it needs to be ensured that when install/dismantle activity is done based on Material Schema, the below combinations are observed:

Removal Method	Supported Installation Method	Reservation creation during disposition
Goods Receipt only	Goods Issue only	Create
Dismantling without Goods movement	Full CCM Control with no Goods movement	Never Create
Dismantling with Goods movement	Full CCM Control with Goods movement	Create

Dismantling with Goods movement and no Goods Issue to Repair Order	Full CCM Control with Goods movement	Create
Dismantling without Goods movement and no Goods Issue to Repair Order	Full CCM Control with no Goods movement	Never Create
Dismantling with good movement without Structure gap	Installation with goods movement without structure gap	Create
Do Not Dismantle	Do Not Install	Never Create
Dismantling without Goods movement without structure gap	Installation without goods movement without structure gap	Never Create

The above-mentioned install/removal methods can also be used in combination with/without configuration check as maintained in the material schema configuration. This concept works with or without an As-Maintained structure and can be used for strip/build of serialized and non-serialized parts.

Full CCM Control with No Goods Movement

Infers that in the event of installation of component to its higher assembly, no material movement will take place and so no material document will be posted. A structure gap will be deleted after installation and conformity check will be carried out, if configured. The equipment remains in stock after the installation event since the Installation is done without any material movement.

Full CCM Control with Goods Movement

Infers that in the event of installation of component to its higher assembly, a material movement will take place and so a material document will be posted. A structure gap will be deleted after installation and conformity check will be carried out on Installation.

Installation with Goods Movement without Structure Gap

Infers that in the event of installation of component to its higher assembly, a material movement will take place and no structure gap will be deleted after Installation. Conformity check will also be carried out on installation.

Installation with Goods Movement without Structure Gap (No Config. Check)

Infers that in the event of installation of component to its higher assembly, a material movement will take place (material document will be posted) and no structure gap will be deleted. In other words, this installation is with goods movement but without structure management.

Do not Install

When the install method is set to Do Not Install, the part will not be allowed to be installed to the structure. An error message will be shown informing the User: "Do not Install is maintained for the Equipment …"

Goods Issue

Goods issue infers that in the event of installation of component to its higher assembly, a material movement will be posted but install event will be skipped. No structure gap will be deleted on installation and no config. check will be performed.

APIs Delivered

API Name	Functionality Description
/AXONXAPP/INSTALL_DONE	API Installation

Installation Rollback

The Installation once performed can be rolled back using the 'Installation Analysis Report' transaction.

Selection Screen

Selection criteria are provided to fetch the details for installation notification created at the time of equipment installation.

Output Screen

Header Area

This area displays the detail of end item details like induction notification, sales order etc.

Left Pane

This area displays the build order with all linked installation notification and corresponding reservation in hierarchical structure. Once reversal is performed task gets updated.

Right Pane

This area displays in an ALV format the details of selected object from left pane.

Toolbar

Reverse Installation button

This button is used to perform installation reversal after selecting the notification number in left pane.

Disposition Rollback

The disposition once performed can be rolled back using the 'Disposition Analysis Report' transaction.

Selection Screen

Selection criteria are provided to fetch the details for tracking notification created at the time of disposition.

Output Screen

Header Area

This area displays the detail of end item details like induction notification, sales order etc.

Left Pane

This area displays the build order with all linked tracking notification in hierarchical structure.

Right Pane

This area displays in an ALV format the details of selected object from left pane.

Toolbar

Disposition Reversal Button

This button is used to perform the disposition reversal by selecting the notification number on the left pane.

Reprocess Split Button

This button enables the order split reprocessing from the error step based on the user status on the split tracking notification.

Reprocess SUBCON Button

This button enables the SUBCON exchange reprocessing from the error step based on the user status on the split tracking notification.

Labor Solution

Overview

The Labor Solution records labor and attendance time clocking events, calculates the elapsed time between clock on and clock off events on work orders and other valid clocking objects, including splitting of elapsed time across multiple clocking objects, and posts the time and attendance data into SAP's Cross Application Timesheet (CATS) application, as well as creating confirmations for hours worked against work order operations.

In summary, HCL's Labor Solution provides the following:

- Labor and attendance collection or clocking with 4 input options:
  - Posting of labor clock on or off events to work orders from within HCL's Electronic Work Instructions (EWI) component
  - Posting of labor clock on or off events, or attendance clock in or out events, using the add-on Time Input SAPGUI transaction
  - Posting of historical labor or attendance clocks, or of labor elapsed time, using the add-on Time Administrator SAPGUI transaction
  - Labor and attendance collection via any front-end device such as a bar-code reader, radio frequency capture device and/or badge swipe device calling web services provided by the Labor Solution to check and validate data and post clocking events into SAP
- Labor elapsed time processor triggered by the above clocking events, which:
  - Calculates the elapsed time for completed time pairs (on/off event for same work order, cost center, or in/out attendance clocks)
  - Deducts all or unpaid breaks, depending on configuration
  - Splits elapsed time for overlapping clocking events between parallel running work orders or other clocking objects
  - Posts a work order confirmation to SAP's Projects System (PS), Production Planning (PP) or Plant/Service Maintenance (PM) modules depending on work order category
  - Inputs the elapsed time or the time pair into SAP's Cross Application Time Sheet (CATS) for subsequent managerial review, optional approval, adjustment and transfer to SAP's controlling and labor costing module to apply labor charges to work orders. On/off labor or in/out attendance time pairs may be defined for input to CATS separately as either a time pair or elapsed time
  - Attendance events may be additionally subject to SAP's elapsed time calculation delivered with Human Capital Management (HCM) and fed to SAP or an external payroll system. Activities downstream of CATS use standard SAP functionality.
- Report of labor vs. attendance vs. planned work-shift time. This allows a supervisor to view, for example, how many hours each employee was supposed to work, was in fact on-site, and booked to jobs - direct vs. indirect hours.

Labor Event Strategies

A unique feature of the Labor Solution is the ability to configure in advance several discrete labor clocking Event Strategies, and to assign these to specific plants or even cells or work centers (via work center category) within your organization.

Event Strategies denote the proposed method of clocking for your organization, plant, or cell. Event strategies normally comprise:

- Clocking "on" and "off" work orders and other objects as two discrete events.
- Clocking "on" work orders only and asking the system to automatically post a clock "off" event for the same date and time, against the current work order the operator was previously clocked onto.
- Clocking "off" work orders only and asking the system to automatically post a clock "on" event for the same work order being clocked off, at the system time and date of the previous clock "off" event.

It is possible for different parts of your organization to adopt different Event Strategies. If more than one Event Strategy is required for a single plant in your company, you must separate the work centers (cells) for each clocking Event Strategy into discrete work center categories and assign the Event Strategy to each plant and work center category combination.

The event strategy prevents clocking of events in the wrong order, such as clocking off a work order two times in succession without clocking back on. This check is based on the current status of the employee. However, it is possible in labor clocking with the time administrator transaction (AXONX/TIME_ADMIN) to enter clocks which occurred in the past. If this done, it will not be possible to determine the status of each employee historically, and consequently, it will not be possible to ensure that clocking events are posted in the correct sequence. For this reason, the event strategy controls are bypassed when clocking events are entered in the past or when elapsed time is clocked.

Labor Capture from Electronic Work Instructions

Pressing the clock on or clock off push-button within EWI (transaction code /AXONX/EWI) performs the following:

The Event Strategy is read together with the current status of the user's personnel number for the current work order or order operation opened in EWI. Depending on these two states:

- If the user is not currently clocked onto the work order or order operation, then depending on the Event Strategy – the clock on event is called for clock-on and clock on/off strategies; and the clock off event is called directly if the Event Strategy is configured to only allow clocking off (clocking on is automatic)
- If the user is currently clocked onto the work order and the Event Strategy is set up for clock on and off, then the clock off event is automatically called. If the labor strategy is set-up to only allow clocking on (clocking off is automatic), the user would not be in a status of clocked onto the work order, as they are only posting clock-off events.

A clock-on or clock-off event is posted to the maintenance work order and operation being processed in EWI per the above rules.

Labor Capture using Time Transaction

Transaction /AXONX/TIME is used to call up the SAPGUI labor and attendance event input screen.

The employee has the option of keying or swiping their SAP Personnel ID or badge number into Personnel No. or Old Personnel ID fields in the top row using a keyboard attached badge reading device. The SAP plant code should be defaulted based on their operator preferences, or it may be input directly. The operator may also optionally input a device, where the device ID represents the identification or location of the front-end device or PC, they are using.

Following input of Personnel ID, depending on the time input screen layout configuration (Labor

Schema), the operator will be presented with either a single clock object or multi-clock object input screen.

Single Order Labor Input Screen

The screen displays all possible operator input fields for single object clocking. The Labor Schema configuration decides which fields are included or hidden on this screen. In practice, the operator will only be presented with input fields for information which it is important to capture during the labor clocking process.

Multiple Order Input Screen

Depending on the Labor Schema configuration set-up, the operator may be allowed to clock to multiple objects, such as work orders, projects, or cost centers, simultaneously. This is recommended for situations where one operator can work on multiple orders at one time, for example in a processing area with one person managing multiple machines, or a work center such as an oven which processes multiple orders at one time.

With the multiple order input screen, when the event type is to clock off, a small screen area on the right will appear which shows any work orders, projects, or cost centers the same Personnel ID is currently clocked on. The operator may then select the work they want to clock off, from this list, and add them to the input table at the bottom. When clocking on to work, the operator may insert (and remove) multiple rows using the Add Row and Delete Row buttons at the top left of the list entry screen area - and then press Save to post a clock off event for each clocked object in the list-entry screen above, simultaneously.

The following functions are available to apply input values to all rows in the input table:

- **Flow-down Quantities**: Applies the yield quantity value (if input is allowed), to all rows
- **Final Confirm all Clocks**: Marks all the clocks in the input table to be finally confirmed

Pressing Enter or Save from this screen the clock object information such as work order is checked to see if it is valid, of a status which allows labor to be charged and - in the case of clocking off without automatic posting of the clock on - the system ensures that the same Personnel ID is currently clocked onto the same work order operation they are trying to clock off.

The Labor Solution checks if clocking operations out of sequence is allowed based on the standard SAP configuration for the order type and control key configurations when clocking against work operations. In addition, the Labor Schema can also be configured to validate the clocking data using SAP's confirmation posting validations (test mode call of business API)

When the operator presses Save, the clocking event is automatically stored in the Labor Solution staging table, and the screen refreshes, proposing a new event type according to the operator's next current state.

Historical Labor and Attendance Capture

The administrative labor and attendance capture transaction is used to record clock in, on, off or out events historically, i.e., after they have occurred. This is normally recommended when clocks are recorded outside the system, such as on paper, and then handed to clerical input staff to record later. The transaction /AXONX/TIME_ADMIN is used to call up the SAPGUI administrative labor and attendance event clocking screen.

There are two ways to input historical or administrative labor clocking events:

1. Record the event starting a time pair (ON) and the event completing the time pair (corresponding OFF) as two separate transactions with the date and time input in the operator's local time-zone on the screen above each time
2. Record the event completing the time pair (OFF) as a single transaction, with the date and time above input for the operator's local time of clocking off the work order, and with the elapsed time input above to represent the duration the operator worked on that order.

In the latter scenario above, the Labor Solution will automatically save a clock off event for the date/time input in the screen above, plus a clock on event for the date/time input above minus the elapsed time. This is performed irrespective of the Event Strategy configuration.

Clocking via a Front-end Device

It is recognized that most customers are not using the EWI solution for paperless shop floor execution will wish to use a front-end device, such as a timeclock or hand-held bar-code reader or radio-frequency gun, to capture labor and attendance clocking events.

Labor Solution supports labor and attendance capture via front-end devices with minimal software running, as web services are provided to perform all the necessary validations, screen layout configuration, data proposals and clocking data capture and processing within SAP.

In order to ease development of front-end device software and to ensure full SAP integration without the need for front-end device programmers to understand SAP, the Labor Solution provides and supports the following web services or remote function modules.

Web Service – Check Personnel Data

The front-end device does not have to display all the information returned from the Check Personnel Data web service.

Web Service – Check Clocking Data

This web-service is called after the operator has entered or bar-coded the objects they wish to clock on, such as work order operations, project codes, internal orders, or a cost center.

Web Service – Save Clocking Data

This web-service is called after the operator has entered or bar-coded the objects they wish to clock on, such as work order operations, project codes, internal orders or a cost center and clicks on Save.

Elapsed Time Labor Processing

Background Job to Calculate Elapsed Time

Transaction /AXONX/TIMECALC is used to process labor and attendance time events, calculating, and splitting elapsed time, and post both confirmations to project networks, production, or maintenance orders as well as labor and attendance clocks into CATS.

This elapsed time program is normally set-up to run automatically in the background, either based on the event of clocking labor or on a periodic basis such as every 15 minutes, every hour, or overnight.

Transactions Posted from Elapsed Time

The elapsed time processing program (transaction code /AXONX/TIMECALC) performs a work order confirmation to capture operational data such as yield quantity and operation status, and a posting of labor and attendance to CATS to support down-stream activities such as review, approval and transfer to order labor costing and billing or payroll.

Elapsed Time Results Display

If the parameter Display Results is checked in the selection screen, the elapsed time shows computed labor and attendance time-pairs. The Start and End time posted to CATS is also displayed.

Any messages encountered during the pegging process are saved to the job application log, accessed for the program name, job name or message log object /AXONMES/LABOR using transaction code SLG1.

Labor Report

The Labor Report lists the differences of time between work schedule rates (WSR), labor time pairs and attendance time pairs. The user can run this report by using transaction code /AXONX/LABREPORT. It will mainly be utilized by Supervisors to track attendance, excess time, and staff utilization proportion. Data can be extracted via personnel number, personnel area, or supervisor ID number.

The report is in ALV format. The data can be exported to spreadsheets for further analysis. You can also add/remove columns by selecting the Change Layout icon.

When the report is displayed with a weekly layout, the WSR (work schedule rate), Attendance, and Labor columns can be double-clicked to display more details. Double clicking on the WSR will produce a pop-up ALV which will produce a miniport (in "day" format) for the week. Double click on Labor columns the confirmations posted details will be visible, which make up the labor durations, likewise for Attendance columns.

The user can modify the utilization and tolerance ID displays (red, yellow, or green) to different utilization percentiles. The tolerances should be configured for each supervisor running the Labor Report.

Maintenance Requirement Workbench (MBX)

Overview

Airline Maintenance and Engineering departments, Aerospace After-market Support organizations and third party Maintenance, Repair and Overhaul (MRO) service providers - as well as any organization which service, repair and overhaul complex equipment such as used in the power generation, oil and gas, nuclear, transportation, construction, utility and telecommunications industries - execute MRO measures on equipment which receive "instructions" or recommendations from their relevant authorities or regulatory bodies. These "instructions" normally request inspection or maintenance activity to be carried out at or before a certain limit and can impact part numbers allowed in the product structure. The Maintenance Requirement Workbench (MBX) manages the "life-cycle" of such an instruction or recommendation (also called service bulletins or modifications, and specifically in Aviation, Airworthiness directives) in the form of an engineering order within the SAP system.

These instructions are received in the form of a master document and have applicability or relevance to all or some of the equipment in the organization's fleet or internal/third party installed base. Once the applicable technical objects (equipment or functional locations) have been determined, the instruction is "embodied". This embodiment is first planned and then actually carried out on each piece of equipment.

Service Bulletins or modifications can be split into many Engineering Orders for embodiment. This would occur, for example, when the work outlined in one Service Bulletin requires diverse skilled technicians performing different tasks and can be performed at different junctures in the lifetime of the components. Multiple Service Bulletins can also be combined into one Engineering Order. This would occur, for example, when a certain set of instructions need to be performed only after another set of instructions have been completed, or multiple sets of instructions from several Service Bulletins can be done concurrently. By allowing a separation of the Service Bulletin and Engineering Order, you can manage and track embodiment status by internal Engineering Order. This Maintenance Requirement Workbench also allows you to manage the relationships between the multiple related Engineering Orders (for example all Engineering Orders relating to one Service Bulletin).

You can also use this tool to transform the instructions in the modification instructions or manuals into executable SAP task lists. These executable task lists will then be available for the planners to estimate the man-hours and materials required to perform the modifications and to create the work orders for the technicians in the shop floor to execute the work.

You can also identify which part numbers, functional locations, or equipment (for example aircraft tail numbers, rail assets, construction assets etc.) and which customers and contracts the modifications must be applied to. Once the modifications have been inducted, executable task lists (work instructions) can be created, applicable part or tail numbers identified, and they can be released to the shop floor.

Some modifications require repetitive work or inspection. You can create maintenance plans for these types of modifications, which in turn are scheduled to generate repetitive inspection orders.

Finally, the Maintenance Requirement Workbench integrates with the Inspection Workbench (IBX), which allows decision support for selection of Modifications or Repair Schemes (engineering repairs) in the form of Service Bulletins (SB), Airworthiness Directives (AD), Technical Orders (TO, TCTO) and other pre-determined repair, inspection, or work tasks on any part or complex assembly being

repaired. This selection facilitates the inclusion of associated repair tasks or task-lists in existing work orders.

Initial Screen

Use SAP transaction code /AXONX/MBX to call the Maintenance Requirement Workbench (MBX). The default screen is the Create/Change screen for users to input document data and process accordingly.

The application toolbar in this screen allows users to toggle between this screen and the MBX search screen.

In the initial screen, you can perform the following tasks:

- Create a new Engineering Order
- Copy from template and create a new Engineering Order
- Create a new version
- Copy from template and create a new version

To create a new Engineering Order, enter the Document, Document type, Document Part and Document version. The system will check if the document already exists in the system, and if it does, will navigate into MBX with the details you have just entered. If the document does not already exist, the system will prompt you to create a new document.

When you copy a new Engineering Order from template, you will be prompted as well if you would like to copy and create a new document. You will also be required to decide which data from the "template" document that you would like to copy over into the new document.

Header Tab

The Header Tab consists of 3 main screen areas:

Header Area

The description at the top of the MBX screen is now the description of the document. Upon successful creation of an Engineering Order, you will navigate into the Header tab. This is also the default tab when you navigate into MBX to change an Engineering Order. Only the Engineering Department field is mandatory in MBX.

The authority/issuing body field values are configurable by document type. So is the Priority field. Priority is linked to the Embodiment Rules values. It was designed with the assumption that one priority (as issued by the authority/issuing body) can be set to many embodiment rules by the customer.

In the Original Files sub-screen in the Header tab, you can assign the original documents to the Engineering Order. This is done to attach the original Service Bulletin or modification paperwork (PDF etc.) as received from the regulatory body to the Engineering Order. Once this is done, click on the Check-In icon. Click on the display icon to view the attachment in its original format.

A check box for 'Repeat Application' is available in the header tab of the mod document. It generates another operative notification or embodiment record once the original notification has been embodied.

A checkbox for Re-Embodiment Flag is available in the header tab of the mod document based on configuration. The corresponding field would be marked during the creation of the new document version to indicate whether re-embodiment is required in the case where the modification was

embodied at the prior version.

Master Notification

The visibility of the next sub-screen for Master Notification is controlled by configuration. The notification type is defaulted in customizing as well. Here, users with appropriate authorization can also maintain an Engineering Change Number (ECN) and a work breakdown structure (WBS) element. You will be able to track changes done to the Engineering Order by assigning the ECN whilst the WBS Element can be used to report on change impact costs.

The main functionality in this sub-screen is to create a master notification. This master notification will be used in the mod review process and to track the steps required to develop the capability to perform the engineering order. The master notification created is linked to the engineering order and is also prerequisite for creating operative notifications in the embodiment rules tab.

Using task codes for the master notification type, you can setup in customizing so that an email sending utility is triggered upon save.

Enter the SAP User ID and press enter. If an email address has been maintained for the SAP User ID, then this will be automatically pulled into the screen. To maintain this, please contact system administrator or alternately, if you have authorization, you can maintain via transaction code SU01. You can also send emails to users without SAP User IDs.

The authorization checkbox, in this case, will not be indicated. You will also be warned by the system that the user does not have the necessary authorization to perform the following task (i.e., access MBX to review the Engineering Order). The authorization checkbox will be indicated if the SAP User ID maintained has the necessary authorization object.

Click on Send Email button once you have completed maintaining the content of the email. The defaulted email content can be changed. The system will inform you that the email has been sent successfully. System administrators will need to set up transaction code SCOT to send out emails at intervals suitable for the organization (recommended every 5 minutes). You can re-send an email for the same task code in MBX. Click on the Re-send email icon and you will see the same pop-up window.

Once the Engineering Order has been reviewed and approved by the various stakeholders, the Engineering Order can be released. When this is done, the Master Notification will be automatically completed. However, this can be done only when all the tasks in the Master Notification have been completed. If you have authorization to set an Engineering Order from "Release" to another status (non-primary or completed), then the master notification will be set to in Process again.

Classification

The Classification sub-screen at the bottom of the Header tab is for users to assign classes to the Engineering Order, to facilitate later searching for the document.

Please take note that the Applicability classification is auto assigned to the Engineering Order in customizing and should not be entered here. Check the Effectivity tab to validate if the applicability class has been assigned. Classes need to be created in the system before they can be assigned for the Document type.

Relationship Tab

A Modification (SB, AD, TCTO etc.) can be split into many Engineering Orders for the actual embodiment work. This would be a common scenario as there are many instructions contained in a

document issued that would require different maintenance groups performing them or performed at different junctures of the lifetime of the assembly. You can also combine multiple Service Bulletin or Modifications into one Engineering Order because the tasks are more naturally carried out simultaneously on each applicable piece of equipment. In some situations, a certain set of instructions may need to be performed only after another set of instructions have been completed or must be done concurrently.

In this tab, you create links from the source mod or engineering order (e.g., the Service Bulletin itself) to another engineering order, or to a source document by relationship type. Relationship types are configurable and can be assigned different logic (methods) to determine/allow how an Engineering Order is linked to another. Relationship types are checked:

- When first set up
- During work-scoping or selection of Engineering Orders to be released for embodiment
- During completion of an order (Completion Check) and during Conformity Check when equipment is repaired and being returned to service.

To create a relationship to the Engineering Order being processed in MBX, you need to enter another Engineering Order in the right sub-screen. MBX performs checks if the value you have entered exists. Alternately, you can select from the list provided when you click on F4 key. Click on the Insert Node button to create the link.

There is also a button which will show the relationship of the Node you have selected to the Engineering Order being processed. To see this path, double click on the node of the Engineering Order, make sure that the values are reflected in the right sub-screen, and then click on the Show Path button.

Relationship Long Text Feature is also provided during MBX document creation.

Please note that you will be able to view all related Engineering Orders, regardless of whether they were created before or after the Engineering Order being processed.

Mod Tasks Tab

A service bulletin or airworthiness directive will contain instructions on what to inspect, repair or modify, with details of each step. You transform the instructions in the service bulletin or mod into executable task list(s) for an engineering order. The executable task lists can be for repair schemes, inspections, or modifications. When the engineering order is released, these executable task lists will then be available for general use on the shop floor as they are included in the form of SAP work orders.

Direct Task List Maintenance within MBX

In this tab, you can create new executable task lists or assign existing executable lists to the engineering order. The task list will be created as an object link to the engineering order being processed. To create a new executable task list, with either external or internal number range (depending on customizing for the general maintenance task lists), enter the following mandatory fields:

- Task List Group (leave blank to create a task list with internal number)
- Task List Type (MBX supports only type A)
- Counter
- Plant

- Status

The system will display an error if you leave fields for plant and status blank.

Upon entering the details above, select the row, and click on the create button. The system will prompt if you would like to continue with task list operations creation. If you affirm this, you will be required to enter details in the lower sub-screen. You can decline at this prompt and enter the operation details later. This is done by selecting the header mod task row and clicking on the Change button. This will take you to transaction code IA06.

If you had affirmed, continue entering details during creation of task list, into:

- Operation sub-tab
- Operation text sub-tab (enter long text for the operation)
- Component sub-tab
- Document sub-tab
- PRT or tooling sub-tab

Please select the header row you had maintained and select the Create button. If all data has been correctly entered, the system will prompt you with a message log. A task list is created, like in transaction code IA05.

If there are errors, these will be displayed as well in the message log. This would enable you to perform the necessary changes before the executable task list is finally created.

The executable task list you have just created can be defaulted into the MBX Embodiment Rules tab. You are given the option to maintain other executable task lists in the Embodiment Rules tab other than the mod task created/maintained here, should there be such a need.

Task List Maintenance via Task List Workbench (TBX)

Maintenance work of complex technical objects includes many tasks and operations that are structured hierarchically. With hierarchical task list maintenance, task lists can reference other task lists, thereby building a hierarchy of task lists. In this way, the structure of work to be performed is reflected by the task list hierarchy.

Dependent on the document type, task list maintenance via the Task List Workbench (TBX) can be activated. Please refer to the Task List Workbench section for further details.

Within TBX, the Master Task List (MTL) will be created as a task list hierarchy in SAP. The Requirements Task Lists (RTLs) that are assigned to each Engineering Order will also be created as list hierarchies in SAP.

The mod tasks functionality has been enhanced to create Requirement task list or Master task list based on customizing setting for document type. Both RTL and MTL task lists are hierarchal task lists.

To create an MTL or RTL the Engineering Order must contain a material link in its Effectivity or Linked Object tab.

Master Task List – The Master Task List contains all possible operation that can be performed on the component. The Master Task List should be created as a task list hierarchy in SAP. The top of the hierarchy should be linked to the part number or part numbers in the Engineering Order.

Requirement Task List – The Requirement Task List is specific to the individual Maintenance Requirement and will be a subset of the Master Task List. This task list will be created as a task list

hierarchy in the background but will be displayed as a standard task list containing operations which are reusable across work requirements. Each reusable operation will be created as a General maintenance task list with a single operation.

The Master Task List will be determined in the mod document based on the material entered in the Effectivity rule and material object link tab.

Effectivity Tab

Technical objects (equipment, functional locations etc.) are identified as applicable to the Engineering Order either via manual inspection or based on applicability classification values search. These technical objects are recorded as applicable to the Engineering Order by creation of document object links associating the Engineering Order document information record to applicable technical objects. In this tab, you can perform many tasks, the most important of which is to identify applicable technical object for the Engineering Order. The main functionalities in this tab are:

- Inheriting values from another Engineering Order or Source Document
- Maintaining values or a value range for the Engineering Order being processed
- Identifying applicable technical objects for the Engineering Order
- Eliminating applicable technical objects identified which are the same assets.

This tab is divided into three sub-screens: Inheritance sub-screen, Applicability Rules sub-screen and the material and serial range sub-screen.

Applicability Rules sub-screen

In this sub-screen, you can manually maintain the applicability values and ranges for the Engineering Order being processed. These values are used to search for applicable technical objects such as equipment, functional location, or part numbers, which are classified using the same characteristics with characteristic values meeting the applicability ranges on the Engineering Order.

You can enter a range of values as applicability rules for a single characteristic, for example for a mod applicable to a range of serial numbers of a part. The characters until the last non-numeric character of the value entered must be the same.

Values can be maintained from the search help (by clicking on F4). Select the row and click on the insert icon. If the characteristic is set to allow multiple values, you can maintain more than one value for a characteristic by doing this. To remove values, select the row and click on the delete icon. It is important to note that the characteristic (in transaction CT04) should be set to allow additional values. If you should encounter an error stating "null value", please go to transaction CT04 and check if this checkbox has been indicated.

The class is defaulted from customizing. It must be created via transaction code CL02 and maintained in table /AXONXAPP/CU04A. It is important to design a classification system that can be used for all the technical objects (MPL Node, Part Number, Equipment and Functional Location). You can either have the same set of characteristic values with the same class name for the different class types of the technical objects (this is recommended), or different characteristic values with different class names for the different class types of the technical objects. The second method would reduce the amount of data in the system.

When you click on the button Identify Linked Objects, depending on the values you selected in the Applicability Rules sub-screen, applicable technical objects will be identified and displayed in the Linked Technical Object tab on the document. Only technical objects with a characteristic matching

the applicability rules sub-screen are identified as applicable. However, if you want to Exclude the technical objects based on their status enter the status in the Functional/Equipment status exclusion field and then press enter. Applicable technical objects with this status will be removed.

When you save after performing this functionality, the technical objects identified will be deemed as applicable to the Engineering Order, creating document object links.

When you click on the Linked Objects button, MBX can be set to search with "OR" functionality or "AND" functionality for the characteristic values. For "OR", you select one or more of the characteristic values in the applicability rules sub-screen before clicking on the Linked Object button. If you had selected more than one, if either of the characteristic ID/value pairs exist in a technical object, MBX will select it as applicable. For "AND", when you click on the Linked Object button, all the characteristic ids and values will be used to identify technical objects in the system. In this case, all the values must exist in the technical object for it to be selected.

In the effectivity tab, there is functionality triggered by clicking on Elimination Objects button that will check all the applicable technical objects in MBX, identify if any of those listed there are the same asset/part number and eliminate the duplicate object from the list. It does this by checking the characteristic type, equipment, and functional location system status. This means that if any characteristic type of value is assigned from equipment, functional location, and material with same asset, it will eliminate the object (Equipment, FL, and material) based on the elimination ranking under the mod configuration. It can also determine the duplicate object based on the functional location and equipment system status from linked objects.

You would need to execute this functionality to avoid accidentally creating a duplicate embodiment notification or operative maintenance plan for the same asset/part.

Once the processing is complete, you will be prompted with a pop-up window proposing to you the objects that should be eliminated from the applicability lists on the right sub-screen. You can then proceed to delete these technical object(s).

Material and Serial Range sub-screen

In this sub-screen, you can maintain the material values and serial number ranges for the Engineering Order being processed. These values are used to search for applicable Equipment using a direct field search on the Equipment record, rather than a classification search. This selection method is used to provide the initial set of Equipment, which are then further filtered based on any classification values maintained in the left screen area.

Inheritance sub-screen

The inheritance section of the screen allows you to select a source document to copy or inherit applicability rules from. This would be adopted for example in cases where several Engineering Orders were created with reference to one source document such as an OEM Service Bulletin or regulatory directive. Rather than repeatedly manually entering the same applicability rules on every Engineering Order, it is possible to inherit the applicability rules for all these Engineering Orders from the source document. Depending on whether you intend the Engineering Order to adopt identical or just similar applicability rules as compared to the source document, use either the Copy or Reference feature.

- **Copy** feature copies the applicability rules from the inheritance or source document number, allowing you to edit the applicability rules independently on each Engineering Order after they have been copied, using the source or inheritance document just to default the values.
- **Reference** feature references the applicability rules of the inheritance of source document,

making the Engineering Order applicability the same as the inheritance or source document. Any subsequent changes to the inheritance or source document after the "referencing" are automatically reflected into all referenced Engineering Orders, because the applicability rules on the Engineering Order are technically pointers to the rules defined on the source document.

To inherit values from another document, enter the document number, type, part, and version before clicking on the Refresh button. MBX will prompt if you would like to inherit from the latest version of the document you just entered. Upon your confirmation, the appropriate document along with its values will be displayed at the Inheritance sub-screen.

To stop referencing a source document, simply delete the document keys fields in this sub-screen and select the Refresh button. Once you save, the link between these two will be removed. For the Copy feature, you will not be able to change the applicability values of the Engineering Order being processed back to what they were before you did the "copy" (in other words values are over-written by the copy).

If an inheritance document is maintained, the Embodiment Status report will display statuses for the Engineering Order being processed, as well as the Inherited Documents and the Inherited Documents, related Engineering Order statuses. It will not display the statuses of the related Engineering Orders for the Engineering Order being processed.

Master Parts List Tab

If you use a Master Parts List from the integrated Product and Process Engineering workbench of SAP (iPPE -> MPL) in your scenario to control the configuration of complex components or aircraft / engine structures, from time to time, a Service Bulletin could contain instructions on what part number must be changed in these MPL structures. There could also be instances when the OEM issues a bulletin to introduce a new part. So, the MPL would have to be created and structure gaps created for all applicable technical objects.

From the Engineering Order created in MBX, you can directly:

- Create new variant(s) for existing MPL node(s) in the Master Parts List as "post-modification"
- Update existing variants for the MPL node(s) to denote parts as "pre-modification"
- Create new MPL node(s) in the PPE structure directly
- Create new MPL node(s) in the PPE and later, via operative notifications created (in Embodiment Rules tab), create the structure gaps in the applicable technical objects
- Delete an existing MPL node in the PPE structure directly

This tab will present all the variants for this MPL node as pre-modification variants for the Engineering Order being processed. You can de-select the selected variants from being a pre-modification variant for this Engineering Order by removing the defaulted indicators under the Pre-modification column.

You can use MBX to easily update the post-modification variant from this tab. To do this you would need to select the node you wish to create a post-modification variant for, and then click on the Add new parts button.

Maintain the new variant number, variant (material master) and quantity. If the material master does not yet exist in the system, the system will show an error. Once you save, the new variant material

will be updated into the MPL structure. You can check via transaction code PPE for the MPL Node. Please note the classification for this new variant will contain the Engineering Order value as its post-modification value. The other earlier existing variant(s) will have the Engineering Order value as pre-modification values.

When you execute the transaction code /AXONMBX/PPEJOB after deleting a variant via transaction code PPE, entries made into the table /AXONXAPP/DRWMPL are immediately synchronized to reflect the current MPL structure. A field for interchangeability code (IC Code) is provided in the 'Create/Delete MPL and Structure Gaps' dialog box of the 'MPL Node' tab, to restrict the determination of interchangeable parts, either related to target build or dismantled part numbers (where target build is not used). Customer specific logic can be provided to determine the interchangeable parts for an input part number and checking if an input target material is correctly interchangeable with an input source material using a BAdI.

Create MPL Nodes

If a mod is inducted to introduce one or multiple new MPL Node(s) for an existing as-allowed structure in the system, you can create these new nodes directly from MBX. This functionality allows you to track the MPL nodes created for the mod and to be able to create the corresponding structure gaps as well in the applicable technical objects.

To create one or multiple new MPL nodes, click on the MPL node button. MBX will prompt you with a new pop-up window. You must enter an existing MPL Node to link (upper relationship) the new MPL node to MBX does not support "orphan" MPL Node creation.

Enter 'Node Type, Node, Node description, MPL Class' and 'Class type'. Also indicate the 'Update Encored Class' checkboxes. Also maintain the variant(s) if any. The variant material should exist in the system.

If you indicate the class checkbox, you will be prompted to enter the class type and class to assign to the MPL node. The search help here will point you to the classes configured for object PNODID (MPL nodes). Upon save, the characteristic values from the Engineering Order being processed will be assigned to the characteristic values of the MPL Node (if the characteristic id exists). Also, the MPL node will be an object link for the Engineering Order and will be updated into the Master Notification (created in the MBX Header tab).

The part status defined against the Mod and the MPL node influences the allowable dispositions that can subsequently be performed on a part to which the Mod applies. The behavior of each status can be fine-tuned in customizing, for example to produce Error, Warning, or No Check. Please refer to the Inspection Workbench (IBX) section for further details.

The MPL nodes will also be displayed in the main screen. At this point, if you check the as-allowed structure, you will see that the nodes you created in MBX have been created and linked to the corresponding upper level MPL node.

Once the Engineering Order has been approved and released, you can proceed to create operative notifications for technical objects identified as applicable for the Engineering Order. Planning data maintained in the Master Notification is then passed to the operative notifications along with its items (MPL Nodes and create/delete task code).

You can then process the structure gap creations from these operative notifications via standard SAP transaction code IW52 or upon generating work orders for it, via Electronic Work Instructions (EWI)

via transaction code /AXONX/EWI. In the Change Notification transaction (IW52), the add-on contains a function module which will be triggered via the notification follow-on action. Upon save, the structure gaps will be created or deleted in the technical object maintained in the operative notification header (depending on the task code in the Master Notification updated during the create MPL Node session).

If you change the technical object in the operative notification manually, the system will accordingly update the embodiment status for the new updated technical object. An enhancement spot has also been provided for customers who would like to manage which level the structure gap is created at. The gap is created directly under the applicable technical object (in reference sub-screen of operative notification). You will then need to use the Sourcing Workbench to source an equipment/part for the structure gap.

Delete MPL Nodes

To delete existing MPL nodes, you must enter existing MPL nodes. You can search using the search help functionality provided in the pop-up window. You can enter MPL nodes to delete. Then click on the Add MPL node button. System will issue a pop-up window. A new line item will be added in mod document with action item as Delete node.

The MPL node will be linked to Master Notification and be marked for deletion.

APIs Delivered

API Name	Functionality Description
/AXONXAPP/DETERMINE_CONFIG_MAT	To determine, if the config material is required or not
/AXONXAPP/MAINTAIN_CONFIG_MAT	To create config material/ create profile/
/AXONXAPP/READ_PPE_OBJECTS	to read the details of the input PPE node
/AXONXAPP/COMPARE_PPE_OBJECTS	Read the iPPE structure
/AXONXAPP/MAINTAIN_PPE_OBJECT	To create/update/delete the node details
/AXONXAPP/SYNC_PPE_OBJECT	This API is used to synchronize the in putted structure with the iPPE structure. If iPPE structure does not exist in the system, this API will create an iPPE structure same as the inputted structure. If the structure already exists, it will synchronize with the inputted structure.

Embodiment Rules Tab

You can create or assign customer policy document(s) for the Engineering Order and maintain Embodiment Cycles for the Engineering Order being   processed in the upper sub-screen, this can be controlled via configuration. Secondly, you can create fixed-date or counter based intervals and limits on a master maintenance plan/master notification. These can either create embodiment notifications or operative maintenance plans, for all applicable equipment technical objects.

"Method Type" and Method controls the Maintenance Plan re-activation date, during processing of maintenance plans for MPD relevant documents through Transaction "MPD".

Note: The plan needs to be scheduled after executing the Maintenance plan "Activation/Deactivation". This moves the date of ineffective plans to a future date, so that the calls from these plans are no longer scheduled unless the plan is activated again.

Long text field "Notification comment" is available for counter-based plan (for both performance and time-based). This Long text is copied into the text of maintenance item. Tolerance and shift factor related fields were available on the screen based on business function activation.

Note: DIR Fields for Tolerance and Shift Factor will be available only when the business function LOG_EAM_SHIFTFACTORS is active.

Maintenance plan decision flag is available under "Embodiment cycles" screen for MPD relevant documents, which controls re-use of existing maintenance plans. The flag is non-editable unless it is set as 'User decision' in the Enhanced versioning schema of Maintenance requirement document.

Create/Assign Customer Policy

Service Bulletins or Engineering Orders which are not mandatory are done at the prerogative of customer's/component owners. With this functionality, you can create or assign customer policy documents as per the setting in configuration and assign them to Engineering Orders to determine the way these Engineering Orders will be embodied. This scenario would be common for third party repair facilities.

You can create or assign the customer policy documents directly from MBX to this Engineering Order. You assign the customer and/or contract for the related policy document to the Engineering Order with the customer-specified Embodiment Rule. It is important to note that one customer and/or contract can have only one embodiment rule per Policy document, however any number of Policy documents per customer and/or contract are permitted.

If the configuration option to assign customer policies is enabled then the Rank, Embodiment rule, customer would be copied in the modification document fields under the Embodiment Rules Tab from the policy document.

In the event one customer has several contracts with several Policy documents with different Embodiment Rules, you must rank the Policy documents. The rank will determine which Embodiment Rule would take effect on the technical objects in priority. In the event the contract has several items, you must assign a rank at each item level for the contract.

The Embodiment Rule against the Policy document per customer with the highest rank will be the one effective Embodiment Rule passed on to the operative maintenance plans or embodiment notifications generated to embody the Engineering Order for this customer.

Embodiment Cycles

In this sub-screen, you create embodiment notifications or operative maintenance plans to manage the execution of the instructions in the Engineering Order. To do this, you can generate one-off notifications for the executable task lists in the mod tasks tab based on a compliance date (embodiment notifications); alternately, if the instructions specify periodic repetitions of the same tasks or a one-off embodiment must take place before a non-calendar counter limit is reached on the technical object, then operative maintenance plans can also be generated from this sub-screen.

The radio button selection Fixed Date generates a single date-based embodiment notification for each applicable technical object (functional location, equipment). The radio button selection Plan or Counter Based is for repetitive inspections or checks to be carried out, or when the embodiment must be accomplished before expiry of a set number of cycles/hours etc. based on the technical objects' measuring points. This radio button option generates an operative maintenance plan for each applicable technical object (functional location and equipment only), which in turn is scheduled to generate an operative maintenance or inspection calls and/or notifications.

A checkbox "Unique offset" is available for MPD relevant which is flagged automatically if unique offsets are maintained for of the technical objects. The flag can be manually unset during creation of the new version. If unset the unique offset for technical object are lost and the default offset are updated for all the plans.

You will need to create the master notification first before the operative objects can be generated. This must be done before the Engineering Order is released.

Creating Embodiment Notifications

To create embodiment notifications, select the radio button "Fixed Date". In the sub-screen, the following details are defaulted by MBX but can be changed by user:

- Start Date – defaulted to today's date
- Required Compliance Date – defaulted to today's date
- Notification Type – from customizing
- Planner Group and Plant – from the Engineering Department in Header tab
- Task List Type, Group and Counter – from mod tasks tab

The data maintained here will be updated into the Master Notification (the same notification used in the Header tab to for the mod review process). You can make changes to this sub-screen and click on the save icon or the update master notification.

Once the engineering order has been released, the sub-screen will be set to display only. You will not be able to make any more changes. You can now proceed to create the embodiment notifications. This can be done if any applicable equipment or functional location exists (you can check by clicking on the effectivity tab for the equipment and functional location sub-tabs).

To create embodiment notification(s), click on the button Create/Update notifications. If there are applicable technical objects, you will see a pop-up. In this screen, you can create new embodiment notifications or update existing ones in the event there were changes to Master Notification. Please save now. Navigate into MBX once again and you can see the notifications generated in the Effectivity tab or by clicking on the Update Notification button. The yellow traffic lights status indicates that there are still applicable technical objects which are yet to have embodiment notifications created.

- An additional check box for Repeat Application has been provided to generate another operative notification once the original notification has been embodied. This is only triggered via MBX JOB.
- The same can also be generated if an already embodied modification is removed from the order based on a user-defined configuration.
- The Multi Unit handling check has been provided at the document level in MBX which will show a warning message if the same modification is embodied on a part of the same hierarchy. This warning message can be bypassed by pressing enter or cancelled using the

escape button.

Create/Delete Structure Gaps

The Structure Gap Update function is intended to be used in the scenario where the modification introduces a new part at a different Functional Identifier (FID). It will create a new Gap (at the new FID) and delete the old one.

In the event the indicator for Structure Gap was selected during creation/deletion of MPL Nodes in the Master Parts List tab, when you create operative notifications the indicator will be passed to the notification.

If a work order has been created for this operative notification, access the order in Electronic Work Instructions (EWI) via transaction /AXONX/EWI to trigger the appropriate action to create or delete the gap.

Structure gaps are created directly under the applicable technical object node. An enhancement spot has been provided to influence the position of the gap. It is important to note that when an operative notification is created, the embodiment status is updated with the notification number and the applicable technical object. So, any changes using this enhancement spot will need to consider the entries to this table as well. Not doing so, will result in inconsistencies in the Embodiment Status report.

Creating Operative Maintenance Plans

With MBX, you can create time based, strategy or performance based multi counter maintenance plans. To create operative maintenance plans, select the radio button "Plan or Counter Based". Selecting this radio button, will provide users with further option to select.

Unlike operative embodiment notifications, you can only create operative maintenance plans for applicable equipment and functional locations. A master notification must exist before the operative plans can be generated. This is done before the Engineering Order is released. Once the Engineering Order has been released, this sub-screen will be display-only.

For time-based plans, do not enter the measurement characteristic. Simply maintain the interval value along with the unit of measure.

For performance-based plans, you must enter the measurement characteristic. MBX will use this to identify the applicable technical objects with the same measurement characteristic and create maintenance plans for them. You can perform search help by clicking on F4 key at this field. MBX will check the applicable technical objects and return characteristic values found in measuring points in those technical objects. If there are no applicable technical objects identified yet for the Engineering Order, you will not be able to maintain this field. If there are applicable technical objects, but without any measuring points, this will be highlighted.

MBX will only create maintenance plan(s) and items as per the master notification.

The embodiment notifications and operative maintenance plans that are automatically generated can also be viewed, maintained, and scheduled using the standard SAP transactions (IW52, IP02, and IP10). Embodiment notifications or operative maintenance plan call notifications can be packaged and scheduled using SAP's Maintenance Event Builder (MEB), or other maintenance planning tools. These embodiment notifications and operative maintenance plans normally display the Engineering Order details and Embodiment Rules on the Customer Enhancement tab.

You can also enter individual offsets per technical object found applicable and / or individual Start Dates.

Embodiment Status Tab

You can track the embodiment status of the Engineering Order being processed from this tab. MBX also allows you to generate a report to identify the status of embodiment for each end asset, assembly (e.g., module, engine) or part that has had a Service Bulletin or Engineering Order embodied upon it for compliance. The report can be generated from the end item asset as top-down or from lower-level assemblies, or for an individual equipment.

When you navigate into this tab, the report displayed is for the Engineering Order being processed.

Depending on customizing settings for the mod type, you will be able to see the embodiment status for other Engineering Orders which are related to the Engineering Order being processed in MBX. You will also be able to see, if any, source documents for this Engineering Order.

A source document is indicated in customizing by mod type. MBX identifies the first source document which is directly related to the engineering order being processed in MBX and displays this in the report. If there are two or more source documents for the engineering order, the first related source document will be the one that will be displayed.

Embodiment Status Report

Using this functionality, you can generate reports across multiple equipment and functional locations. Depending on customizing settings, the report generated can be set to display for an individual equipment/functional location only, or for the hierarchy.

If the functional location is entered, the report generated will identify all the functional locations and equipment's linked in the structure hierarchy beneath it and check for any related Engineering Orders and display them in the report. If equipment is maintained, the report generated will identify all the equipment's linked in the structure hierarchy beneath it and check for any related Engineering Orders and display them in the report.

You can drill down further by double clicking on a row. The next report appears in a pop-up window which allows the user to see the details of the Engineering Order, technical object along with the operative notification/maintenance plans generated. To drill down further, double click a row here, and the next drill down report will show the orders/notifications generated for the operative notifications/maintenance plans you generated in MBX.

Use SAP transaction code /AXONX/EMB_STAT_NEW to call the Embodiment status report.

In the initial screen, you can select by which object you want to search. Based on the selection it will display relevant fields.

- Select by Technical objects
- Select by document
- Event specific modifications

Depending on the customizing settings for the Report, it will display the modification documents based on the selection screen criteria.

ALV Report: Based on Event specific/Sales order

Enter Sales Order on the selection screen and execute. The ALV report will be generated which will show all the mod documents with rollup status, superior equipment, Equipment, Functional location, Pre-mod Part and Post mod Part, document status (fields can vary depending on the entries in selection screen)

Changing the Embodiment Status from the Report

In the ALV report, you can change the embodiment status of the selected modification document through the '**Update mod Status'** button. The allowed from and to status combinations are defined in customizing.

Based on the configuration setting, the user can be mandated to enter 'Notes' for a   change in embodiment status of MBX documents during mod popup.

The cancellation of the MOD embodiment status update with/without mandatory text is handled to stop the after processes. The status change function is enhanced to receive the long text as input and not present the long text editor in case the text is given as input.

Embodiment Status

Updates to the embodiment status in the report are triggered by various events across the add-on. The embodiment status represents the current embodiment stage the equipment or functional location is at, at the point in time the report is run. The embodiment status is updated by events of standard SAP transaction codes as well as the Inspection Workbench (IBX).

To capture the embodiment details as per MBX document and various other details like who, when, status, active/inactive flag etc. there is an Embodiment Status History table in addition to the Embodiment Status table.

Embodiment Status	Description
Initial	Technical object is applicable to the Engineering Order
A	Applicable
00	Not embodied (planned)
01	Packaged (revision)
02	In process of embodiment
03	Embodied (completed)
04	In process of cancellation
05	Embodied, then cancelled
06	Partially embodied
07	Found embodied
08	Previously embodied
09	Not embodied (closed)
10	Embodied (this visits) but repeat
11	Complied with through engineering requirement
12	Complied with through Alternative compliance

13	Complied with through AMP control
B	Not Applicable
X	Control transferred

The status codes are as follows:

- In the event a functional location, equipment or material number is found applicable in MBX, with no embodiment plan, there will be an entry in the status "Gray" and embodiment status "initial"
- In the event an embodiment notification or operative maintenance plan is generated for this applicable technical object in MBX, the embodiment status will be updated with 00. Even if the operative maintenance plan is scheduled and one or more call notifications are generated, the embodiment status remains as 00
- When these notifications are packaged into a Revision (transaction code WPS1 or via Work-scoping Workbench) and saved, the embodiment status will be moved to 01
- When work orders are generated in the PM module via transaction codes IW52 or via IW58 or via work-scoping workbench (WBX), the embodiment status will be 02. This is normally carried out during work-scoping, as part of asset induction, or when pre-planning the maintenance work just prior to the asset induction
- When notifications are de-packaged from a revision, the embodiment status for that equipment will be reversed back to 00. In the event there are already work orders generated for the mod notifications, when these notifications are de-packaged, the work orders will be closed. The embodiment status will be reversed back from 02 to 00
- If the work orders are technically completed or closed via transaction code IW32 or IW38, or via the Declare Service component, the embodiment status will be moved to 03
- If these statuses are reversed, the embodiment status will also be reversed back to 02

If your organization uses the Maintenance Event Builder to package work, operative maintenance plan calls, and embodiment notifications generated via MBX can be packaged along with routine and deferred work items.

Report Status

The status column in the report displays "traffic lights" which allows you to check if the embodiment is still within its required compliance date. The required compliance date for the notification is derived from the master notification which is then transferred to the operative notification's required end date field.

- If the current system date is more than the required end date in the operative or embodiment notification, the status will be "Red"
- If the current system date is equal to the required compliance date, the status will be "Yellow"
- Only when the required compliance data is still in the future when compared to the current system date, will the status be "Green"

If there is a PM work order generated for the Mod notification, then the status will be "Yellow" if the required compliance date is in the future. If the required compliance date is in the past or equal to the current system date, then the status displayed will be "Red". In the event the PM work order has

been technically completed, the status will still be "Yellow". If the required compliance date is in the future when compared to the actual finish date of the PM work order, then the status will be "Green". If these two dates are equal, it will still be set as "Yellow".

Rollup Status Management

The Embodiment Status report shows the "Rollup Status" of hierarchical mods. This is an indication of the overall status of the mod hierarchy, based on the status of the subordinate documents in the hierarchy. It is not the actual embodiment status, but it is intended as a guide when managing the overall status of a complex hierarchy. The rollup status of an individual mod document is determined as follows:

- Optional Child:
    - If the status of any or all the optional child documents is open, then the Rollup Status of the Parent will show as "open".
    - If the status of all the optional child documents is closed, then the Rollup Status of the Parent will show as "open".
- Mandatory Child:
    - If the status of any of the mandatory child documents is open, then the Rollup Status of the Parent will show as "Partially completed".
    - If the status of all the mandatory child documents is closed, then the Rollup Status of the Parent will show as "Completed".

If the status of all the mandatory child documents is not completed, the Rollup status of the Parent will be "Open".

Using transaction code /AXONX/EMB_STAT_NEW, enter the modification document the ALV report generated. The rollup status of the modification documents is open for those which are open and complete for those which are completed.

BADI /AXONMES/BADI_EMB_STAT allows customer specific fields in the selection screen and report output of the /AXONX/EMB_STAT_NEW report

Embodiment Status Validation & Correction

In rare scenarios the modification embodiment status table /AXONXAPP/DRWEMB can get corrupted. A program *'/AXONXAPP/DRWEMB_VALIDATE'*, is provided in order to validate and correct the contents of this table, for scenarios where modification documents contain embodiment cycles based on maintenance plans.

Once this program is executed the selection screen appears. The program output contains message text depending on the scenario mentioned in the below table.

Message	Explanation	Additional Info
Record OK	Notification status is consistent with embodiment status in table /AXONXAPP/DRWEMB	Notification has status 'COCE' ('Completion Certified') and embodiment status in /AXONXAPP/DRWEMB is either '03' ('Embodied'), '07' ('Found embodied'), '08' ('Previously embodied'), or 'B' ('Not Applicable').
Incorrect Embodiment Status	Notification status is inconsistent with embodiment status in table /AXONXAPP/DRWEMB	Notification has status 'COCE' ('Completion Certified'), but embodiment record in /AXONXAPP/DRWEMB has a 'not embodied' status.
Record OK. Status Not Checked	Embodiment Record is consistent, but notification is not yet complete	Embodiment record is correct, but status cannot be validated against notification status (not yet 'COCE')
Record does not exist	Embodiment record is missing in /AXONXAPP/DRWEMB	There is no embodiment record for the determined combination of DIR, Maintenance Plan, Notification
Maintenance Plan exists with no Released Calls	Embodiment Record is consistent, but no Maintenance Plan calls have yet been generated	Embodiment record is correct, but status cannot be validated against notification status, since no calls exist for the Maintenance Plan
No Maintenance Plan	Embodiment Record is inconsistent as it contains Notification without Maintenance Plan	Embodiment Record contains Notification (Maintenance Plan Call), but Maintenance Plan is blank.

If the records are identified as inconsistent then the user can perform double click on those records to navigate to a screen for further correction. The screen displayed is split into two sections, one showing the wrong/missing record and other with the correct record. The Edit button can be used to correct the entries in table from this screen.

Embodiment status can be uploaded through an excel file using Transaction '/AXONX/UPLOAD_DRWEMB'

Linked Object Tab

The linked technical objects screen shows all technical objects in your system – such as equipment records, functional locations, materials and MPL nodes – that are applicable to the Engineering Order being processed. These objects can be populated via the Linked Object features described previously or input manually. Even if an applicable technical object is input manually (allowed for document types

other than MPD), information is given to the user to inform them if the applicable technical object's classification meets or is compatible with the applicability rules of the Engineering Order, as shown on the Applicability Rules screen to the left. Two columns, the status traffic light and delete icon, are used to indicate the status and conformity of the applicable technical object. These columns are visible only for 'Fixed-date' documents with operative notifications. They are not available for Maintenance Plan-based documents. The following are the possible states of applicable technical objects,

- Records marked as deleted will be removed (made not applicable) on Save. Even if the technical object's classification is compatible with the applicability rules of the Engineering Order, the object will not be associated with the Engineering Order to record applicability in the database.
- Records marked with green traffic light are applicable and have previously been stored in the database, via document object links between the Engineering Order and the technical object such as an equipment or functional location.
- Records marked with yellow traffic light are applicable in terms of the technical object's classification matching the Engineering Order's applicability rules, but this link is not yet stored on the SAP database. A document object link between the Engineering Order and the technical object will be created on Save.
- Records marked with red traffic light are not applicable in terms of the technical object's classification does not match the Engineering Order's applicability rules. However, it is possible to manually override, and to still make the technical object applicable by entering it into this screen. Provided that the delete icon is not shown, a document object link between the Engineering Order and the technical object will be created on Save.

As soon as you accept the results in the Message Log, the technical objects will be transferred to the Linked Technical Objects sub-screen. The status lights displayed will be yellow (applicable but not an object link yet to the Engineering Order being processed). The objects will be segregated into the separate tabs according to equipment, functional locations, part numbers. Once you save and re-navigate into this Effectivity tab, the status light will now display as green. This denotes that the technical object is now applicable, stored as a document object link for the Engineering Order being processed.

In the event you delete a characteristic value in the Applicability Rules sub-screen while there are technical objects on the right sub-screen of Linked Technical Objects, the status would change into red. This is because the characteristic values of the Technical Object no longer match those of the Engineering Order.

Making an Object Applicable Manually

In addition to using the Linked Object button to identify the applicable technical objects, you can also manually make a technical object applicable to all document types other than the "MPD relevant" ones. This is done by clicking on the insert button at the bottom of the sub-screen for the object you want to make applicable. A blank row will appear in the table above. Input the technical objects identifier and press Enter. MBX now will check if technical object has matching characteristic and value as the Engineering Order. If it does, the status light displayed for fixed date documents, at the row for this object will be yellow, otherwise it will be red.

In the event the technical object maintained does not have a class maintained, the system will prompt if you would like to assign a class to this object. You can maintain any class (which exists in the system

with the applicable class types) to the technical object. Please note that the class type and class will need to be configured beforehand.

In the event the Applicability Rules sub-screen does not have any values, you can still assign a class manually to the technical object by inserting it into the Linked Technical Object sub-screen. The status for this technical object (or all technical objects in this sub-screen for that matter) would be red (no classification matching).

If you need to remove a technical object from the Linked Technical Object sub-screen of document types other than the "MPD relevant" ones, please click on the button in the Delete column for the row corresponding to the chosen technical object. MBX will prompt if you would like to delete this technical object link, and if you affirm, a delete icon will be displayed in the row for the technical object. In previous releases, once an MPL Node had a post- modification variant created for it, the Node could no longer be deleted from this sub-screen. From this release, this can be done if your user ID has the necessary authorization object assigned.

When you delete an equipment or functional location link to the Engineering Order which has had operative maintenance plans or embodiment notifications generated for it, the events listed below are updated automatically to clean up redundant data in the system. In MBX, you cannot delete equipment/functional locations that have one or more operative maintenance plan/notifications generated with orders which are already confirmed or even partially confirmed.

In case of MPD Document, addition / deletion of technical object is only possible through transaction MPD-iMRO Effectivity.

Please note that when an MPL Node is found applicable, all the variants for this MPL Node will deemed as pre-modification parts by MBX automatically. This will be updated simultaneously in transaction code PPE for the MPL node's variants. However, you can remove this applicability in the master parts list tab. Please refer to the section on Master Parts List tab.

Part Progression Tab

The part progression tab contains the Pre- and Post-mod parts for the mod. This information is used during repair order workscoping to update the return part number in the repair order with the Post-mod part when the corresponding mod is added to the order.

The document once released will not allow any changes to the Part Progression tab.

Only released mods will be displayed in repair order workscoping. Please refer to the Workscoping Workbench (WBX) section for more details.

Quotation and Billing Method Tab

The tab is used to capture the service material and billing method used for pricing of the task in the Bill of Work solution. The contract number is maintained corresponding to the customer in the mod document and is used for determining the interchangeable materials during sourcing.

Task Based Effectivity Tab

This tab holds the effectivity details of the document. The following details are available in this tab: ATA System Code, ATA number, PM/PS Reference, Phase Indicator and Check indicator. Interchangeability strategy Target Build will be displayed as a Form in this tab.

Configuration Management Policy Tab

This tab contains the interchangeable materials and Interchangeability (IC) rules. The following details are available in this tab:

- MPL Node: This field is visible based on a customizing check box 'Configuration policy without MPL' against the document type, which determines if MPL node maintenance is allowed or not.
- Reference Material: a valid MPL node variant (if MPL node field has an entry in corresponding row) or any Material
- Description: Material description
- IC material: Material
- IC rule: Interchangeability rule, with the following possible values:

  Restrict – used to limit parts considered allowed by the MPL

  Override – used in place of other sources of valid parts

  Extend – used to add parts to the valid parts list

Version History Tab

The tab contains an ALV grid, where each 'released' prior version of the document can be viewed. This will show only the released version of the prior version of the same document. User can view the ALV grid to see the prior version of the document. There are links available on each record in the tab for users to select and navigate to MBX (Display mode) and check document details. On clicking back, the user will be navigated back to the same screen.

Customer Tab

The tab is used to assign the customer/contract for the related, policy document to the engineering order with the customer related embodiment rule.

OMP/AMP Enhancement Tab

The tab is used to define customer specific fields.

Note: The display of tabs can be restricted in maintenance documents based on authorization groups available in user's role and the MBX schema configuration.

Engine Manual Maintenance Plan/Program (EMP)

The purpose of an Engine Manual Maintenance Plan is to represent the maintenance planning criteria for a sub-set of engines (fleet or program) related to a specific (common) engine maintenance manual.

EMP represents a collection of tasks which are relevant for the maintenance of an ATA chapter. It comprises all the details of the maintenance tasks based on the planned modifications, release life for LLP parts and measurement cycles for the various components of the engine structure. The EMP defines the workscope level of each maintenance task, thus enabling a workscope proposal to be generated for the relevant maintenance tasks based on the selected workscope level during packaging.

Workscope Levels

Workscope level is used for 'Engine Maintenance Plan' and provides the following functionality
- Addition and removal of existing workscope documents
- Maintenance of MPL Node/ATA Chapter and customer workscope level against the workscope document

- Customer workscope level is stored as a free text for reference against the document relationship. This can be used in reports and forms as necessary for communications that need to be sent to the customer.
- Ability to sort, filter the ALV grid data and export it to Microsoft Office documents
- Ability to save a custom layout for ALV grid.

Disposition Requirement Tab

Disposition Requirement tab contains two sub-screens: the first for entering the MPL nodes for the components which have disposition requirements and for assigning the appropriate Disposition Requirement category to each, and the second screen for viewing the repair task lists / documents that have been entered for these records. Repair tasks can be added or deleted selecting the parent MPL node. Task documents can be linked through the linked object tab in the task document by adding component nodes in it.

Workscope Requirement/tasks

This is a display only tab and shows all the maintenance tasks that are related to maintenance workscope documents, linked to the EMP. This tab lists all the workscope levels and will define whether a task is mandatory or optional for a workscope level. The list of determined maintenance requirements/tasks is validated against the engine manual documents linked to the EMP. The tasks are displayed as a hierarchical ALV table. The hierarchy is displayed for the main maintenance tasks (i.e., maintenance requirements) and the sub-tasks related to the main tasks.
Reference PM/PS element and Phase field are provided in EMTs which helps in order generation for these EMTs.

Soft time rule

The soft time rule helps in the determination of the modules that need to be packaged at a workscope level for each selected ATA Chapter or MPL node. Multiple measurement positions can be maintained as a gate for setting workscope level against the single MPL node.

Modification

This view displays the list of all the relevant ATA Chapters and/or MPL nodes and corresponding modification documents with corresponding workscope level. Based on the added documents, the default compliance category of the document is determined from the modification document. The user can update the compliance category which is saved with the modification document linked to the EMP document.

Release Life view

This view displays the ALV list of ATA chapters and/or MPL nodes and corresponding materials which are classified as Life Limited Parts (LLPs) based on the Master Parts List (MPL) node and material schema configuration. The view has the following sub screens:

Minimum Release

This tab provides the following functionality:

- Ability to maintain/delete minimum life for a 'MPL Node' and 'ATA chapter'.

- Ability to sort, filter the ALV grid data and export it to Microsoft Office documents.

- Ability to save a custom layout for ALV grid.

LLP Work scope

This tab provides the following functionality:

- Ability to display materials for the corresponding 'MPL Node' and 'ATA chapter' in the 'Release Life Rule' tab which are classified as Life Limited Parts (LLPs).
- Ability to sort, filter the ALV grid data and export it to Microsoft Office documents
- Ability to save a custom layout for ALV grid

Integration with Inspection Workbench (IBX)

In the IBX work order view, executable task lists for an Engineering Order which have been released (of course the Task List status must be set to Release as well), will be available for selection to the Inspector.

There is a configuration option in IBX which will determine how Engineering Orders and Repair Schemes are proposed for incorporation into removed part repair orders from within the IBX work order view screen. This functionality allows multiple filters to be defined and then assigned to an IBX Schema in priority order defined in the customizing table.

When you select the customized filter option in a drop-down menu, the corresponding Engineering Order/Repair Schemes will be proposed under the corresponding nodes, either Repair Schemes node or Engineering Orders node.

To be able to select filter ID Planned mods/repairs, in MBX, this would mean that applicable technical objects would have had embodiment notifications or operative maintenance plans generated for it (have an embodiment status of 00 or 01). This option would be pertinent for embodiment of Service Bulletins or modifications onto parts dismantled/to be dismantled in IBX.

You can also set in customizing a filter ID as default by IBX schema. It can be set to display all the Repair Schemes and Engineering Orders that are applicable to the part number or equipment in the dismantled work order. For an Engineering Order/Repair Scheme to appear for this setting, you would need to make the part number or equipment applicable for the Engineering Order. It would not matter if the status light were red (class does not match) or green (class match). Use this setting for Repair Schemes generated from MBX. You can manually make a part number or equipment applicable to an Engineering Order in the MBX Effectivity tab.

To do this, configure a separate Repair Scheme document type in MBX. The Repair Scheme configuration would not need applicability classification assigned. You can also disable the Embodiment Rules tab for this Repair Scheme document type. In the MBX screen, users would just need to make the equipment/part numbers applicable to the Repair Scheme. Please see section on Effectivity tab.

Non-serialized part embodiment is supported. Engineering Orders and Repair Schemes applicable to a part number (depending on the Filter ID you select) will be proposed for selection. The applicability-by is differentiated for the user in IBX via the icons preceding the Engineering Order or Repair Scheme.

For a non-serialized part number, the embodiment status along with the master batch for the part number is updated into the embodiment status database.

When you select the Include Eng. Order or Repair button, the system will prompt you with a selection screen to enable you to further select the operations from the executable task list in Engineering Order or Repair Scheme you just selected.

Depending on the configuration, the post-mod part which is maintained in the Part Progression data

of the Engineering Order can be adopted as the return part number in the repair order (negative reservation item), in place of the dismantled part number. If more than one potential post mod part number exists in the part progression data, then a pop-up will be displayed requesting the user to select the required post mod part.

If the Task List master data contains Elimination ID and Sequence IDs, after considering the selection you made above, the Task List Elimination and Sequencing component will trigger and eliminate operations with the same Elimination IDs and sequence the operations according to the sequencing values. Please refer to the Task List Elimination and Sequencing section for more details.

Document Hierarchies

Dependent on the document type, MBX can display a tree structure in the left-hand area of the screen. This is relevant in scenarios where a single Maintenance Requirement (SB, AD etc.) is modelled using several documents arranged hierarchically. This may be the case for example in an Aircraft Engine Overhaul scenario, where the SB is modeled as a hierarchy that corresponds to the technical structure, with applicability to the Engine at the top level, the modules at the lower level, and the Piece Parts at the lowest level.

To create a document hierarchy in MBX, enter document, document type, document part and document version fields. In the main page click on insert node. A pop up will open, select Document relationship type, and enter document, document part and document version.

If document number is not created already and field is left blank a new document will be created and get attached in hierarchy. The new document created will use internal numbering defined in customizing to give document number.

After pressing the insert node button this modification document will be added to the document hierarchy.

When the Embodiment status report is executed using transaction /AXONX/EMB_STAT_NEW for engineering document, it will show the entire modification document maintained in relationship with this modification document.

There is an ability to add child nodes to an already released DIR which can be enabled via a BAdI implementation.

It is possible to define hierarchical relationships as "unique" in order to validate that only a 1:1 relationship between the parent and child document types, using that relationship type.

When a new child MBX DIR is created or assigned to a parent DIR it is possible to copy custom field values to target MBX fields

List Display of Documents

The technical documents related to aircraft maintenance or modifications are circulated by the OEM. These documents are maintained by airlines or third-party organizations. The third-party system sends important data to the airline customer. The data get saved in SAP as documents.

The standard SAP Document List Display (transaction CV04N) has search criteria based only on standard fields.

The list display search functionality has been enhanced to search documents based on user defined fields in addition to standard SAP document fields

/AXONX/CV04ND: List of documents will open in display mode

/AXONX/CV04NC: List of documents will open in editable mode.

Once the document type has been entered in the search criteria, select the check box for which transaction data must be displayed.

- A) CV04N
- B) MBX

The fields will be displayed at the Customer Data tab. If in the selection criteria multiple document types are entered, Custom fields will not be displayed.

MBX Job

The job /AXONMBX/MBX_JOB is typically run in the background, but can also be run online via transaction code, /AXONX/MBXJOB. It will search the system and identify all the applicable technical objects/master notifications as per entries made on the selection screen, match the technical objects to the master notifications and vice versa. It can also automatically create new maintenance plans and schedule those plans as well.

Based on the selection parameter MBX job will create operative notifications for the concerned technical objects.

MBXJOB can also consider an equipment hierarchy while searching for mod documents based on characteristics. A flag has been provided on the selection screen that controls this behavior. When the flag is checked, the equipment structure is exploded (downwards) and all the Equipment are treated as inputs.

Variant of MBX job

A variant of MBX Job titled as "MBXJOB New" is available, which can be run in the background. It can also be executed in foreground via transaction code '/AXONX/MBXJOBN'. It intended that /AXONX/IP30 or /AXONX/IP30_T is used for scheduling of the plan hence the transaction no longer provides an option to do maintenance plan scheduling.

- A 'Work process ID' can configured for an equipment or a functional location category using 'Technical Object Change Management' Workbench. An option is provided on the selection screen to process records only for a specific 'Work process ID'.

APIs Delivered

API Name	Functionality Description
/AXONXAPP/GET_MODS	Read the MODs included in the order
/AXONXAPP/UPDATE_MOD_STATUS	UPDATE mod status.

Material Shortage Report

Overview

The Material Shortage Report complements the standard SAP Materials Requirement Planning (MRP) functionality by providing visibility of both stock and Work in Process material availability. This report provides the material planner an up to date (partly dependent on how frequently the update programs are run) view on the status of material availability for maintenance activities in a service center or maintenance facility.

The Material Shortage Report runs in 2 modes: It can run based on pegging results (refer to the Pegging section) or in real time. The "Real-Time" Shortage Report works in conjunction with the Sourcing (SRC) solution to allow real-time reporting against sourced demands. In addition, it shows a real-time "pegging status" for the material/reservation from the last pegging run and an indication whether the supply/demand situation for the material has changed since the last pegging run.

This functionality in turn allows material expeditors to move away from reacting to near-term and existing shortages to instead focus on planning and supply conflicts over the entire planning horizon, supply chain network and maintenance demands, proactively managing predicted shortages weeks or months before they impact maintenance activities.

The following transactions are utilized in this section:

- /AXONX/SHORT: Report displaying the current shortage situation based on latest pegging data
- /AXONX/REAL_SHORT: Report displaying the Real-Time Shortage Report for sourced parts and the pegging status for non-sourced parts.

Shortage Report

Selection Screen

The selection screen is separated into four different sections:

Organization and Layout Controls

Contains general selection criteria.

Independent Demand Criteria

Selection values entered in this tab limit Shortage Report data based on the end item or independent demand attributes matching the user input ranges or values.

Next Higher Demand Criteria

Selection values entered in this tab limit Shortage Report data based on the current demand matching the user input ranges or values. Use this tab when exploding the report one or more levels down the bill of material for selected work or procured items. It will not explode down multiple levels unless the explode BOM field is also checked.

Component or Supply Criteria

Selection values entered in this tab limit Shortage Report data based on the current supply matching the user input ranges or values. This displays shortages from the viewpoint of the components supply orders/stock etc. If an MRP controller is entered, all material that is short for that MRP controller will be reported. If order number(s) are entered, only the planned receipts from the input orders are reported, about the demands that needs these parts.

For the selection criteria listed in the three tabs, any combination of fields can be entered, but data reported must meet all the selection criteria across all three tabs. It is important to understand the interaction between each tab before combinations of selection fields are used.

- The independent demand criteria tab limits data to a vertical "slice" per the chosen end item demand, whereas
- The next higher demand, component, or supply tabs limit data to a horizontal "slice" for the chosen next higher demand or supply material data.

Shortage Report Results and Drill Down

The Shortage Report can display summarized or detailed information depending on the user's desire for more information vs. limiting the overall length and complexity of the report.

From highest to lowest level, the Shortage Report levels can be described as follows:

1. The most summarized report shows one row of data per material (as indented BOM or materials list).
2. The next alternative or drill-down level of detail shows one row of data per material and next higher assembly. Demands for the same material which supply two different next higher assembly part numbers would appear as two rows at this level, vs. a combined row at level [1].
3. The next alternative or drill-down level of detail shows one row of data per combination of next higher assembly, material, and end item demand. In this case, demands for the same next higher assembly which ultimately supply two different end item sales orders would be shown on separate rows in the report.
4. The next alternative or drill-down level of detail shows one row of data per supply order reference number, or per demand reference number. Demands for the same next higher assembly, material and end item sales order might appear on separate rows if they a being built on separate work orders (for summarization by supply order) or if they are being assembled at the immediate next level on a separate assembly order (for summarization by demand).
5. Finally, the most detailed Shortage Report available shows one row of data per supply and demand order combination, or per individual "peg". If a supply order is split across six demands at the next higher level, this option will show six rows of data on the report. Similarly, if a demand order is met by six supply orders or supply sources, this option will show six rows of data.

In all summarized report layouts (alternatives [1] to [4] above) there is normally more than one shortage or "peg" which makes up one row of data in the report. In this case the worst-case scenario is displayed, showing supply information from the latest supply order making up the single row of data, or for the first supply order in shortage.

The main Shortage Report details screen is split into three panes, color-coded as follows:

1. The first pane is blue and contains basic material and row status information. It can appear as an indented bill of material or as a basic material list.
2. The second pane, which is white, will only be displayed if the level of detail/summarization of the Shortage Report layout schema customizing is at next higher assembly, or at material number. It

provides a grid showing selected end item demands as columns across the screen, and the supply situation to each of these independent demands in successive horizontal cells. Each row on the report represents the overall situation for a material or material and next higher assembly combination. This provides a very useful summary of the many critical demands against a range of supplies and can significantly reduce the resulting length of the report. The information contained in each horizontal work-cell depends on what has been configured in the layout schema.

3. The third pane shows detailed pegging specific information for the worst-case making up the row, or for the first shortage. In other words, specific details on the latest supply for a demand, or the earliest demand for a supply, or the first shortage against a material; is defaulted into the columns of the third pane. The columns are arranged in various colors that show different classes of information.

Double-clicking a row shows pegging and shortage information for the next level of detail configured against the Layout schema, providing an interactive "drill down". You can also double-click on an individual cell in the white central grid-style panel showing aggregate demand information for a material or select one or more rows and press the Drill Down button in the SAP toolbar.

Detailed Data Elements

- **Supply Details**: Includes the supply order, it is expected receipt quantity and date, and pertinent expediting supply order information.
- **Demand Details**: Include the component reservation reference, demand quantity and date, the next higher-level assembly order, and some pertinent expediting parent order information.
- **Independent or End Item Demand Details**: Include the sales order, the forecast reference and pertinent expediting information about the end item demand
- **Peg Quantity**: The combination of the supply that is pegged or allocated to the same demand in the pegging table. Every piece or quant of a supply and a demand appears in one or other pegging record, so that:
    - The sum of peg quantity for all records of the same supply order equals the supply order delivery quantity.
    - The sum of peg quantity for all records of the same next higher demand order equals the demand quantity.
- **Traffic Light Status**: gives a quick visual indication of the status of the shortage as follows:
    - **Green Light**: supply is already in stock and available to meet the demand at any time.
    - **Yellow Light**: supply is still in process but is scheduled in SAP to meet the demand date.
    - **Red Light**: supply is short vs. the demand, either because it is being delivered later or after the requirement date, because there is a shortfall in supply vs demand quantity, or because there is no supply planned at all.

Actions and Inputs to Shortage Report

The expeditor or user of the Shortage Report can add a comment to any row of the report by pressing the Comment button in the SAP toolbar. This provides a pop-up window where the user can input or edit an existing comment. Each comment is stored against the next higher assembly demand or the reservation/requirement as a long text. If the report summarization shows multiple rows for the various supplies pegged to the same demand, the comment will apply equally to all rows of the same demand. If a comment has been entered and the expeditor selects another record with the same demand, pressing the Comment button will display the existing comment for the user to add or

change input text.

Action Buttons

Action button can be configured into the application toolbar, which can call the defined function for the selected row.

Real-Time Shortage Report

The Real-Time Shortage Report is designed to be used in environments where the Sourcing solution is heavily utilized and capitalizes on the real-time nature of the sourcing data.

For those materials that are sourcing relevant as defined by their material schema, the Real-Time Shortage Report will read the sourcing table directly to retrieve the supply situation for a given demand.

For those materials that are not sourcing-relevant, the assumption is that they are MRP-controlled and processed by the pegging engine, and the Real-Time Shortage Report will still refer to the pegging table to retrieve the supply situation for these demands. The Real-Time Shortage Report is therefore a compromise between truly Real-Time Shortage Reporting (for sourced materials) and asynchronous reporting (for pegged materials), with the intention of balancing the need for real-time data against system performance considerations.

Selection Screen

Upon execution of /AXONX/REAL_SHORT, the initial screen will provide you with the option of running the Real-Time Shortage Report or the normal Shortage Report. The latter option will display the same selection screen as stated above and carry out the same process as /AXONX/SHORT. The Real-Time Shortage Report allows you to customize the layout schema and enter details of the plant for revision, range of work orders and range of revision numbers.

Report Results

Once all the relevant information has been entered and executed, the report will be displayed, showing details of the reservations (based on the selection), details of the demand and supply, and the shortage/pegging status.

Detailed Data Elements

Some important data elements in the Real-Time Shortage Report are as follows:

- **Material** – The demand material in the reservation item
- **Requirement** – The reservation/item
- **GR Qty** – The supply quantity currently allocated (sourced or pegged) to the demand
- **Pegging Status** – Shows the pegging status for the material/reservation from the last pegging run
- **Repegging Status** – Indicates whether the supply/demand situation for the material has changed since the last pegging run. Indicates whether pegging should be re-run for the material. If pegging-relevant changes have occurred, you should re-run pegging for the material(s) in question and then re-execute the report.
- **Shortage Status** – Gives a quick visual indication of the status of the shortage. The logic to determine the traffic light color is the same as in the standard Shortage Report.

Pegging

Overview

The Pegging update program evaluates supplies (stock, planned or in-bound receipts and work in process) against demands (sales orders, forecasts, and work order requirements) based on first in, first out date sequence, running in the background.

Essentially the supply/demand matching logic in the pegging update program is the same as the standard SAP Stock Requirements List (MD04) but is executed on a mass update basis (for all materials as opposed to just one at a time), thereby creating and maintaining a database of supply / demand combinations which the Material Shortage Report can then read directly without itself having to first evaluate all the potential supply/demand combinations in real time.

Pegging Update Program

The Pegging Update Program reads supply and demand for a selected range of material and plant combinations and assigns supply to demand on a quantity-by-quantity basis, in date sequence, at each level of the bill of material. Within each MRP planning segment – planning material, plant, and special stock segment with optional MRP area – supplies are pegged to demands following first in, first out business logic. This means stock is pegged first, then the earliest in-bound receipts, to the earliest outbound requirements, irrespective of whether a demand comes from a sales order, forecast or work order component requirement.

Supplies will only peg to demands in the same MRP segment, i.e., the combination of material, plant, MRP area and project, customer, or sales order special stock reference. Stock transport orders and material transport reservations between plants and within a plant between two storage locations with separate MRP areas are considered for pegging purposes as outlined in the Inter Plant Pegging section. Stock transport orders and material transport reservations between two storage locations in the same MRP area, or in the same plant with MRP area inactive, are ignored. Pegging supports the Part Interchangeability concept based on configuration policy rules defined in mod document of usage type Maintenance Policy -TBW and Maintenance Policy - Generic.

The pegging solution needs to be run on a regular basis, at least every night. The more often pegging is run, the more up to date shortage report data will be, however there is a consequential load on the system from running pegging.

Depending upon which mode it is run in, pegging takes the selected materials and determines how supplies (stock, inbound shipments, and inspections, planned orders, production orders, purchase requisitions and purchase orders) are pegged against demands (forecasts, sales order and outbound shipments, network, production, or service order reservations, dependent requirements, and manual reservations). Pegging also calculates the top-level requirement or end item independent demand for each peg relationship. All this information is written to a table. The shortage report is then based on this table.

Pegging is run in one of two modes, depending on your business requirements:

- Pegging in refresh mode, which means that all material/plant combinations specified in the selection screen are pegged, irrespective of their MRP run status. Refresh mode pegging is the slowest to run however it does guarantee that pegging results are up to date for all selected material and plant combinations

- Pegging in net change mode, which means that only material/plant combinations which were

planned in a recent MRP run, or are due to be re-planned in MRP, are processed. Since the MRP planning file only stores date (not time), this mode is best suited to shortage reports based on last night's data. Pegging in net change mode is far more efficient than refresh mode, as only a small fraction of the total material/plant population are processed

MRP is not a pre-requisite to the Pegging Solution. However, if both jobs are being scheduled overnight it is recommended to run MRP first and then to run the pegging program in net change mode. If MRP is not being run regularly, it is recommended to run the Pegging Solution in refresh mode, which does not rely on MRP results. Online use is mainly for troubleshooting or for updating pegging results for a few fast-moving materials where the batch pegging update is insufficient.

Running the Pegging Update Program

Call the Pegging Update Program with transaction code /AXONX/PEG_UPD. Normally the Pegging Update Program is defined as a background job.

In the initial screen displayed, you enter the supply and demand range for the material and plant.

Pegging will read supply and demand for this selected range of material and plant combinations. It then assigns supply to demand on a quantity-by-quantity basis, in date sequence, at each level of the bill of material. As a result, a relationship is made between a supply and demand. This is also referred to as a "soft peg". A hard peg is a relationship which does not change based on schedule changes or MRP results, normally as a result of assigning the same batch or lot identifier to the supply and the demand. This type of relationship can be created through the Sourcing transaction.

Pegging Mode Selection

New Refresh Pegging

This indicator instructs the Pegging Update Program to process all selected plant and material combinations in the selection criteria, irrespective of MRP status. This option is recommended for individual material pegging runs, in plants where MRP is not being used, and when a "regenerative" or new-planning MRP run has just been performed.

Net Change Pegging

This indicator instructs the Pegging Update Program to process materials which will either be adjusted in the next "net change" MRP run, or which were processed in a recent MRP run. Materials are processed for all plants per the selection screen criteria, irrespective of whether MRP was executed in every selected plant or not, based on either:

- All selected materials for which MRP was most recently run since a specific date, or,
- All selected materials for which MRP was most recently run in the past "n" days.

Net change pegging is recommended for the normal overnight pegging job. Assuming MRP is also run nightly the job should be set to check back one day so that all materials processed in the immediate prior net change MRP run are pegged.

Planning Scenario

This function is not required in Maintenance scenarios and should not be used.

Other Pegging Selection Criteria

Plants to Process

Specify the plants for which you want to calculate pegging results. For production orders and process orders, this plant is the production plant in which the material is to be manufactured. For purchase

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orders, this is the receiving plant. For all requirements (sales orders, reservations, inter-company shipments) this is shipping or issuing plant.

It is recommended to specify all plants in an inter-plant supply chain, for example if product is shipped from plant A to plant B, assembled further, and then shipped to the customer from plant B, it is recommended that you peg both plants A and B at the same time for the inter-plant pegging process to work properly. If you run pegging for only plant A, there can be an inconsistency between the pegging for plants A and B because the stock transport order from plant A to plant B will rely on historical, not current, pegging for plant B to know how to peg the parts from plant A being shipped to B.

MRP Planning WBS

This is the WBS against which network activities, production, process, service, planned and purchase orders are account assigned, as well as the WBS assignment for project stock, sales order or planned independent requirements which are defined as project stock relevant. It is called "MRP Planning" WBS because it is the WBS used to create the MRP segment for planning purposes and results in a segregated MRP run, appearing as a heading with the stock requirements screen (MD04). Pegging always ensures that supply and demand relationships are defined within an MRP segment, in other words it is not possible for a demand against one MRP Planning WBS to be pegged to a supply from another MRP Planning WBS.

Specify this field only if you want to restrict the Pegging Update Program to specific planning WBS elements.

Materials

This is filled out if you want to restrict the pegging run to a subset of materials, typically for example if you are running it online during the day either for troubleshooting or because the supply/demand for a specific material is changing so much that the background pegging run is not adequate.

If the material of a higher-level assembly is not included in the selection, the pegging process cannot automatically inherit the end item or independent demand from the higher to lower material in the BOM structure. In this situation, pegging automatically refers to the pegging results database to see if pegging data exists for the excluded higher-level assembly material from a previous pegging run.

Material Status

Filling out this field restricts materials with the specified status codes being processed. Performance is improved if all materials of a blocked status are excluded.

BOM Low-Level Codes

The bill of material (BOM) low-level code is the lowest level that a material appears in any product structure of the company, across all plants. The low-level code controls the sequence in which the material is planned in an MRP run. It also controls the sequence in which materials are pegged by this program.

First the materials with low-level code 0 are pegged, then the materials with low-level code 1, and so on. The further down the product structure the material appears, the lower the level, and the higher the low-level code that is assigned to that material.

Planning and pegging materials in low-level code sequence means that material will only be pegged once all assemblies in which it occurs have been pegged and exploded. This is necessary to allow proper inheritance of pegging results (top level requirement, top level material etc.) from the higher

assembly to the material being processed. This selection parameter can be used to reduce the number of levels down the BOM for which pegging is run. It is to enhance performance, so if performance or memory allocation in pegging is not an issue this field should be left blank. If pegging performance or memory becomes an issue, it is possible to break up the pegging runs into successive runs at each level, with the low-level code gradually increased from 0. However, it is important to note that pegging must be completed for the higher (smaller numeric) low-level codes before it is initiated for the lower (larger numeric) codes.

Ignore Bulk Material

This indicator causes the Pegging Update Program to ignore materials which are marked as bulk on their material master. It improves the pegging performance; however, it also means that bulk managed materials will not be pegged. It should normally be set since bulk materials are not critical for expediting purposes. If you have previously configured MRP not to generate requirements or reservations for bulk materials then this checkbox does not have any effect, as bulk materials are not being planned for. In the standard settings for the Pegging Update Program, the ignore bulk material checkbox is indicated.

Requirements to Include

Only supplies and requirements up to this date, or "n" days forward into the future, are considered in the pegging run. For example, with planned orders, the Pegging Update Program will only consider planned orders due for delivery on or before this date. The same rule applies to all other reservations, sales orders, and production orders. Stock which is already on hand is considered to have a "finish date" of today for the purposes of this selection parameter.

If no requirements/demands or supplies exist up to this date, pegging results are not created for the material and MRP segment in question, and any pre-existing results will be deleted.

Process Control and Report Parameters

These parameters control the way the Pegging process behaves, as outlined below.

Test Mode

This indicator runs the pegging in test mode and stops the pegging results table from being updated. Tick this if you elect to display the pegging results. Do not set in normal usage, it is for testing only.

Full Reservation Table Read

This field is for system performance reasons. When a limited number of materials are being pegged, either due to a restricted material list selection or because net change pegging is being run with only a few materials planned in net change MRP, it is quicker to read the reservations database for only selected materials. When a larger number of materials are being pegged, such as for a full-up refresh mode pegging run, it is quicker to read the entire reservations database into memory and then to reduce the dataset to only required records in memory. This optimizes the reservations database read, typically the bottleneck to overall SAP system performance.

The value entered in this field is the threshold number of materials being processed beyond which a full reservations table scan is performed. It is recommended to initially set this field to a value of 5,000. During performance tuning, the system administrator or SAP competency team member responsible for Material Expediting can experiment with this setting, increasing it in multiples of 1,000 material records to optimize database performance, and reducing it to optimize pre-read memory utilization. Ultimately this requires experimentation.

Reservation Table Packet Size

Only if the full reservation table scan is triggered (see previous selection screen input field above) then the data read may be split into smaller packets of data to manage system memory. Set a value in this field only if there is a value in the above field, and always larger than 5,000 entries.

Suppress Warning Message/s

This checkbox is provided to control the suppression of any warning message that needs user confirmation during the execution of pegging update report.

Display Run-time Statistics

This checkbox shows pegging statistics relating to the number of records processed (supply/demand relationships within the selected material, plant and MRP segment), the number of records from the pegging database which are being deleted, and the number being added. If the new and previous pegging results did not change, typically because no goods movements or planned, production, purchase, sales etc. order changes took place since the last pegging run, then the pegging database is not updated. Only pegging records which have changed are deleted and added to the pegging database, for performance reasons. For this reason, the number of records deleted and added is sometimes different to the number of pegging records processed.

The checkbox also shows the start and finish time in hours, minutes, and seconds of each step of the pegging process, as written to the job log when running in background mode. This is extremely useful for performance analysis.

Display Results

This indicator causes pegging to display all the pegging results for the selected material and plant combinations in the report. This displays all the pegging results, regardless of whether they have changed or not since the last time the program ran. For this reason, the number of pegging lines in the results may differ from the number of pegging records inserted or deleted from the pegging results table.

ALV Layout ID

The pegging results come out in a hierarchical ALV Layout grid format displaying sub totals. As such you can pick and choose columns of data to display; change the width and sequence of columns and hide columns. Once you are comfortable with a specific display format it is useful to "Save Layout" within the report itself and then recall the same layout set ID by specifying it below on the selection screen. You can use the drop down (F4) key to display the list of pre-existing layout ID's to choose from or leave it blank and all fields will be displayed in the default sequence.

Pegging Results and Statistics

Pegging results are displayed in a hierarchical list, with a "data block" for each supply order (e.g., stock segment, purchase order, production order, planned order, refurbishment service order etc.) listing all "pegs" or demand relationships within the one supply order.

The first line or "header row" on the pegging results depicts supply order header information such as the supply order material, plant, MRP planning WBS, type of supply or replenishment, the specific replenishment order number, and the total available quantity of the supply order or replenishment. The total available quantity is calculated as the total quantity on hand for stock or the total quantity yet to be produced (open quantity on order or in process) for a production, planned or purchase order.

The status traffic light normally displayed to the left is calculated as follows:

- A green light indicates that the full supply order total quantity is properly pegged to true demands.
- A yellow light indicates that the full supply order total quantity is properly pegged but to an exception code such as excess material or safety stock.
- A red light indicates that the full supply order total quantity is not pegged, or the total sum or all pegs for the supply order exceeds the supply order total quantity. Typically, a red light indicates that there may be an issue with pegging of this supply order which warrants further investigation.

The second, third etc. or "item rows" on the pegging results depict each demand or requirement which is "pegged" to this supply, together with information about the "supply/demand" relationship such as the pegged quantity, the demand requirement date, the type, and identifier of the demand (e.g., reservation number), the top level or independent requirement which originally drove the demand ("top requirement").

The pegged quantity is the quantity or portion of the supply that is pegged to the demand, and the quantity or portion of the demand which is pegged to the supply. It is always the smaller of the total demand quantity, total supply quantity or a portion of one of these, in the case of a split peg. It can be a fraction as outlined under Fractional Pegs section.

The replenishment object (in the header row) and requirement (in the item row) are important fields identifying the specific supply and demand object or document numbers being pegged. The requirement is the pegged demand for the same material and MRP segment and can be viewed directly in MD04 Stock/Requirements screen. It should be possible to compare pegging results to the Stock/Requirements screen within each MRP segment and to match supplies and demands quantity for quantity in date sequence. Put another way, when the ATP quantity in MD04 reaches zero, the supply and demand on consecutive lines in MD04 should be pegged to each other.

The top requirement, top material, and top plant fields in the report, and in the results table /AXONMEXW/PEGSFT, are inherited from the requirement down the BOM structure through pegging results. This is extremely useful since it allows the shortage report to display, at any given level of the BOM, the end item demand to which a supply is pegged, potentially up many BOM levels. This is like the MD04 pegged order report but runs hundreds of times faster. Unlike the MD04 pegged order report, if the requirement or a mid-level assembly is pegged to several end item objectives, all end item pegged demands are considered and pro-rated against each supply order pegged to the same requirement or mid-level assembly; end item demands for a mid-level assembly are not considered in demand date sequence.

If you opted to display statistics from the Pegging Update Program you will see a list report with counts for the number of pegging results processed, deleted, updated, or created against active pegging (PEG_SOFT) or simulative or long-term planning pegging (PEG_LTP). You will always also get a list of any pegging errors encountered, saved to the application message log accessible via SAP transaction SLG1.

Replenishment and Requirement Types

Supply orders or "replenishments" and demands or "requirements" are stored in the pegging database using a coding system consisting of an object type and document reference. The first two characters of the replenishment and requirement field denote the type (purchase order, stock, reservation etc.) and the remaining characters denote the specific document number and, if applicable, the document line-item number.

Pegging Error Logs

Pegging errors are written to the pegging error log together with the material, plant etc. and an appropriate error code and text description. This log can be accessed via transaction code SLG1. Input the pegging job name and/or user and/or run date and time to access the correct log. Many error codes include a long text description to explain the error in more detail.

Pegging Performance Considerations

Pegging, like MRP, is a system intensive process. It reads all supplies and demands for all selected materials and plants into memory, and then updates a database table in the background with each supply/demand relationship. If you have 50,000 active materials defined in ten separate plants, and each material/plant combination has 100 records in MD04 (supplies and demands) there will be approximately 50,000 x 10 x 100 = 50 million pegging records. Since each pegging record contains approximately 750 bytes of data just one copy of the pegging table in memory requires almost 40 GB. In reality, with these volumes you should never run pegging across all plants and all materials in refresh mode in one go, the run would normally be divided up by material based on either low-level code or using "net change" mode, and by plant.

As with any system intensive process, there is a trade-off between database performance and memory utilization. Running the application out of memory improves run-time, just as dividing the reads up into separate blocks with smaller memory requirements normally takes more time to read the database. This trade-off is something which is unique to each client based on their business needs and hardware environment. However, the following are recommended at a minimum:

- Run pegging in net change mode where possible ensuring that less than 2,500 materials are being processed (based on net change mode) in each pegging run,
- Run pegging for plants which have few or no inter-plant stock transport orders in separate background jobs, which can be scheduled to run in parallel, to further limit the number of material records being processed by each pegging run,
- Be prepared at initial "start-up" (refresh mode) to run pegging by low level code. This takes longer overall than running for all low-level codes at once, but uses less memory,
- Set the field "MDRS Read All After" field on the selection screen can be set to its optimum value based on performance testing in a production-like environment. This field triggers a full database scan when the number of material records being processed exceeds this threshold value. This optimizes the database read of MDRS/RESB, typically the overall bottleneck and largest database for an operations or manufacturing SAP system,
- Set system parameters for memory (various types e.g., RTTA, Heap, Swap etc.) in RZ10 to the maximum values recommended by SAP for your hardware customizing, and to the maximum recommended in OSS in response to any ABAP terminations based on running out of memory.
- It is important when running consecutive pegging jobs for performance testing to compare run-times with all other parameters are equal, including:
- Other background jobs running on the system,
- The number of materials being processed; comparative test runs should normally be run in refresh, not net change mode to minimize the impact of MRP on run-times,
- The number of records being updated; either run in test mode (no-update) or separate the update run-time in each comparison by inspecting the job log,
- Data volumes; avoid significant transactional activity between comparison pegging runs.

Special Pegging Situations

Inter Plant Pegging

Stock transport orders (STO), requisitions and planned STOs link a supply from a shipping plant to an appropriate demand in the STO receiving plant. The original supply order satisfying the STO shipment (whether stock, a production or purchase order) is pegged directly to the demand in the STO receiving plant, which the STO receipt is fulfilling. Furthermore, the STO details are also stored in the pegging table.

If only the sending or receiving plant of the STO is included in the pegging selection, results will not always be accurate. Where historical pegging data exists, because the missing plant was recently pegged after the STO was set-up, missing data will be read directly from the pegging results database and not recalculated. There will be a pegging error when pegging has not been run for the missing plant since STO has been established. This is because historical pegging data does not exist.

Pegging based on Sourcing or Batch

The Sourcing transaction allows a material planner, expeditor, or shop floor technician to search for available supplies to meet an open or exchange demand and to "source" or hard peg a specific supply – whether in stock, work in process, installed etc. - to the demand in question. This can be a many to many relationships: one supply meeting one demand; one supply meeting many demands; many supplies meeting one demand etc. Please refer to the Sourcing and Swap section for more information.

Alternatively, standard SAP batch determination procedures can assign a batch to a demand based on the availability of supplies (for batch managed materials), and in the case of production orders can even split the batch or component reservation of the demand order according to allocation of a single demand to multiple supplies with different batch numbers.

In cases where the Sourcing transaction or batch determination is being used it might be desirable to peg based on sourcing or batch information. This literally means that instead of pegging the first demand to the first supply, working in date sequence within an MRP segment, pegging considers sourcing or batch determination, as follows:

- In case of pegging by batch number if the demand has a batch then it is only pegged to supply orders with the same batch identifier, or to supply orders with no batch
- In case of pegging by source if the demand has one or more source assignments, it is only pegged to supply orders that are sourced to the demand
- In either case above a demand is not pegged to supplies with batch equal to, or sourced to, another valid demand.

Planning Task List (PTL)

Overview

The Planning Task List (PTL) is an integral part of the Maintenance Demand Generator solution for medium and long-term capacity planning. Planning Task Lists, also known as routings in the context of SAP production planning, are utilized in the creation of planned orders, which are capacity load bearing objects representing future maintenance events. Planning Task Lists can be automatically generated in the solution based on the creation of executable task list), which can be included in maintenance notifications, in turn triggering the creation of planned orders and enabling capacity requirements planning for both routine and non-routine work and materials without the need to create maintenance orders far into the future.

Creation of Planning Task List

The Planning Task List is a routing in SAP containing summarized work and duration. There are two ways that a PTL can be created:

1. Automatic creation of PTL: - creating a new executable task-list/HTL and clicking Save will generate a PTL (based on an event-driven background job).
2. Generating PTL directly via transaction /AXONX/CREPTL.

To create a PTL directly from transaction /AXONX/CREPTL, enter an existing task list (either and executable task-list or an HTL) in the selection screen, select the Routing check box and click on Execute. The PTL will be created, and a log is generated, which can be viewed in the Application Log - transaction SLG1.

Summarization of Executable Task List

In the case of an Executable Task List the PTL would calculate the summarized work and duration as follows:

*   A sequential relationship (FS- Finish – Start) is assumed to exist between the operations in the executable task list, unless otherwise specified.
*   If no other relationship type is defined, then PTL considers the operation relationships as sequential (FS- Finish Start relationship in the operation). The man hours are summarized by work center and the total duration is summed across all operations. If a relationship other than FS is defined between the operations, then PTL considers the relationship when calculating the duration.

Behavior of Non-routine % in the executable task-list

As an example, the non-routine field in the executable task-list is processed by PTL as follows:

An Executable Task List has 100 hours' work and 100 hours' duration. PTL creates a routine routing for the executable task-list with 100 hours' duration against the dummy work center (main operation) and 100 hours' work against the actual work center (sub-operation). The executable task-list header has 20% non-routine work and one defect task list assigned. PTL creates a non-routine routing for the executable task-list with 100 hours' duration against the dummy work center (main operation), 20 hours work against the original work center (sub-operation 1), and 20% of the work specified in the defect task list against the original work center of the defect task List (sub-operation 2).

Summarization of Hierarchical Task List (HTL)

In the case of Hierarchical Task Lists (HTLs), the Planning Task Lists (PTLs) of all executable task-list contained in the HTL will be considered for summarization of work based on work center and PM-PS reference element. (PM-PS reference element is copied into the PTL from the executable task-list at the time of creation). The duration maintained in the Hierarchical Task List header becomes the duration against the dummy work center at main operation level and the summarized work will be stored in the sub-operations. The number of sub-operations is determined from the number of work center/PM-PS reference combinations used in the HTL.

Creation of Service Material

A service material will be created automatically for each PTL (note: material is a mandatory field in the routing). To create the service material from the PTL program, the following criteria must be met:

- The service material must be externally numbered, and the material number will be based on a concatenation of task list type, group, and group counter. The description of the material will be the same as the description of the Executable Task List or Hierarchical Task List
- The service material has views Basic Data 1, Basic Data 2 and MRP1.
- A second service material can also be created for non-routine work if required. The nomenclature is slightly different from the routine material for identification – in addition to the task list type, group and group counter, the non-routine service material includes the suffix "_NR".

Planning BOM

The PTL Creation and Synchronization programs have a Bill of Material (BOM) creation checkbox. This will create / update a BOM for the service material related to the task list. The materials in the planning BOM are added as components to the planned order (see below) and are therefore visible to MRP.

- For an Executable Task List, all the components assigned to its operations are summed on material and plant. A BOM will be created after summarization of the material quantity, for the service material, task list, task list type, group, and group counter. BOM usage is taken as 1.
- For a Hierarchical Task List, components of all the Executable Task Lists in its hierarchy will be read and summarized to create the BOM for the HTL service material in the same format as described above.
- Only materials assigned to a Material Schema which is configured for inclusion in the planning BOM will be included in the summarization process. Table /AXONXAPP/CU66A is used for this purpose.

Update of Planning Task List

There are two ways a PTL update can be triggered

1. Automatic update of PTL - making changes in executable task-list /HTL and clicking Save will update the PTL (based on an event-driven background job).
2. Update PTL directly via transaction /AXONX/SYNPTL.

The PTL Synchronization Program is intended to ensure that any changes made in the executable task-list /HTL are reflected in the corresponding PTL:

- Re-summarize all man hour requirements from all operations by work center

- Re-calculate the duration of the task List based on any relationships maintained or assuming the operations are sequential
- Check this data against the existing PTL and update if required.

To update a PTL directly from transaction /AXONX/SYNPTL, enter an existing task list (either and executable task-list or an HTL) in the selection screen, select the Routing check box and click on Execute. The PTL will be updated as required and a log is generated, which can be viewed in the Application Log - transaction SLG1.

Creation of Planned Order

To create (capacity load bearing) planned orders based on maintenance notifications, the notification type must be configured for planned order generation (in table /AXONXAPP/CU121) and the notification should contain an executable task-list /HTL with a valid Planning Task List (routing). The notification may have been created directly from transaction IW51 or as call object from a maintenance plan, or as an operative notification from the Maintenance Requirements Workbench.

The process is as follows:

- Select notification type associated with planned order generation as per table /AXONXAPP/CU121.
- Assign the task list to the notification and click on the Save icon.
- The planned order will be automatically created for the notification (based on an event-driven background job). The planned order number is now visible in the notification (along with a planned order for non-routine work if the PTL also has a non-routine routing).
- The planned order van be viewed in transaction MD13. The Detail Scheduling tab in the planned order shows the capacity load against the work center.
- The Components button shows the planned materials from the planning BOM.

Sourcing and Swap (SRC)

Overview

The Sourcing and Swap functionality allows you to search for parts to meet actual or planned demand across multiple conditions, owners, states (in stock, in inspection, in repair, installed) and special stock segments, optionally performing an internal exchange or swap to bring the searched part to the internal demand.

Sourcing is the procedure whereby an open or un-sourced demand is used to search for a suitable replacement part across multiple:

- States such as in stock, in quality inspection, in repair work, on an open purchase order, installed on another assembly.
- Stock types such as unrestricted stock, inspection, blocked.
- Special stock segments such as in plant stock, project stock (Q – including for a WBS or in project stock for a different project), sales order stock (E – including for another sales order) or customer stock (B – including owned by another customer for example in the same rotable pool) or vendor consignment stock (K).
- Conditions such as split valuation types or batches to represent any conditions e.g., new, used, repaired.
- Life remaining standards – as recorded on the equipment record.
- Supply delivery date.
- Remaining batch shelf-life or use-by date.
- Locations – such as storage locations and even SAP plants.
- Other customer defined characteristics as recorded in batch level classification.

Sourcing is like availability check (ATP) and batch determination strategy but more sophisticated, because sourcing can search across so many stocks and not yet in stock segments, types, and conditions.

If the demand is for a quantity higher than one (e.g., a set of similar parts), then sourcing can split the demand into sub-sets according to how many of the complete set come from each respective "source". To avoid changing the order reservation, sourcing stores the results of split demands in a separate table. Sourcing is normally designed for actual demands such as work order reservations but can be optionally carried out for planned demands in the form of planning notifications and planned orders.

Sources can be approved, or unapproved but authorized, or unapproved and not authorized, meaning in business terms that the planner or expeditor of the demand is allowed or is not allowed to "take" the part from the respective source. Unapproved and not authorized sources can trigger a work-flow e-mail and require a special authorization object.

During sourcing users can over-source more parts than the requirement quantity of the demand based on system set up. Further to this, the Installation processes can check if the demand is over-sourced and adjust the sourcing data accordingly

Sourcing is invoked by calling transaction code /AXONX/SRC for a selection of one or more demands. The demands are listed, and the user selects one or more of these demands for sourcing.

Swap or Exchange is the procedure that normally follows sourcing whereby the sourced part is physically and if necessary, logically moved from its current location, or source, to the demand. A logical movement is where the attributes of the source, such as the special stock segment (project, customer, sales order assignment or vendor consignment) is updated but the part does not actually move, and the demand is sourced but remains open. Physical movement is where the part is physically moved, normally required if the store location or plant or other physical attributes of the source is being changed during the swap.

In cases of a physical swap, the exchange can be either cannibalization or swap. Cannibalization brings the source to the demand without returning anything. In a swap, the part which is currently sourced to the demand is replaced by the new source material, and the original part is returned to the source (work order etc.) at the same time as bringing the new source's material to the demand. The swap function can be used by customers to trigger exchange movements between work orders. The exchange process also captures financial and audit information for billing of exchanges.

Sourcing Selection Screen

The selection screen has organization & control inputs and then two tabs:

Demand criteria by end-item

Controls demand selection based on the higher-level work order, induction notification, sales order, planning notification or notification item.

Demand criteria by part

Controls demand selection by reservation or component.

Demand List Screen

The demand list screen displays all demands that have open quantity. It will retrieve details of the demands based on the selection criteria from the sourcing selection screen.

If material schema is active for sourcing, as per the configuration, then only demands for those materials will be shown which are assigned to a sourcing-relevant material schema. Typically, it is not useful to run sourcing for every type of material, and it is therefore important to define and allocate material schemas accordingly.

Source

Highlight a line item on the demand list that you want to source and select the Source button. This invokes the sourcing engine which looks for the "best-fit" supply to meet the selected demand.

The sourcing engine first determines the best rank sourcing strategy, based on the plant and optionally storage location, valuation type, MRP group and stock determination group (on material master) of the demand reservation or part number. Once the sourcing strategy is determined, each sequence or sourcing strategy item is processed in turn, based on the priority if specified, until enough valid supplies have been found to equal the sourcing quantity plus additional supplies based on a quantity factor.

Once sourcing is completed, the sourced supply details such as plant, storage location, batch and serial number are automatically copied to goods issue to work order reservation in MIGO and warns in case of any change in supply details.

Source in Background

When selecting a row and clicking this button, the system will carry out the same process as when the user selects source, but it all works in the background. This means the user cannot change the proposed quantities and the best-fit calculated sources will be automatically updated against the selected demands. This is used in cases where you want to automatically source selected open requirements without further manual intervention.

Unsource

If the user clicks Unsource, all or some of the related sourced supplies for selected demand(s) are deleted. A pop-up window lists all previously sourced supplies and you can select which ones to unsource.

Supply List Screen

This screen is displayed after selecting the source action button and lists all available supplies, depending on how the sourcing strategy sequence(s) is (are) configured, and sorts the supplies according to the configured sort of strategy. Once the subset of supplies has been found, they are sorted within each sort of sequence item according to the configured sort of sequence. This helps the sourcing   proposal to select the most suitable supplies to meet the demand. The supplies listed at the top of   the screen are therefore those meeting the first sort sequence criteria and highest in the sort of priority. These top-most supplies can be automatically proposed as sources until the un-sourced or open demand quantity has been completely sourced.

Interchangeability strategies can be used to determine valid interchangeable parts in the sourcing supply list. A maintenance requirement document configured with usage as 'Maintenance Policy - Generic' or 'Maintenance Policy - TBW' can be used as a pool specification document, which is used to further filter the valid interchangeable parts.

The 'Policy' field in the sourcing strategy configuration can be set based on the options defined in the system and is used to influence the business logic for filtering the interchangeable parts based on the pool specification document.

If the 'Policy' field is set as 'With Contract', then the contract maintained in the induction notification is used to determine the pool specification document reading the contract maintained in '**Quotation and Billing**' tab in the mod document. The 'life remaining' field and its corresponding 'Unit of Measure (UoM)' determined from the pool specification document is displayed in the supply list.

If the policy field is set as 'Without Contract', the pool specification assigned to induction notification is used to determine the interchangeable parts in the mod document.

The sourcing supply list works for just one demand at a time; if the open demand quantity is greater than one, then several sources will be proposed to meet the open demand quantity.

Based on the configuration, The supply list will be restricted by sequentially reading the set of available characteristics maintained in the following objects:
1. Reference object
2. Sales order
3. Contract
4. Policy document which is linked to induction notification.

Once the first set of characteristics the determined the subsequent objects are ignored.

Requesting an Unapproved Source

If you do not have authorization to take a certain supply (unapproved source) highlight the row and click request source to request the source.

Requesting a source triggers an email to a supervisor, who will authorize the source on your behalf. Following this, the supervisor or someone who is approved to access this supply object will need to run the sourcing program and select and save the unapproved source. They will know that they are approved to access the unapproved source because the traffic light will be yellow.

The traffic light status column indicates the status of the source from an approval viewpoint as follows:
- Green traffic lights represent approved sources.
- Yellow traffic lights represent unapproved sources, but the user has the authorization.
- Red traffic lights represent unapproved sources where the user has no authorization.

The pop-up confirmation screen lists up to 10 SAP users who are authorized to take this source. The user can delete some of the user IDs and email addresses, leaving only the users whom the users want to send or copy the email to. To send the email to a supervisor that is not on the list, simply enter his/her user ID and/or email address (if the email address is not maintained in the user master record).

Source and Move Parts (with cannibalization)

To execute a cannibalization, click the Move/Swap part button. Following a confirmation screen to save the sourcing data first, several transactions are executed in the background depending on the status of the source supply.

- The proposed source is saved in the sourcing transaction table.
- If the selected source was a serialized equipment record that was previously installed on another assembly, then depending on the swap strategy in customizing the part is either:
  - Dismantled from the source assembly with structure gap or not.
  - Optionally installed at the demand assembly with goods movement posting or not (physical installation assumed in same step).
- If the selected source was previously installed on another assembly or work in process on another repair or production order component, the selected source part is returned to a logical stock location (defined in customizing). This occurs even in the above case where the selected source will be issued to or installed at the current demand.
- Part is transferred to plant/storage location of the demand (if different to plant/storage location of source). As mentioned above the sourced part can also be automatically issued to the selected demand.
- In cases of a two-way exchange the part previously sourced to the demand is returned to the same logical stock location as mentioned above or even issued back to the work order where the replacement part was taken from.
- For billing and audit tracking purposes a log table is updated with the swap/exchange/sale information.

Once the swap/exchange process has been executed, a message log is displayed with the results of the transfer and any errors or warnings encountered in all the transactions.

Source and Move Parts (without cannibalization)

The user can also update the source part(s), without performing a physical swap, to move or issue the parts to the selected demand. To do this follow the same steps of either accepting the proposed quantity or changing it, then hit Enter and subsequently click Save in the sourcing – supply list screen.

To move or issue the source supply to the selected demand, press Move/Swap part. The user will get

a posting confirmation if the issue was successful.

Special Sourcing Scenarios

Notification-based Sourcing (Advance Material Planning)

The Planning Task List (PTL)/Planning BOM concept has been further enhanced into an Advance Material Planning solution, allowing forward visibility of material demand based on planned maintenance activity. The Advance Material Planning (AMP) solution integrates with the Sourcing function and allows planned material demands to be sourced in advance of the actual maintenance event (i.e., before order reservations are created).

The Sourcing workbench can be used for forward sourcing of such demands and a background job is provided to subsequently synchronize the planned demands and actual demands (i.e., transfer the sourced supplies from the notifications to the work order reservations).

To perform sourcing for a planning notification created for Advance Material Planning, enter the planning notification number in the Sourcing selection screen and execute. Once on the sourcing – demand list, select the line item to be sourced and click the Source button.

The notification-based sourcing workbench can source the demand generated from planning notification and save the sourcing result in the sourcing table. When actual work orders are created and the planned notification is workscoped to the order, the order sync report is used to transfer the sourced supply from the notification-based sourcing record to a standard reservation-based sourcing record (in table */AXONXAPP/RESPLT*).

This can be achieved by executing a batch job *(/AXONSRC/ORDER_SYNC_JOB)* in the background which will be triggered automatically when the planning notification is workscoped.

Alternatively, the order sync report can also be executed directly by using transaction code - */AXONX/ORDER_SYNC*.

Advance Material Planning based on Notification Component

Advanced material planning is the concept of allowing the planner to reserve parts for specific assignment and use. The parts could be reserved for a long period of time without any demand. This makes the parts available in advance to the actual maintenance event. The parts can be reserved for an upcoming event using the sourcing workbench against planning demands. Parts reserved in this way are shown as already sourced in the Sourcing Workbench. The Sourcing Workbench will also consider reserved parts as potential supplies to be sourced to the actual disposition demands, based on the sourcing strategy configuration. The Sourcing Workbench will display the planning demand list from the demand table "/AXONXAPP/PLNDMD". This will allow the sourcing of the planning demands from the sourcing workbench.

Planning demands are created as components in a notification. The components represent the parts that need to be reserved.

The planning notification is enabled to show/maintain the standard SAP notification fields of sales order and contract. These fields are used to ensure the availability of the planning notifications within the event. Setting the values in these fields eliminates the need for packaging the planning notifications into the event, thus ensuring that the planned reserved parts are available for consumption in downstream processes, like Disposition and Sourcing.

The notification header is extended with the component list which will be the list of reserved parts.

The user can select a component and source it through the planning notification. Once the item is sourced the reserved quantity field is updated to show that the item is sourced. These entries are also saved in the sourcing table.

The user can select an already sourced component and unsource it through the planning notification. Once the item is unsourced the reserved quantity field is updated to show that the item is not sourced. These entries are updated in the sourcing table.

Already sourced components are not allowed to be deleted.

If the notification is set as complete or the deletion flag is set, then the sourced planned components are unsourced.

The disposition processes will check for planning notification and check if the disposition is being executed for a reserved part. In such case, the disposition will create a disposition demand as normal, but the reserved part would be taken as the supply and the sourcing data would be updated accordingly.

The sourcing strategy configuration also controls the display of planned/reserved supplies in the supply list.

The sourcing workbench handles the planning demands as follows:

i.   Planned orders can be created from the planning notification itself using Material BOM without need of a planning task list.

ii.   Logical Movements are not triggered for supply parts since the material requirements are planning demands and not actual demands. When the components are sourced to planned demands, later the planned supplies are transferred to the actual demands and the original planned demands (quantity) are consumed.

iii. Transfer reservations are not created for WIP supply parts since the material requirements are planning demands and not actual demands.

iv.   The sourced data is updated in Reservation Split table and the supply stock segment data and exchange strategy "Planning" is updated in the Exchange Replacement Loan Reservation Table. This data is required later at the time of actual demand consumption.

The Order Sync Job can be triggered from the disposition and executes the following process steps:

i.   'Reservation Split' record is created with the reserved part details from the planned component parts.
ii.   'Exchange Replacement Loan Reservation' record supply section is updated with the reserved part details.
iii. 'Exchange Replacement Loan Reservation' record Payback/Original Part section is updated with the disposition part details.

The exchange strategy is updated in the 'Exchange Replacement Loan Reservation' table

Sourcing in Forward Exchange Notification

During sourcing for forward exchange, the exchange strategy is determined based on the requirement category of the requirement type entered.

Requirement Category	Exchange Strategy
Exchange	Exchange (2)
Loan	Exchange (2)
Sale	Sale (1)
Return	Over Source (6)
Blank	Planning (5)

When a contractual lead time commitment is under threat for a specific repair, an exchange may be offered to the customer against the end item being repaired. In this case, the traditional sourcing against a service order reservation is not supported since there is no higher-level demand (i.e., no build order). In such cases, the component item can be entered on the event notification against a requirement type (or some notification belonging to the event) where the replacement part could be sourced and shipped against the related sales order. When sourcing against a notification item with a requirement type that has payback setting configured, a pop-up is presented, and the payback segments of the exchange record would be entered based on the replenishment object selected. If no payback supply is defined, then sourcing is not saved.

Multiple Engine Exchange

Multiple Engine Exchange is a scenario commonly used in an engine overhaul facility, whereby parts from engines earlier in the build sequence are routinely allocated to engines later in the build sequence. This scenario differs from a normal sourcing scenario in that the supply object from the first engine is still in WIP at the time it is sourced to the second engine, and the supply object from the second engine is still in WIP at the time it is sourced to the third engine, and so on. This way, a "chain" of sourcing/exchange transactions is built up. The chain persists until something happens to break the chain – either a supply object is declared serviceable and returned to stock without being onward sourced, or a supply object is scrapped.

The following is an example of a Multiple Engine Exchange scenario for an engine module:

- Unsource the module from Engine 1

- Source replacement module (stock) to engine 1 demand

  Once the source is saved, a logical move document is created (to update the stock segment of the supply to that of the demand), a physical move transfer reservation is created (to move the supply to the location of the demand), a payback transfer reservation is created (to move the original supply part back to the stock segment of the source) and an exchange/sale record is created (to record the open exchange).

- Table*s /AXONXAPP/RESPLT* (Source) and */AXONXAPP/RESEXC* (exchange) will be updated accordingly after saving the source.

- Unsource the module from Engine 2

- Source the engine 1 WIP module (Repair Order) to the engine 2 demand

- Declare engine 1 module serviceable
  When the engine 1 module is declared serviceable, it is simultaneously the 'payback' part of the first exchange, and the "replacement" part of the second exchange, therefore 2 transfer reservations are triggered on declare serviceable:
  1. The payback reservation from the first exchange (to move the module into the stock segment where the replacement module of engine 1 came from) and
  2. The replacement reservation from the second exchange (to move the module into the

stock segment of the engine 2 demand).

The first exchange (on engine 1) is complete at this point (both replacement and payback have occurred). The replacement side of the second exchange (on engine 2) is complete, but the engine 2 exchange is still "open" since no payback has yet occurred.

- Declare engine 2 module serviceable

When the engine 2 module is declared serviceable, it is the payback part of the second exchange (note: in this example, it has not been onward sourced to a third engine, so the chain ends with the second exchange). Only the payback reservation of the engine 2 exchange is executed, and the engine 2 module is paid back into the engine 1 stock segment where the replacement module for engine 2 came from. This completes the second exchange.

When the exchange chain extends to more than two engines then all the links in such a chain are grouped into one single exchange group and the payback processing for the group is adjusted and executed considering the whole group rather than one single exchange. The Exchange group records are stored in table /AXONXAPP/RESGRP.

During unsourcing for a Multiple Engine Exchange scenario, the chains are updated as follows:

- If the first exchange in the Multiple Engine Exchange chain is unsourced then the payback of the whole chain is updated from the second link in the chain.

- If the last exchange in the Multiple Engine Exchange chain is unsourced then the second last exchange becomes the last chain in the link and the payback object is updated in the second last exchange record.

- If any middle exchange in a Multiple Engine Exchange is unsourced, the chain is decoupled at the exchange being unsourced.

Order Split/Scrap at Vendor

In cases where a WIP supply (repair order) for a quantity more than one is split, a new order is created for the split quantity, and the corresponding sourcing record in table /AXONXAPP/RESPLT is also split.

This would occur for example in the subcontracting process where the subcontract vendor is not able to deliver the entire quantity at the same time, or a partial quantity needs to be scrapped, then the repair order would first be split. If the parts being repaired are also involved in an exchange, i.e., they are due to be paid back to a different stock segment, then the exchange record is also split, so that each sub-quantity of the source (replenishment element) can be handled separately.

Hot Pick

Hot Pick functionality displays the sourcing data during Goods Receipt (GR) for a component. If a component is sourced to a demand and GR is being executed for the component, an information message is displayed which contains the details of the demand.

Sourcing based on Target Build Standard

In cases where modifications created through the Maintenance Requirement Workbench (MBX) are used to influence the final demand part number, Sourcing can be configured to consider this target build standard when searching for suitable supplies. Details of the post-mod part numbers are maintained in MBX MPL Nodes tab.

There may be other part numbers on the same MPL node that would normally be regarded as valid

MPL alternates, but if a specific mod has been workscoped, then only the post-mod part numbers of that mod are valid, and therefore proposed as suitable supplies in the Sourcing Workbench.

Task List Elimination and Sequencing (TES)

Overview

The Task List Elimination and Sequencing (TES) solution is designed to eliminate duplicate tasks in work orders which involve complex and multi-tiered work (e.g., multiple/hierarchical task lists). There are instances where a work operation may be duplicated during the packaging process because it exists in more than one task list that is in that package. This solution allows for such an operation to be eliminated and/or sequenced/prioritized appropriately.

In summary, the TES Solution provides the following:

- A maintenance screen (accessible from task list create and maintenance transactions; IA05, IA06 and IA07) for maintenance of elimination and sequence IDs at task list operation level.
- Enhancements on standard SAP work order maintenance/creation transaction (IW31 and IW32) for maintenance of elimination and sequence IDs at work order operation level.
- Work elimination considering the elimination IDs and sequences on PM work order generation/maintenance.
- TES is triggered in the standard SAP Maintenance Event Builder (WPS1) work order generation function, after the standard task list explosion logic.
- Operation sequencing based on customizable sequence block IDs.

Elimination of Operations

Maintain Elimination/Sequence IDs on Task List

Elimination and Sequence IDs drive the TES solution's definition of redundant work and its priority in relation to work that is similar. Elimination and Sequence IDs are maintained on SAP's standard task list maintenance transactions (IA05 - Create General Task List and IA06 – Change General Task List) once an executable task list has been created.

In transaction IA05 or IA06, clicking on the maintain elimination/sequencing ID button will bring the user the maintenance screen for elimination and sequence IDs for the task list operations.

Here, the engineer will maintain the elimination IDs for the various task list operations deemed to be redundant by other operations in other task lists with the same elimination ID. The sequence ID determines the priority of the operation over other operations maintained with the same elimination ID. The higher the sequence ID, the higher its priority.

Maintain Elimination/Sequence IDs on PM Orders

A work order generated off a task list with elimination and sequence IDs maintained will have its operations adopt the elimination and sequence IDs from the task list that generated it. These elimination and sequence IDs can be further changed and modified on the PM order operation level, if necessary.

The order operation's elimination and sequence IDs can be found on the enhancement tab.

In the event a work order has existing operations with elimination ID but with blank sequence ID and a task list which has an operation with same elimination ID and blank sequence ID, the existing operation in the work order will prevail.

Adding a Task List in PM Order Maintenance Screen

Adding a task list while in the change PM order transaction will result in elimination between operations on the order and operations on the task list being added. The result of the elimination will be displayed on the screen during edit time, for the user to further modify as appropriate.

When adding task lists to an unreleased order, if there are existing operations on the order, a popup will appear prompting if operations should be replaced by the ones from the task list, or if they should be added. Select as appropriate.

After adding the task list, the user makes further modifications to the order operations, elimination/sequence IDs before saving.

Adding a Task List to a Confirmed/Partially Confirmed PM Order

Order operations that have already been confirmed or are partially confirmed are exempt from elimination. This is because actual work done on the shop floor needs to be tracked (cancellation of confirmations does not change the fact that work was already done). Other aspects of work, such as materials/tools/parts, used to complete the operation will also have been consumed. These will directly affect the total cost of the work. For these reasons, TES will not cancel confirmations or eliminate confirmed operations.

Hence, when adding a task list to an order with a confirmed operation, the TES solution will prompt for a user decision when a task list operation to be added tries to eliminate the confirmed/partially confirmed operation already on the order.

When a task list operation tries to eliminate a confirmed operation on the order, a popup will appear with 2 options for each confirmed operation:

1. Do not add – The eliminating task list operation will not be added.
2. Add duplicate – The eliminating task list operation will be added to the order. This operation is a duplicate (considering it shares the same Elimination ID with the operation it tries to eliminate).

The results of the user decision will be reflected on screen, for change/modification as needed.

Variant Configuration in Task Lists

Task list operations can be tied to a certain variant configuration, in which only operations from the task list relevant to the technical object on the PM order will be added.

The TES solution sits on top of this initial variant configuration operation elimination, considering only the operations that are relevant to the technical object, for elimination.

Task List Elimination in Maintenance Event Builder (MEB)

Operation elimination will also work when generating orders for a work package (revision) from SAP's Maintenance Event Builder (transaction WPS1). All notifications with task lists packaged under the revision will have a work order generated (if it has not already been generated), with duplicate work being eliminated across notification orders.

Orders already generated within the revision will not be considered for elimination.

It is important to note that, in MEB, all standard task list explosion logic will be carried out first before the TES component is triggered.

For MEB, if operations in two different task lists have the same elimination ID, but with blank sequence value (initial), the first operation, whichever it is in the internal table, will prevail (the system will take into consideration alphanumeric task list groups when performing the elimination).

Sequencing of Operations

The Sequence Block ID in the task list header/work order enhancement tab is used to assign operations to a defined operation number range associated with each sequence block ID. For example, in the case of a component dismantle order, typically the operations associated with accessing the component to be dismantled ("remove bolts", "open panel") would be sequenced before the operations associated with the actual dismantling of the component. These operations may come from different task lists, added to the same work order, and the sequence block IDs in each task list would determine the number range, or sequence block, that each operation is assigned to when it is copied into the work order.

Sequencing Strategy

There are two sequencing strategies for operation sequencing in the work order, namely

1. Sequencing Strategy using Sequence Block ID
2. Sequencing Strategy using Master Task List

The sequencing strategy for a work order is determined based on the order type in the order type customizing.

Operation Sequencing based on Sequence Block ID

A work order generated off an executable task list with Sequence Block IDs maintained will have its operations adopt the sequence block ID from the task list that generated it. Based on the operation number range of the sequence block ID, and the maximum operation number in the order with the same sequence block ID, the new operation number is determined and appended to the last operation number with the same sequence block ID, if present in the work order.

If there is no operation in the work order with the same sequence block ID, then the first operation number within the number range of the sequence block ID would be determined and added to the work order. These sequence block IDs cannot be further changed or modified at the work order operation level unless operations are re-numbered manually.

Operation Sequencing based on Master Task List

A work order generated off an executable task list linked to a Master Task List (MTL) will have its operation number adopted from the MTL. This would ensure that the correct operation sequence is maintained in the work order, provided the operation sequences are correctly maintained in the MTL.

Task List Workbench (TBX)

Overview

The Task List Workbench (TBX) is a solution built to facilitate the definition and maintenance of component repair task lists. A task list contains sequenced instructions of work that need to be performed on a component.

Task List Workbench helps users to create a 'General Task List' and 'Hierarchical Task List'. The Task List Workbench can be called directly from the TBX transaction itself (Task List Workbench) or via navigation from MBX (Maintenance Requirement Workbench).

TBX helps the user to further classify the task list, using 'MRO Task List type' which is a mandatory field to be maintained for each task list during creation1 from MBX or TBX workbench.

Hierarchical Task List types:

- MRO Hierarchical Task List (HTL),
- Master Task List (MTL) and
- Requirement Task List (RTL).

General Task List (non-hierarchical)

types:

- MRO General Task List (GTL)
- Classical Task List (CTL)

In a component repair task list, each reusable operation is created only once as a classical task list (CTL) with a single operation. A single 'Master Task List' (MTL) for a part number, or family of part numbers, is a hierarchical task list containing all possible operations (CTLs) that can be performed on those parts. TBX creates an individual 'Requirement Task List' (RTL) for each specific maintenance requirement, containing only the required operations (CTLs) from the corresponding master task list, correctly sequenced and with duplicates eliminated based on the 'Sequence Block IDs' and 'Elimination Keys' in the MTL. The CTL cannot be directly created either in TBX or by navigating through MBX workbench, but can be created in TBX indirectly, while the user creates the executable task list below a master task list (MTL).

The hierarchical approach brings the added benefit that any changes to the operations in the MTL are automatically reflected wherever that operation is used in RTLs.

The MRO Hierarchical Task List (HTL) provides usability enhancements and works in a similar way to SAP's hierarchical task list. The reusable GTLs assigned to the HTL can have multiple operations.

The MRO General Task List (GTL) provides usability enhancement and works in a way like SAP's general task list.

A detailed explanation of each MRO task list is provided in a later section of this document.

Initial Screen

The default screen contains the following options:

1. Create – User can create a new GTL or HTL
2. Change – User can modify existing task lists in system.
3. Display – User can display the task list

Create Task List

In transaction /AXONX/TBX, user needs to maintain the following details in the selection screen of TBX.

- Task list type as 'A' (General Maintenance Task List)
  MRO task list type as GTL or HTL whichever is relevant. User can only create task list types 'GTL' and 'HTL' directly from TBX screen.
  Pop up message is displayed after user takes create action asking below information
  Input fields from the user:
    1. Planning plant
    2. Planner group
    3. Task list Status

Once the user clicks on continue, a pop-up message is shown as in the figure below. Click 'Yes' to navigate to the TBX main screen. This will navigate to the task list workbench main screen.

Change or display Task list

This button is applicable for all the task list types. The user can enter a task list group/counter or select task list using the search help to display or modify it.

In case of MTL, if there is more than one MTL for the part number, then a pop up is presented to allow the user to select the relevant 'Master Task List'. If there are multiple MTLs linked with the RTL or if there are multiple MTLs with the same part number as in the MTL which is input in the selection screen, then a pop up is displayed to allow the user to select the relevant master task list.

Click the relevant button the main screen appears.

Task List Workbench Main Screen

Within the task list workbench interface, there are standard SAP PM technical components. There are   three distinct navigation areas.

- Primary Area
- Secondary Area
- Main Work Area

Primary Area (Upper Left)

The primary area consists of following:

- Primary Pane
- Primary Pane Toolbar

Primary Pane

- This displays the current task list on which the user is working.
- This will show operation and sub operation details from the task list.
- Ability to select task list by double clicking on the group number. The details can be

seen in the main work area.

- In case of MTL scenario, it will show linked RTL for the MTL in the primary area.

Primary Pane Toolbar

The following table shows the buttons which are enabled for each MRO task list type in the primary pane toolbar. Since CTL and MTL are displayed in the secondary area only, the primary toolbar buttons are not applicable for MRO task list type 'CTL' and 'MTL'.

Button No	Description	Enabling Buttons for Task list				
		GTL	HTL	CTL	MTL	RTL
1	Create HTL or GTL		✓	NA	NA	
2	Change Operation	✓		NA	NA	
3	Copy Task List	✓	✓	NA	NA	
4	Change Task List	✓	✓	NA	NA	✓
5	Remove Task List from Hierarchy		✓	NA	NA	✓
6	Find	✓	✓	NA	NA	✓
7	Select Layout	✓	✓	NA	NA	✓

Create HTL or GTL button

The button is used to create a new HTL or GTL under the parent HTL and is applicable only for HTL. This creates the task list hierarchy. Once the HTL is created, the user can create a new GTL under the selected HTL.

Change Task list

This button is useful in updating or changing header level data of an existing task list.

Depending on the configuration maintained, the tabs are displayed in the top screen main area of the TBX screen. These tabs (explained in main work area section) are:

- Task List Header tab
- Configuration profile
- Dependency editor
- Classification

Change Operation Button

Once the user clicks on the change operation button, the bottom right area becomes active, and the top part of the main work area is grayed out. This button allows you to modify operation level data

Copy Task List Button

The user can use this functionality to make a copy of an existing task list with a new group number, and later modify the newly created task list. Copy functionality can create a configuration profile for the newly created task list automatically which is not possible in standard task list copy. This simplifies the task list creation process.

Once the user clicks on the button 'Copy' for a GTL/HTL, this will create a new GTL/HTL will all the data from the existing GTL/HTL.

This functionality saves time and reduces errors while creating a new task list.

Select Layout

Select 'Select Layout' to select, change, save and manage layout.

Secondary Area (Lower Left)

The secondary area consists of following:

- Secondary pane
- Secondary pane toolbar

Secondary *Pane*

- Displays the master task list for the part numbers.
- Review the task list before adding or copying it.
- User can display an existing CTL in the MTL by double clicking on a CTL.
- User can create a CTL and assign it to MTL.
- User can select a CTL and add it to RTL in the primary area.

Secondary *Pane Toolbar*

The secondary pane toolbar consists of the following buttons as mentioned in the below table:

Button No	Description	Icon	Enabling Buttons for Task list				
			GTL	HTL	CTL	MTL	RTL
1	Change Master Task List	✏️	NA	NA	NA	✓	NA
2	Create Operation	📄	NA	NA	✓	NA	NA
3	Copy Operation	🗐	NA	NA	✓	NA	NA
4	Change Operation	✔️	NA	NA	✓	NA	NA
5	Where Used List		NA	NA	✓	✓	NA
6	Find	🔍	NA	NA	✓	✓	NA
7	Find Next		NA	NA	✓	✓	NA
8	Add to Required Task List		NA	NA	✓	NA	NA
9	Select Layout		NA	NA	✓	✓	NA
10	Folder Option	📁	✓	✓	NA	NA	NA

This toolbar will change dynamically based on the task list type selection in initial screen.

Change Master Task List

'Change Master Task List' is used to change the master task list header details. The header details can be edited in the main screen area. However, 'Document' and 'Material' fields are grayed out i.e., non-editable.

Create Operation

Select 'Create Operation' to create an operation. It will not allow the user to create multiple operations. However, the user can add multiple sub operations under a single main operation.

Copy Operation

'Copy Operation' copies an existing operation. This will create a new copy of an existing CTL with a new group number and group counter.

Change Operation

'Change Operation' allows the user to change an existing CTL- header and operation details.

Add to Requirement Task List

'Add to Req. Task List' allows the user to add the operations from MTL into RTL. Select the requirement task list in change mode followed by selecting the CTL from the MTL hierarchy. Click on 'Add to Req. Task List' button to add CTL to RTL.

Where-Used-List

The user selects CTL from MTL hierarchy to display CTLs in where-used list of MTLs.

Find / Find Next

'Find' and 'Find Next' buttons are used to find the CTL in the MTL hierarchy and highlight it.

Select Layout

Choose 'Select Layout' to select, change, save and manage layout.

Folder Option

The purpose of this functionality is to enable the user to review the task list or operations before adding it to a task list. This functionality helps the user to add an existing GTL/HTL to another HTL. The folder button is available in the secondary area. While using the folder option, the user can use the main work area to review the existing task list before adding it to the task list in the primary area.

Main Work Area

The Main work area supports the following functions:

- The task lists header tab description will change dynamically depending on selections in the two left areas (Primary and Secondary).
- The header area (top part of the screen) displays task list header details.
- The lower part of the screen displays task list operation details.
- The tabs in the top and bottom screens are configurable.
- The description on the task list header tab will be changed dynamically based on the user selection   in the primary or secondary area.
- The 'Task List Header' tab from the top area and 'Operations' tab from the bottom area of the   main work area are mandatory tabs.

There is a button to display or hide the hierarchy. Clicking on the 'Close Hierarchy' button will close the primary and secondary screen areas such that the whole screen is available to the main screen area (affecting left navigation panes).

The main screen area is divided into two parts:

- Top screen
- Bottom screen

Main Work Area Top Screen

The following tabs are available in the top screen of the main work area:

- Master Task list/Requirement Task list/Hierarchical Task list/General Task list. This tab depends on the type of selected task list.

- Configuration profile
- Dependency editor
- Classification

Task List Header Tab

In this tab, the user can update header data of the existing task list. Task list header tab description changes based on the type of task list in use.

Configuration Profile Tab

This tab is used to make the task list configurable. On selecting this tab, click on 'Create Config. Profile' button which navigates to *CU41* screen where the user can create a profile and add a variant class to it.

Click on the 'Class Assignments' button to assign a 'Class' to the task list.

Dependency Editor

This tab is only relevant for hierarchical task lists.

This tab allows object dependencies to be added at header level in a hierarchical task list. The assignment of dependencies is based on the class assigned in the configuration profile.

Classification Tab

The classification tab is used to assign classes to the task list.

Main Work Area bottom screen

The following tabs are available in the bottom screen of the main work area:

- Operations
- External
- Operation Text
- Component
- PRT
- Document
- User Data
- Inspection Characteristics
- Object Dependencies

This area is activated or available for change when user clicks on the "Change Operation" button.

Operations Tab

TBX supports single operation and multiple sub operation for each CTL. The 'Operations' tab is used to describe the individual maintenance tasks to be performed. The operations include the time, the work center, and other controlling information for an individual maintenance task. The operation holds the following information:

- Details of the capacity requirement.
- Indication of whether a task is performed by the company's own staff (internal processing). or by the staff of another company (external processing).
- Status of the operations.
- Specification of required spare parts and utilities (such as special tools).
- Data for sequencing and elimination of operations.

The user can also use the 'Add/Delete' buttons to add a new operation or delete an existing operation from the list.

Add button has two functions:

1. If the user selects an operation and clicks on this button, this will create a sub-operation.
2. If the user does not select any operation, and clicks on the insert button, it will create a new   main operation.

This way the user can continue creating operations and sub-operations as required.

'Add Task List' button is available in the right side (lower right corner screen) to add an existing CTL directly from the task list selection screen to the MTL hierarchy.

Operation Text
The tab displays the long text for the selected operation in the 'Operations' tab.

Component Tab
The component tab is used to assign material components to the selected operation from the 'Operations' tab.

There are 'Add/Delete' buttons available in the component tab. These allow new components to be   added or deleted to/from a task list operation.

PRT
The PRT (Production Resource Tools) tab is used to assign PRTs to the selected operation on the 'Operations' tab. PRT's can be

- Equipment PRT
- Material PRT
- Document PRT

Various buttons available in PRT tabs are:

- Material
- Equipment
- Document
- Others

Based on the PRT type, the user can assign PRTs to the task list operation as required by choosing   them from the available buttons.

The 'Delete' button will remove a PRT assigned to a task list operation.

MIC
This tab is used to assign "Master Inspection Characteristic' (MIC) to the selected operation on the 'Operations' tab.

MICs and dependencies can be assigned only to one operation at a time. Select an operation, assign inspection characteristics or dependency, and save.

Like other tabs, there are 'Add/Delete' buttons available for the 'Inspection Characteristic' tab. These add or delete MICs to/from a task list operation.

Dependency Tab
The 'Dependency' tab is used to assign 'Global' or 'Local' dependencies to an operation. The user can

SAP Enterprise Asset Management, add-on for
                                                                                          MRO 8.0 by HCL for SAP S/4HANA 2022

click on the 'Editor' radio button to create a Local dependency. This can be used only if there is no prior dependency assigned to an operation.

The 'Assignment' radio button can be used to assign or create a 'Global' dependency. If the dependency added already exists in the system, then the system will assign the same dependency to the operation, else it will ask the user to create a new dependency.

The 'Basic Data/Dependency Editor' button is available for to view the master data of an assigned dependency. The 'Assign/Create Dependency' button is used to assign or create an existing global dependency to the task List operation. The 'syntax check' button is used to verify the syntax of code written in the editor of a dependency.

Standard transaction *CU01* is used to create the dependency. To assign a dependency to an operation, it is mandatory to save an operation. If the user tries to assign a dependency to an unsaved operation, the system issues an error message.

Object Navigation within Primary and Secondary Navigation Area

If the user selects an object in the primary and secondary navigation area hierarchy, then based on the object selected, the task list work bench will fetch the details into the main work area (right screen area).

Object in Hierarchy	Navigation Area	Resulting Action (On Double Click)
GTL	Primary Area	Display GTL Header Details in the top-half and all the operations details are displayed in the lower-half
HTL	Primary Area	Display HTL Header Details in the top-half and all the operations details from all the GTLs assigned to the HTL are displayed in the lower-half
RTL	Primary Area	Display RTL Header Details in the top-half and all the operations details from all the CTLs assigned to the RTL are displayed in the lower-half
CTL	Secondary Area	Display CTL Header Details in the top-half and single operation details are displayed in the lower-half
MTL	Secondary Area	Display MTL Header Details in the top-half and all the assigned CTL operations details are displayed in the lower-half

Area	Button No.	Description	Main Work Area
Primary Area	1	Create HTL or GTL	Maintain Header Level Details in Top Right area and Operation Details in Bottom Right Area
	2	Change Operation	Maintain Operation Details in Bottom Right Area
	3	Copy Task List	Maintain Header Level Details in Top Right Area
Secondary Area	1	Change Master Task List	Maintain Header Level Details in Top Right Area
	2	Create Operation	Maintain Header Level Details in Top Right area and Operation Details in Bottom Right Area
	3	Copy Operation	Maintain Header Level Details in Top Right area and Operation Details in Bottom Right Area

4	Change Operation	Maintain Header Level Details in Top Right area and Operation Details in Bottom Right Area
5	Where Used List	NA
6	Find	NA
7	Find Next	NA
8	Add to Required Task List	NA

Supported MRO Task Lists Types

Only general task list and hierarchical task list can be created directly from the TBX workbench. For creating a master task list or requirement task list, the user needs to create it from MBX and navigate to TBX to update or make changes in the task list.

MRO Hierarchical Task List

Maintenance work of complex technical objects includes many tasks and operations that are structured hierarchically. With hierarchical task list maintenance, the task list has been enhanced to be able to reference other task lists, thereby building a hierarchy of task lists. In this way, the structure of work to be performed is reflected as a task list hierarchy. The user can create HTL from MBX or directly from TBX.
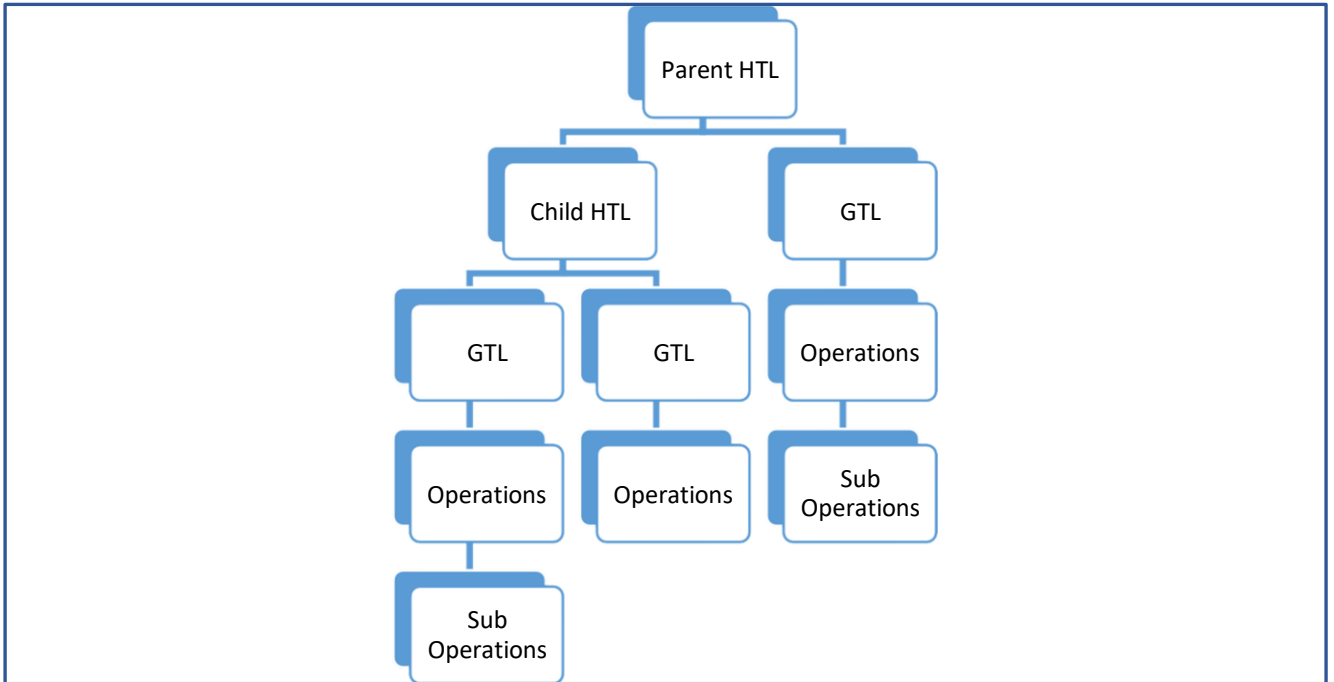
MRO General Task List

The general task list contains all possible operations that need to be performed for a job. This is like the general task list created using T-Code 'IA05'. General task list is further classified using MRO task list type using the TBX Workbench. The user can create GTL from MBX or directly from TBX.
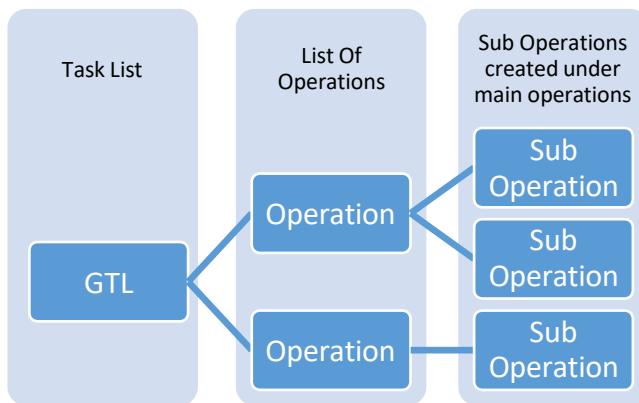
Master Task List

The master task list contains all possible operations that can be performed on the part. The master task list should be created as a hierarchical task list in SAP. The top of the hierarchy should be linked to the part number or part numbers. This can be achieved by entering the relevant material number(s) in the header of the MTL.

The following figure further explains the Master Task List structuring:
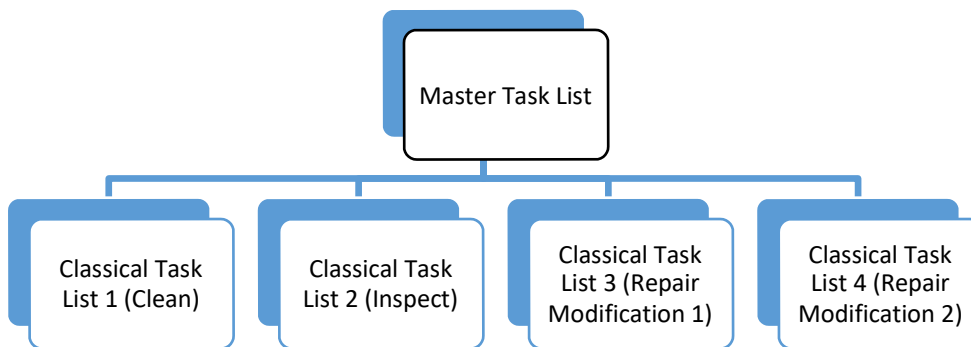
Requirement Task List

The requirement task list is a task list specific to an individual maintenance requirement and contains a subset of the operations available in the master task list. Each operation in the MTL is created as a separate CTL which is reusable across work requirements. The RTL is created as a hierarchical task list and adopts the CTLs from the respective MTL.
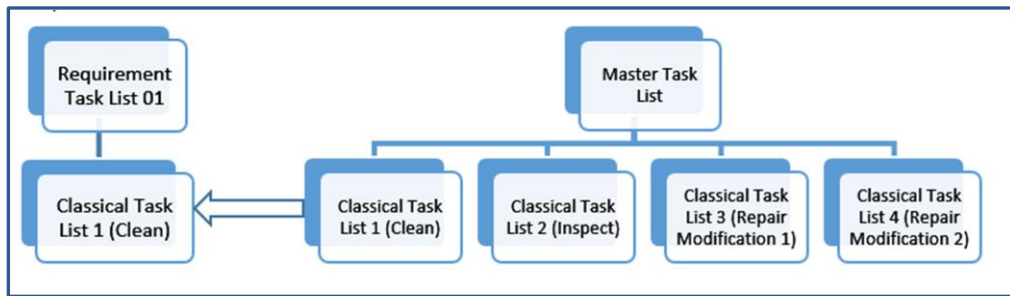
Classical Task List

Classical Task List is a task list which has MRO task list type blank. CTL is the general maintenance task list with only one operation and is created under MTL in TBX.

Integration Points

The Task List Workbench is tightly integrated with the surrounding functions, specifically the Maintenance Requirement Workbench (MBX), Workscoping Workbench (WBX), and Inspection Workbench (IBX).

Maintenance Requirement Workbench (MBX)

In MBX, dependent on the customizing of the document type, the task list workbench replaces the standard task list maintenance facility in the MBX mod tasks tab.

Within MBX, it is possible to call up the task list workbench directly from within a maintenance requirement (Engineering Order).

The relationship between the Requirements Task List (RTL) and the Master Task List (MTL) depends on a relational link between material masters maintained against the master task list and the material master maintained as material object links and material effectivity in the MBX document to which the corresponding RTL is assigned.

For further details on creation of MTL and RTL from MBX, please refer to the Maintenance Requirement Workbench section.

Workscoping Workbench (WBX) and Inspection Workbench (IBX)

In WBX and IBX workscoping, when RTLs created in TBX are added to repair orders, the operation sequencing and elimination logic is triggered based on the sequence block IDs and elimination keys that were copied into the RTL from the MTL.

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

Technical Document (TDOC)

Overview

Airline Engineering and Aircraft Maintenance, Repair and Overhaul (MRO) shops constantly work to improve critical maintenance processes, including inventory and the provisioning of parts, configuration management and compliance, and maintenance planning and execution. The information necessary to optimize each of these critical activities is typically available but not readily accessible. The Technical Document (TDOC) solution supports the integration of a 3rd party Technical Publication System and is intended to help maintenance technicians use the available information more effectively. The supported functions are:

- Content search from SAP into the Technical Publication System.
- Parts ordering directly from the Technical Publication System.
- Creation/update of document Info Record (DIR) (e.g., AMM) based on updates received in the 3rd party Technical Publication System.
- Viewing documents in the Technical Publication System.
- Generation of Job cards including information from the Technical Publication System based on selected orders or revisions in SAP.

The TDOC solution can be integrated with any 3rd Party Technical Publication System (TPS) using generic interface protocols.

OEM Content Search

When performing several MRO business functions from within SAP it is often necessary to search for information from within the OEM documentation. By integrating the two systems, a user can streamline the process and have the results of a search on the OEM manual returned directly to SAP for further processing.

This enhancement is intended to facilitate the process of finding the correct part number(s) by introducing an additional search help for the material number field in SAP. It can therefore be initiated anywhere in the system where there is a need to search on the material number field and will initiate a call to the 3rd party Technical Publication System (TPS) to find and return the correct part number to SAP for further processing.

OEM Content Search from IE01/IE02

The search can be executed from transaction IE01/IE02. On executing the search in SAP, it will open the search portal of TPS. TDOC provides an interface to send the result back to SAP from the external TPS system.

OEM Content Search from IW31/IW32

Upon entering the required data and execution of the transaction, the user will need to navigate to the components tab and perform a material search. In the search help choose IPC part search. The user is required to maintain the data and select the tick icon. The system will launch the TPS search portal screen, where you will be able to choose the required material based on your specification. The data is then populated back into the system.

Parts Ordering

This feature is used by the technician working in the Technical Publication System. The technician can order parts in SAP for an existing defect or create a new defect and order parts using this feature. This enhancement will allow users to run a transaction or launch a URL in SAP which will enable them to

select or create a defect PM order. Using this PM order, the user will be able to demand parts. Upon saving, a material reservation will be created for the part numbers entered on the screen which will allow goods issues of stock to the PM order. Parts can be entered in SAP Web Dynpro screen or the user can send the parts as a URL parameter while calling the Web Dynpro application.

Any third party TPS can use the part ordering application to create a defect in SAP. Parts added in the part ordering material list will be added into the order based on either a new defect or existing defect.

New defect
Enter all required fields and press enter. This will create a new defect notification and order.

Existing Defect
Choose the option existing defect to create defect order. Enter either notification or order number to update the part into the defect order.

Document Upload
This component is used to perform updates in SAP whenever an aircraft maintenance manual, engine manual or IPC is updated in the Technical Publication System. The Technical Publication System creates an input for SAP that holds the relevant information for creating or updating DIRs in the SAP system.

XML data files are present at a secured file location specified in the configuration in SAP. An upload program extracts the relevant data based on XML mappings and transformation rules and transfers it to a staging table. Based on the value(s) entered in the selection screen of the document upload transaction (/AXONX/EDM), data will be fetched from the staging table (/AXONTDOC/STAGE) and displayed in an ALV tree format.

A background job for upload will read the work list database table and the file stored at the shared location (maintained in configuration) will be read. The share point location can be any FTP server or application server. XML data will be converted and stored in a staging table (/AXONTDOC/STAGE). This data can be processed manually using the upload transaction (/AXONX/EDM).

Create DIR
Execute transaction code /AXONX/EDM for creating DIR with reference to the TPS ID.

Based on each TPS reference (according to the selection parameters), DIR records will be fetched from the SAP database. If the TPS reference is not present in the DIR data records or the status in the staging table is "N", then it is flagged for creation only, no other action is permitted until a new record is created.

While creating a new DIR, based on the default version maintained in V_TDWA_1 for the document type, the DIR version is created. Once the new record has been created in the SAP database, the respective staging table entry is deleted.

When a new document is being created, based on the DIR levels maintained in /AXONTDOC/CU01H and characteristics that are maintained in the table /AXONTDOC/CU01P as per the hierarchy requirement, it will be linked automatically to the document matching the parent characteristics.

Version Management
A new version of the document can be created if the create button is clicked selecting the reference ID for which the initial version of the document is already created. This depends on the configuration to allow the new version creation for a document type in electronic document maintenance.

Display DIR Object

In the display original column, the user can check for the latest (new) or original manual version of the selected DIR in the TPS database (In-Service MRO Viewer) through a BSP (web based) application URL link created in SAP. When opening the URL link, users can see the content of the document.

Change/Modify/Delete DIRs

With each action button, the user has the flexibility to perform the corresponding task(s) and update the SAP database accordingly. The user can perform all the required actions on a DIR record (change/modify/delete).

The user can update DIR data as required by entering change mode and henceforth any other updates to the linked objects also must be done manually. After any update, if the refresh function is invoked then the updated data is displayed on the ALV grid.

A framework is available in technical document maintenance transaction (/AXONX/EDM) to configure action buttons on the application tool bar.

Create Task List

Create Task List has an option to create a new task list. The program triggers standard transaction IA05 in the foreground, defaulting the change number on the first screen. The user then decides what to enter in the subsequent screens. After saving the task list subsequently, the new task list number is created and linked to the DIR record via an object link and displayed in the screen under the task list heading after clicking the refresh button.

Create Object, DIR(s)

To create a new DIR, select the DIR(s) button and click on the create icon to create the next version of the existing DIR record. It will copy all the data of the old version into the new version except the DIR version value, which will be updated to the next incremental value. Once the new version is created, the ALV will display the newer version by clicking on the refresh icon and link it with the existing reference document number.

Assign or Change Object

- **IPPE Node(s)**: By pressing the assign or change icon, the user has the option to change or add to the IPPE node(s) of the existing document number.
- **DIR(s)**: By pressing the assign or change icon, the user has the option to change or add any document to the existing document number.
- **Functional Locations**: By pressing the assign or change icon, the user has the option to change or add functional locations to the existing document number.
- **Equipment**: By pressing the assign or change icon, the user has the option to change or add equipment to the existing document number.

PRT Order and PRT Task List

PRT order and PRT task list cannot be created or changed from the /AXONX/EDM transaction. Both PRT order and PRT task list will be updated in the system when a work order is created and a PRT is assigned as a document.

Mass Objects Assignment

It is possible to mass assign task lists, equipment, materials, notifications, networks, WBS, IPPE nodes, to a DIR. Select the source ID and assign the required objects like material, equipment, functional location etc.

View Document

Providing access to the OEM manual content is a key part of the maintenance process and by creating this link from within the SAP work order, the overall process is faster and greatly simplified. As companies move towards fully electronic workplaces and digital signature it is increasingly important to provide all the information the mechanic requires within or from one single mechanic portal.

The DIR in SAP can be linked to many different objects relevant to the MRO process and provides the ability to link to external URLs. These links can then be viewed from within SAP.

When viewing a document from SAP, effectivity information will be sent along with the document URL. View document can be initiated from EWI, from a work order or directly within an SAP DIR. In case the document is opened from the EWI or order screen, effectivity is determined from the order. While opening the actual document in TPS effectivity information can be sent to TPS.

Display Document

Execute the transaction /AXONX/EDM and enter selection criteria. Select the document and click on display object. Double click on the URL-Internet link to display the PDF document.

Job Card Printing

This application is used to print the job card from the content management server. The user selects the orders for which he wants the job card to be printed. After selecting the orders and giving the print command (clicking on the print button in the output screen) the actual process to collect the data for the job card will be started. This data for each work order selected is segregated and an XML file for each work order is generated and copied into the local machine. This XML file is sent to the external server at the third-party service end. A web service is called at the third-party service end with the XML file path, username, and any other parameters as per the web service configured at the TPS end. The web service at the TPS end processes the XML file and generates a document for the file name given in the input for the web service. The document generated by the web service is placed in the shared FTP server.

Carrying out Job Card Printing

Execute the transaction /AXONX/WOPR and enter selection criteria. Selection criteria are work order selection or work package selection. Enter the order selection criteria and execute. A screen will be displayed based on the selection layout. Select single or multiple orders and print. When the print button is pressed, SAP will generate an XML file and send it to the TPS server.

Generated job cards will get automatically sent to the printer in the order specified by SAP and sent to TPS. The report can be run either in background or foreground.

Print Management

TPS will send the appropriate settings to the print manager to ensure it gets printed to the correct paper/layout etc. (tray, paper color etc.). These flags will be based on the flags sent to TPS in the work package request.

APIs Delivered

API Name	Functionality Description
/AXONTDOC/XML2STAGING_UPLOAD	This API uses interface loads XML data into staging table for later creation of Maintenance requirement documents.

Tooling Workbench (TLM)

Overview

The Tooling Workbench enables the management of tools as inventory, and therefore makes available the full range of SAP Inventory Management and Planning functions with respect to tools. Tools are issued and returned against maintenance orders and are essential for carrying out maintenance activities as well as for dismantling and assembly processes. The Tooling Workbench has its own tooling goods issue/return function as well as reporting.

The tooling functionality is executed from the tooling goods issue/return function. In addition, tooling has its own reporting.

Certain functions of tooling are integrated into other workbenches such as the Inspection Workbench (IBX) and Electronic Work Instructions (EWI). For example, during completion of a maintenance order, directly or during any disposition which leads to completion of the order, if any tools are outstanding (issued but not yet returned) against the order, then the order completion can be disallowed until the tools are returned.

Tool Issue

Tools are issued and returned against maintenance/service orders. Maintenance/Service orders are created in various scenarios, such as component induction, build orders for complex asset overhaul, repair orders created during dispositions, etc. Depending on the configuration, tools can be issued and returned against any of these orders.

To carry out any repair procedure, tools are required. Tools will be issued to the order using the tooling function which can execute using transaction /AXONX/TLM.

For issuing tools using the tooling function, the following data needs to be maintained in the initial screen of /AXONX/TLM –

- **Movement Type** – Only those movement types will be available for selection which have been maintained in the configuration for tooling. Selection of any other movement type will be invalid. In this case, goods movement for goods issue against order is to be selected.
- **Order Number** – The Maintenance/Service order against which the tool will be either issued or returned.
- **Operation Number** – On execution of tooling goods issue and return, before the actual goods movement, the order reservation is updated with two new reservation items. The first reservation item is used for the issue of the tool and the second for return. To create this reservation, the operation number of the order needs to be maintained. For tool issue, the first reservation item with positive quantity against the operation will be used.
- **Goods Recipient** – This is a mandatory field during goods issue. Personnel number of the person receiving the part is to be maintained in this field.
- **Tool** – The material number of the serialized tool is to be maintained in this field for goods issue/return.
- **Serial Number** – The serial number of the tool is to be maintained in this field.
- **Batch** – For a batch managed material, the batch number of the tool is to be maintained in this field. This is an optional entry. The system will determine the batch number based on material number and serial number.

- **Storage Location** – The storage location from where the tool is to be issued or the storage location to which the tool is to be returned is to be maintained.

Upon maintaining the data and executing the transaction, the tool issue process is initiated. Based on configuration, during tools issue/return, the usage of the tool can be captured. The functionality of measurement documents is used here. The posting of measurement documents can either be manual or automatic.

If the configuration is maintained for updating tooling counter readings manually, on execution of the tools issue/return transaction, the system will check if a counter is maintained for the serialized tool. The counter should be based on the same characteristics maintained in tooling configuration. If the conditions are fulfilled, a pop-up window will appear prompting the user to input the tool usage. The system then posts a measurement document to record the usage of the tool

Once the order has been updated, the tooling function adds a reservation item, which is then used for issue of the tool. Since, the tool should not be consumed against the maintenance order, a negative reservation item is also added against which the tool will subsequently be returned to inventory.

Tool Return

After a tool has been used and the repair activity has been completed, the tool must be returned to inventory. Tools are returned using the same Tooling function which is used for issue. Use SAP transaction /AXONX/TLM to call the tools issue/return function.

Selection criteria remains the same as described above in the tool issue section.

On executing the transaction, the system asks whether the same tool is required again against the same order operation. If Yes is selected, a new reservation for the tool will be added to the order operation.

The next prompt is for declaring the condition of the tool and whether the tool requires repair or calibration. Please refer to the confirm tool section for more details.

If the configuration is maintained for updating counter readings automatically, on execution of the tools issue/return transaction, the system will check if a counter is maintained for the serialized tool. The counter should be based on the same characteristics maintained in the tooling configuration. If the conditions are fulfilled, the system will pick the predefined usage reading maintained in the configuration and post a measurement document in the background.

A material document is posted as the tool is returned from the maintenance/service order to the storage location.

The measurement document is posted by passing the value maintained in the configuration as a difference value.

Tool Reconciliation

Tools are maintained as inventory and are issued and returned against maintenance/service orders. However, a tool should not normally be consumed against a maintenance/service order. Hence, when a maintenance order is being completed, the system will check (depending on the configuration) whether any tools are outstanding against the order. If any tools are issued but not yet returned (i.e., the positive reservation item has a goods issue against it, but the negative reservation item does not yet have a goods receipt), order completion will not be allowed.

Maintenance/Service orders can be completed directly from transaction IW32 as well as from /AXONX/EWI. Orders can also be completed during declaring a part serviceable from transaction /AXONX/IBX. This check is applicable to all the above scenarios.

Tool Requirement Generation

When a tool is being returned, based on the configuration, the system will prompt whether the same tool is required again against the same order operation. If the user confirms that the tool is required again, new positive and negative reservation items are created in the order operation. When the tool is again issued to the order, the positive reservation item is used to issue the tool. Likewise, when the tool is subsequently returned, the negative reservation item is used.

Confirm Tool

When a tool is returned, based on configuration, you are required to decide whether to declare the tool serviceable. If the tool is declared serviceable, it means it can be used again and hence it is returned to unrestricted stock. However, if the tool is declared as unserviceable, the tool is returned to blocked stock and further a repair/calibration notification is created for the tool. When a tool is being issued, the system checks if any notifications are outstanding against the tool. If there are, the list of notifications is displayed, at which point there is the option to continue or cancel the process of tool issue.

Tooling Report

The report displays records related to material postings for the tools. Use SAP transaction /AXONX/TLM_REPORT to start the tooling report.

The following fields are available on the selection screen –

- Order Number – The report is executed based on order number only. The field is mandatory.
- Tooling Only (Check Box) – When this check box is selected, only those records are displayed for which the material type of the material is relevant for tooling.
- Outstanding Only (Check Box) – If this check box is selected, only those records will be shown in which the material/tool has been issued to the order but not yet returned.

When only order number is passed, all the records are shown, i.e., tooling, and non-tooling movements.

WBS Determination

Overview

Maintenance orders require a WBS (Work Breakdown Structure) element assignment to settle all associated costs for labor, parts, tools, and other charges. This is important from a financial controlling perspective, to analyze the costing across a work pack, sales order, or an individual work order. The WBS determination function is intended to facilitate the automated assignment of WBS elements to maintenance orders in a typically high-volume environment where manual assignment is not practical.

The WBS determination provides the following functionality:

- Automation of WBS assignment to work order.
- Automation of settlement rule population to work order.
- Configurable priority rules to identify the sequence of WBS assignment.
- WBS retrieval rules for unplanned/ad-hoc/one-time work.
- Update of WBS to a customized table control in the maintenance order Enhancement tab.

Automation of WBS Assignment to Work Order

If the WBS determination function is active, it will automatically assign WBS element(s) to maintenance orders (both in the location data / account assignment and the additional data / organization) during the maintenance order create process. The parent WBS is determined in the first instance from the network activity, revision or sales order linked to the maintenance order, and the correct child WBX is subsequently determined based on the logic described below. This applies throughout the system, regardless of where it is triggered from.

Automation of Settlement Rule Population to Work Order

In addition, the WBS determination function will automatically assign WBS element(s) to maintenance orders in the settlement rule during the maintenance order create process, based on the logic described below. This applies throughout the system, regardless of where it is triggered from.

It reads the standard settlement rule configuration for the maintenance order type and checks if an order settlement profile exists or not and if it does then whether it allows for WBS assignment. If this check is passed, it then checks whether single (FUL only) or multiple (FUL and PER) rules are required to be assigned and accordingly for all the determined WBS element values (based on the logic described below) it evenly splits the % or assigns at 100% in the Settlement Rule section of the maintenance order.

Configurable Priority Rules to Identify Sequence of WBS Assignment

Table /AXONXAPP/CU56 (List of Standard Maintenance Checks) is a customizing table which defines the linkage between different notification, order, and project types along with the priority sequence in which the WBS assignment should take place. The key fields also include functional location category and type of technical object (for equipment or functional location) that can further segregate the project type and priority for similar notification/order type combinations.

The Project Type field must be defined in this table as it identifies the appropriate child WBS (exploded from the main retrieved parent WBS) and assigns it to the maintenance order. This field is defined as a required field in the WBS header, so the linkage is the key for fetching the correct WBS level.

The program will read the lowest priority entry and assign the corresponding project type WBS to the maintenance order. If more than 1 record has the same priority value (for 1 or more notification types

also) then all the corresponding project type WBS(s) are assigned in the maintenance order (in the table control in the Enhancement tab and potentially also the settlement rule, depending on the settlement profile) but the first value (after sorting based om the level within the project structure) is assigned to the order header in the additional data and location tab. If the manual WBS field is not checked, then the program checks for auto assignment of WBS value otherwise it ignores the retrieved value and lets the user link a WBS manually.

WBS Retrieval Rules for Unplanned/Ad-Hoc/One Time Work

Table /AXONXAPP/WBSDET is used to define WBS element rules for unplanned work. The table can be maintained via transaction code /AXONX/WBSDET.

Table /AXONXAPP/WBSDET defines the settings for maintaining a default WBS/project value for a specified technical object (equipment or functional location) and for a valid duration (valid from date field). This is needed for unplanned and ad-hoc work arising, such as line maintenance and defects.

The rules here are based on the following key fields - plant, work center, equipment, functional location and valid from date. At least one of the technical objects is needed to define a line entry in the table and based on the order technical object and start date the appropriate WBS element is retrieved. Once fetched, it is expanded and all the relevant child WBS(s) are stored; then the priority rules (as defined in the /AXONXAPP/CU56 table) are applied based on notification/order/project type combination to retrieve the correct WBS level and link it to the maintenance order.

Update of WBS to a Customized Table Control in Maintenance Order Enhancement Tab

Table /AXONXAPP/ORD_WB stores the retrieved WBS(s) values for a maintenance order along with the notification type and priority number. It can hold multiple WBS values for an order since a split WBS settlement is possible with similar priority value. The entries are also presented in the table control defined in the maintenance order header enhancement tab.

Work in Process Report (WIP)

Overview

The Work in Process (WIP) report complements the standard SAP materials requirement planning (MRP) functionality by providing visibility of work in process. This report provides the maintenance planner an up to date (partly dependent on how frequently the update program is run) view on the status of work priority for maintenance activities in a service center or maintenance facility.

The WIP report runs in 2 modes. It can run based on the WIP database (which is based on the WIP Update Program) or based on the order list (or order operation list) which reads the work orders in real time. The report acts as a prioritized work list for each cell, work center, or area of a maintenance facility, showing work currently at each point in the maintenance process.

The following transactions are included in this section:

- /AXONX/WIP_UPD: upon execution, the work in process database is updated.
- /AXONX/WIPD: displays a report showing prioritized work in process.

WIP Update Program

Before displaying the work in process (WIP) report, you will normally need to call transaction /AXONX/WIP_UPD to execute the WIP update program (unless running the report based on the order list, as described below). The program adds records to the work in process tracking table from any changes/updates to operations in work orders. Once WIP has been updated, you can call transaction /AXONX/WIPD to display the WIP report.

Work in process essentially describes how many of a given part quantity being repaired on a refurbishment order reside at each given operation or activity on the work order, and therefore reside at each work center in your plant. Given that SAP permits skipping of confirmations, confirmations out of sequence, scrap, and rework, the WIP calculation is not as simple as at first thought. This is one of the reasons WIP is calculated using a background process, allowing the end user to run the WIP report in an efficient and responsive manner.

WIP is calculated for refurbishment orders as follows:

1. No parts reside at operations which have not yet been released (system status REL) or which are completed (system status CNF).
2. Parts received to the warehouse from the order are no longer considered WIP.
3. Scrap and rework quantities are not considered as work in process unless they are moved to a separate repair or scrap order. WIP quantity calculations therefore exclude any confirmed scrap, rework or previously received quantities.
4. The remaining calculation for WIP quantity at an operation is basically the sum of all parts confirmed to that operation minus the sum of all parts confirmed from the operation.
5. In the case of skipped confirmations (e.g., confirmation of operations 0010 and 0030, with no confirmation at intermediate operation 0020) the WIP is assumed to have proceeded to operation 0030, bypassing or passing through operation 0020 along the way.

WIP is also calculated for maintenance (non-refurbishment) orders. The WIP location of the part(s) is calculated simply as the first available unconfirmed operation that is also released. In other words, confirmed operations are skipped and the part(s) being repaired or serviced are assumed to reside at the first unconfirmed operation found on the order.

The WIP update program can be triggered on an as-needed basis, whenever there are changes performed to work orders. This is facilitated by exits or events within the confirmation, order save, and order receiving transactions to flag up relevant maintenance or refurbishment orders that need recalculation of WIP. The WIP program can be scheduled in SAP (using transaction SM37) to either run on a regular periodic basis, or in near real-time after the event triggered from an order change.

WIP Update Selection Screen

The selection screen of the WIP update program contains one mandatory field (production plant) for the program to be executed. For a more defined selection, work order and work order types can be specified. When the checkbox indicator refresh mode is ticked, the worklist of recently changed orders will be ignored and instead all work orders identified by the plant and work order range inputs above will be processed. Historical WIP data for all selected work orders will be consequently deleted and recalculated.

Statistics are always displayed or written to the job log each time the WIP update program is run to highlight the number of WIP results records (an order operation/work center quantity in process) created, updated, and deleted. Any errors encountered during the WIP update process are also recorded. This gives an indication to system administrators if the process is operating correctly. detailed WIP results are not listed.

Work in Process Report

The WIP report displays work in process at a given work center, cell or repair area based on either data within the WIP database or based on maintenance orders in the SAP system. Further, the WIP report prioritizes and organizes the work in process according to any SAP field (such as schedule finish date, order priority etc.) and according to industry standard work prioritization calculations (such as APICS™ critical days, TOC buffer remaining etc.). The report is normally run for all work currently in process or in queue at a specific work-center or repair area. It supports maintenance and refurbishment orders, but not networks.

The WIP report provides an option to display a summarized work list by notification, superior order, superior network or maintenance revision or package. The summarized list option is really designed for repair and overhaul, where work is naturally grouped based on requirement.

One very important feature of the WIP report is the pegged requirement date, which is the requirement date of the demand or next higher assembly requirement that the supply order be ultimately fulfilling. The pegging process that supports shortage reporting also calculates the pegged requirement in the WIP report. The requirement date of the pegged requirement is important, as work in process to meet an earlier requirement should often be prioritized over similar work to meet a later requirement, irrespective of the scheduled or planned finish dates for each supply order. For this reason, there are options in WIP report to calculate priority, critical days etc. based on the pegged requirement date.

The Work in Process (WIP) report identifies and considers all order operations that are not fully confirmed (operation system status CNF). This means that order operations that contain the following system statuses are not reported:

- CNF (confirmed)
- DLV (delivered)
- DLT (deleted)
- TECO (technically completed)

- DLFL (flagged for deletion)

Based on the material requirement in the order operation, the availability or shortage is read from real-time shortage report. These are displayed in the WIP report as traffic lights which helps the technician to proceed with the maintenance work based on the availability or shortage status of the operation.

- A green light indicates that all the materials pertaining to an order and operation are available.

- A yellow light indicates that one of the materials is unavailable.

- A red light indicates that all the material are unavailable.

A button can be configured for detailed review of material shortage status. For details check the 'Action Button Functions'.

WIP Prioritization and Navigation

When entering data on the selection screen to display a specific WIP report, it is recommended to run the manufacturing and maintenance work list for specific plant/work center combinations to improve performance and limit the length of the report. The plant is checked against the maintenance plant of the order operation, and the work center is checked against the work center of the current operation on the work order with work in process.

Data Processing Option

There are two data processing options, from the (real-time) order list or from the WIP results database. The WIP update program builds the WIP results database as described above. Processing data from the WIP results table means that all work order operations that meet the plant/work center criteria in the WIP prioritization and navigation, and that additionally meet the restrict work orders to be displayed criteria are included in the report.

Processing data from the order list means that the WIP results table is not used, so the WIP update program does not have to be run. Instead, SAP work orders are read which meet the above and below selection criteria, and which additionally are open or in work per the system status checks. This takes longer to run and does not accurately calculate work in process quantity for larger volume repair orders with partial confirmations (work in process spread across multiple operations). However, for smaller lot-size or batch of one maintenance orders it can be more accurate than processing data from the WIP results table, because it does not rely on a periodic batch process to stage the data. Instead, real-time data in SAP is directly accessed to build the WIP report.

Restrict Work Orders to be Displayed

There are several selection criteria which allow the user to reduce the list of order operations displayed in the WIP report irrespective of whether data is processed from the real-time order list or from the WIP results table. Where multiple selection criteria are specified only order operations that meet all the input criteria are displayed.

WIP Report Display Options

There are three display options for the work in process report:

1. **Display Orders** – produces a list of work order or operations that are in process or ready at the chosen work centers or cells. One row of data is provided for each work in process quantity at an operation.
2. **Display Notifications** - produces a report of only the notifications.
3. **Display Notifications and Orders** – produces both the above lists on the same screen.

The user can specify the order or notification layout, which will determine the list format. The layout can contain the list column structure, sort criteria and filter conditions.

Work in Process Report Results

Once the report is displayed, it is possible to move the horizontal divider between the summarized notification list at the top, and the detailed order operation list at bottom, up or down. This makes it easy for the user to view more information from one or other list, subject to the overall size of their screen. In addition, if one or more notifications or order groupings are selected from the top list and the drill down button is selected (or double-click on a single record), the list of order operations in the lower screen is reduced to only show order operations resulted from or grouped to the selected entries from the upper screen area.

If the display option was selected to show summarized information only, then the notification list in the upper screen is expanded to fill the entire screen. Selecting one or more records and pressing the drill down button, or double-clicking on a single summary record, automatically jumps to the detail order operation list of operations per the selected summary row(s). Pressing the back icon from the standard SAP toolbar from this screen returns to the summary list.

Pressing the refresh button on the standard SAP toolbar refreshes the data on the report, read from either the WIP database or SAP order list, to reflect any changes to orders and progress made since the screen was first displayed.

Workscoping Workbench (WBX)

Overview

The Workscoping Workbench (WBX) facilitates the process of defining the scope of work to be carried out on the end-item (component or complex asset) during the current maintenance slot.

WBX supports both the primary activity of "packaging" work into the maintenance slot, i.e., defining the complete scope of planned work for the current maintenance event, and the subsequent activity of "workscoping", i.e., adding detailed work tasks into individual work orders.

WBX works from an asset induction notification, or sales order in case of a third-party repair, and uses details of the inducted asset to search for applicable work items to package into the event, such as:

- Planned notifications, including mod/sb embodiment notifications from maintenance plans
- Applicable mod/sb's with or without one-off embodiment notifications
- Build orders, repair orders, and sub-orders
- Defects and deferred defects
- Other outstanding work items

Workscoping workbench is invoked from:

- Induction workbench transaction code IW51/IW52, while an end-item asset is being inducted for the current visit by double-clicking the notification action-box item change workscope
- Transaction code /AXONX/WBX

Initial Screen and Selection Screen

The Workscoping workbench initial screen consists of:

- Two navigation areas on the left – primary navigation area at the top and secondary navigation area below
- Selection screen on the right

Main Toolbar Buttons

Display Icons

Upon pressing this button, a pop-up is displayed that lists all the icons for work items or document types appearing in workscoping screens.

Hide/Show Hierarchy

Each of these buttons hide or display the navigation areas on the left side of the screen, dependent on which is pressed.

Save Variant

Saves the variables currently entered on the selection screen.

Primary Navigation Area

The primary navigation area has a fixed toolbar with 4 buttons and language-dependent hover text, as described below:

Open

Displays the selection screen and enables you to perform a new selection.

End Item Notification List

Shows the list of selected induction notifications, in ascending order of the notification number. When you select a notification from this list (via double-click or single-click and drag to the secondary navigation area), the default view display of the secondary navigation area is set or reset to this induction notification and the main tool bar (above the ALV grid) may be re-built based on the induction schema associated with this current induction notification.

History

Shows the last 10 induction notifications that you had previously processed.

Show Selection Criteria

Displays the current search list's selection criteria for the 7 fields on the initial selection screen.

Please note that the end item notification list and show selection criteria buttons will only become active once the user enters the main WBX screen.

Secondary Navigation Area

All the buttons in this area are grayed out in the selection screen and only become available once the upon displaying the main WBX screen.

Selection Screen

The selection screen contains search criteria for end item objects such as material, notification etc. A 'Review Item' checkbox is provided on the selection screen, which if selected will append previously reviewed records that do not match the filter results in the WBX ALV.

Main WBX Screen

The main WBX area is split into the primary and navigation area on the left-hand side, and the work area

Primary Navigation Area

The primary navigation area remains static across both this and the selection screens, and therefore the button descriptions mentioned above remain the same.

Secondary Navigation Area

The Secondary Navigation Area also has a fixed toolbar with 4 buttons and language-dependent hover text, as follows:

Nodes

Parent button which enables you to expand or collapse all nodes depending on the child button selected.

Business Document View

Shows the repair header data for the end-item's visit created during induction (i.e. induction notification, sales order, contract, and operative network).

It also shows the total number of work items related to the end-item and its entire structure such as build orders, component removals using the Inspection Workbench (i.e. removal notifications and repair orders), planned notifications, applicable mod/sb's in the form of engineering orders and other outstanding works grouped into work type groups such as routine, non-routine and work arising with several sub-groups which are fully configurable in terms of number of groups/sub-groups, descriptions and which work items the group contains.

Packaged View

This button sorts the work items into packaged or unpackaged work. If a revision had been created and assigned to the end-item and superior operative network, the revision number will be displayed at the top of the packaged view display. In cases where revision is not used, work items can be packaged to a network or a superior order.

To view the complete list of work items again, double-click on the icon tile end item notif. (notification number).

Product View (Sections)

This button shows the as-maintained structure of the end-item and enables you to filter the work item list by functional location, assembly, or equipment.

To view the complete list of work items again, double-click on the icon tile of the top-level functional location/equipment.

Task Based work scope view

The task-based work scope solution links the engine manual maintenance plan (EMP) document to the induction notification controlling the workscope Levels of various parts on the engine. It lists the various maintenance tasks that are needed to execute the maintenance of various parts at various work scope levels. The Disposition Requirements solution is provided within Task based workscoping solution framework to derive workscope level for workscope relevant equipment in the workscope summary view. Under the disposition requirement tab, a sub-screen of disposition requirement details is provided which presents the related repair tasks for the corresponding component. The repair tasks are derived using iMRO filter function logic for the Filter ID maintained against the disposition requirements category. On saving the work scope proposal the records for both the disposition requirements and the related tasks will be saved in the /AXONXAPP/WRKSCP table.

The workscope level for a part is determined based on the comparison between its current usage parameters and the soft life values maintained in the applicable maintenance program document (as defined in MBX). A component can have multiple counter possibilities like hours, cycle, time based etc., and all of these are considered while deriving the most appropriate workscope.

Various sections shown in this task based workscoping view are:

- Induction Workscope Summary
    - Modification Workscope
    - Release life Workscope
    - Soft Time Workscope
    - Maintenance Tasks
    - Disposition Requirement View

Main Work Area

The main work area on the right-hand side of the screen displays existing work items in the form of notifications, orders, and applicable mod/sb's (made applicable via the Maintenance Workbench (MBX) with or without embodiment notification) that are relevant to the end-item asset and all equipment and materials in its as-maintained structure. The main work area also shows MPL effective mod documents in the ALV. Work items and their details are listed in an ALV grid in columns that can be displayed/hidden, arranged/sorted to suit your business needs. An applicability status traffic light is provided to determine the applicability of an 'MPL Relevant' mod to a technical object based on 'Effectivity Type Group.' If the effectivity type group has classification/material serial effectivity activated, then the system compares the classification values of the technical object with the

classification/material serial effectivity values defined for the document.

A specific layout has been designed for task based workscoping solution which displays the information like PPE objects, defined workscope, derived workscope, packaging indicator etc. based on the section selected under the task based workscoping view.

An indicator is provided in the ALV report to clearly differentiate between work objects and workscoping objects.

Work objects include:

- Notifications:
    - Planned notifications (e.g., from maintenance plans, or one-off).
    - Outstanding defect notifications (e.g., deferred defects from previous events).
    - Modification embodiment notifications.
- Applicable documents without embodiment notifications.

Workscoping objects include:

- Work Orders for the Event (e.g., build orders, repair orders, sub-orders).

Action Buttons

The workscoping workbench can be used as a decision support tool in determining the required workscope level for the end-item. the user can review the initial workscope, review the pending planned or unplanned work items and potentially change the workscope by including or excluding work items, creating work arising, creating mod/sb embodiment notifications, and including them into the workscope. This is achieved using action buttons whose functionalities are explained in the following section. These action buttons are fully configurable as to which buttons you want to turn on or off, the buttons sequence on the workscoping screen, the button text and quick info (hover text).

Include/Package

To package a notification, or a notification that has an order, to a revision, or network in repair scenarios where revision is not used, select the work item row, and then press action button Include.

Depending on the customizing of the induction schema, packaging occurs either at network or network activity level.

When packaging a hierarchical mod, clicking on Include will display the entire mod hierarchy relationship.

Depending on the customizing of the relationship type, all the mods in the hierarchy can be automatically packaged at the same time.

After pressing the action button, you will see the confirmation message that the notification has been saved and the workscoping status icon changes to a green tick. This indicates that the notification is now included in the workscope.

The notification is updated with the revision number and will therefore also appear in the Maintenance Event Builder (MEB) as a packaged notification.

If the work item you are packaging is an order without a notification and you are packaging to a WPS-controlled (MEB-controlled) revision, then based on the customizing of the Induction Schema, the workscoping workbench can automatically generate a notification for the order in the background and then packages both the notification and the order into the revision.

Adding Modifications to Routine Orders

The ability to add modifications to routine orders (e.g., build orders) has been incorporated into the existing packaging function in WBX and can be activated in the WBX schema.

The function does the following:

- Identifies the correct routine order. This is done by identifying routine orders that have the same header equipment as the modification selected, are in the same event, and where the phase from the mod document matches the order type (as per the configuration).

- Adds the mod task list to the routine order and updates the embodiment table (/AXONXAPP/DRWEMB) with the routine order number and status 02, while the embodiment notification status is set to "X" ("Control Transferred").
- Shows the status in WBX as 02 (In process after successful addition).

In situations where modification packaging has taken place before the creation of routine orders, it is still possible to add the mods at the time the orders are created through the PMOGEN (PM Order Generator) process:

- The correct mod is identified using the same criteria of header equipment, event, and phase, and have a status 02 – "packaged".
- The task list from the modification is added to the routine order.
- The embodiment table is updated with routine order number and status 02, while the embodiment notification status is set to "X".

Partial Embodiment using Compliance Category

The compliance category concept enables more detailed definition of the target build standard, based on the compliance category of the packaged mods. For example, a packaged mod may only be required based on the condition of the parts it relates to and is therefore not required in every case. The compliance category concept enables the packaged mods to be "partially embodied", but still meet the target build standard and therefore still pass the mod status conformity check.

Packaging of Embodiment Records in WBX

If the compliance category is activated in customizing, then the compliance category of the mod is recorded against each embodiment record in the embodiment table.

If the modification being packaged is controlled by a policy related to the sales order, then the compliance category that applies to the modification comes from the policy (in table /AXONXAPP/DRWMPR), and this takes precedence over the compliance category from the mod DIR.

Un-Packaging of Embodiment Records in WBX

When mods with compliance category are un-packaged, the compliance category is cleared from the embodiment record in the embodiment table

Exclude/Un-package

To un-package or exclude a notification or a notification with an order from a revision or network, select the work item row then press the exclude action button.

Upon clicking, you will see the confirmation message that the notification is saved and the workscoping status icon changes from a green tick to a red cross, indicating that the notification is now excluded from the workscope.

The revision number is removed from the notification and this is also visible in the Maintenance Event Builder (MEB). Notifications that were automatically generated for an order to enable packaging to a WPS-controlled revision are not deleted.

While reviewing the list of pending work items for the end-item and its structure, you may decide to exclude from workscope some of the unpackaged work items and you may want to mark them as reviewed to let another person who views the list of work items know that a decision has been made on them. Select the unpackaged work item and select the action mark as exclude to update the workscoping status. Selecting the action unmark will reset the workscoping status.

If you select mark as exclude or unmark against a packaged work item, it does not alter the workscoping status. You can only exclude a packaged work item from the workscope using action button exclude.

Error Handling

During WBX packaging and un-packaging of the selected record into the maintenance event (revision or network), the following objects are updated at various stages and thus a lock entry check is provided to avoid further system updates and inconsistency in database record(s):

- Document info record (modification or repair document)
- Revision
- Embodiment (Operative) notification
- Task list
- Build/strip order

Similarly, the status changes of the below objects are captured, and appropriate messages are shown to avoid inconsistent database record(s):

- DIR status
- Embodiment notification
- Embodiment record

If a hierarchy is being checked for the above scenarios and an error is encountered in some of the records, then packaging/un-packaging will continue for the success records and be skipped for the locked/status change objects. The generated errors will be a pop-up in WBX ALV screen. The generated error messages will be added into the WBX log; they are also added into the SLG1 object. It can be reprocessed after required changes are made in the data.

Create Notification

This button is used to create a one-off mod/sb embodiment notification or a notification for work arising, depending on the cursor position when the button is pressed.

To create an embodiment notification for a mod/sb that was made applicable to the equipment via the Maintenance Workbench (MBX), select the corresponding row in the ALV and press the action button. A new embodiment notification is created and the work item row in the ALV is automatically updated with the notification number and type. Selecting the application log button displays the logs.

The details of the mod/sb which include embodiment rule and mandatory indicator, required compliance date, maintenance planning details and task list (if specified in the master notification of the mod/sb) are copied to the newly created embodiment notification:

The embodiment status remains as 00 ("Not embodied (Planned)") until it is included in the

workscope when it changes to 01 ("Packaged (revision)") with workscoping status "Reviewed and Packaged".

To create a notification for work arising, press create notification without selecting any work item row in the ALV grid. A pop-up window appears. Enter notification data in this window and select the confirm button.

Add Task List

To add a task list of a mod/sb embodiment notification or other notifications to a work order, select the work order and the notification, and then press 'Add Task List'. WBX will add the task list to the order and eliminate duplicate operations if elimination IDs have been set up in the task list master data.

The workscoping status of the notification changes to "Reviewed and Packaged" and the application log confirms that the task list has been successfully added to the work order.

The task list is visible in the planning tab of the order.

Update mod status

Two buttons are available in WBX for updating the mod embodiment status directly to either "Previously Embodied" or "Not Applicable".

The update mod status button is used to update the status of the selected mod document and validates the allowed combinations of "From" and "To" status based on the customizing. Upon clicking, a pop-up is displayed to select the target embodiment status and save the new status against the mod document.

Mod Filters

The workscoping workbench uses the same modification filtering function as the Inspection Workbench (IBX). Please refer to the inspection workbench section for more information.

Workscope

To the add task list of a notification to an existing work order, select the notification, and then press Workscope. From the pop-up displayed, select the order, and click the tick button.

The workscoping status of the notification changes to "Included". In addition, the workscoped order number is displayed in the ALV, the workscope status icon is updated and the embodiment status changes to 02 ("In process"). In case of addition of one or more task lists with inspection data, the inspection characteristics from the relevant task list operations can be included into the work order inspection lot. Additionally, these characteristics will be removed from the inspection lot if the task list with inspection data is un-workscoped from the work order. This will happen in the background automatically. The automated addition & removal of Inspection Characteristics during workscoping is delivered via consulting note.

Validation is provided to ensure that the maintenance requirement is applicable to all the parts within the repair order created through 'Multipart Disposition', during workscoping into the repair order.

Descope

To delete the task list operations in the order for a mod/sb embodiment notification, select the mod notification, then press Descope, after which workscoping status changes to "excluded", and embodiment status changes to 00 ("Planned").

If the notification was added to the order object list during workscoping (based on the configuration), then it can be removed during descoping, and with it the operations of the associated task list. If the notification was not added to the order object list during workscoping, then descoping will not remove the task list operations.

Raise Defect

Upon clicking the raise defect button, a pop-up is displayed to select the reference object for the defect. For further details, please refer to the defects, deferrals, transfers, and splits section.

Set Review Status

The review status buttons are intended to facilitate the process where multiple users are responsible for defining the workscope, and can be used to mark individual entries as follows:

- **Mark as Include**: This button is used to set the status as "Include in Workscope", which means the work item has been reviewed and included in the workscope.
- **Mark as Exclude**: This button is used to set the status as "Reviewed but exclude from Workscope", which means work item has been reviewed and a decision has been made not to include it in the workscope.
- **Unmark**: This button is used to remove the review status.

Work Order Status

The work order status button is used to update the user status in the selected work order to a predefined value maintained in the configuration. Select the order line in the ALV and click on the set order status action.

Refresh ALV

A refresh action is provided in the WBX ALV. When any actions have been carried out such as workscope, descope, include, exclude etc., and the refresh button is pressed, the updated data will be displayed in the ALV grid.

Completed notifications will not be seen in the ALV after pressing refresh unless the "Completed work items" check box is selected on the initial screen.

Call WBX ALV

A Call WBX ALV action is provided in the upper left area of the order view screen, which allows navigation from the work order screen to WBX ALV.

If the work order screen of WBX is called through any transaction such as /AXONX/IBX, /AXONX/EWI, IW52, or /AXONX/WBX, on selecting the Call WBX ALV action, the WBX ALV screen will be displayed.

Save Proposal

On action "Save Proposal", the data from all the WBX proposal views is committed to the workscope table /AXONXAPP/WRKSCP.

Release Network

This button performs release of networks associated with sales order after performing proper validations.

Update Proposal

If the maintenance policy linked to the induction notification is changed then all records in all views which are different from the prior records determined will incrementally be added to each screen. (previously valid records no longer valid will continue to be displayed if already part of the saved

workscope).

Release Proposal

Is used to release the created/updated records of WBX proposals. It also updates the embodiment status record in the mod document. The saved proposal data is updated with the workscope status as "Released" for all the proposal records

Generate New Release

If the user needs to revise the workscope for an event, the action "Generate New Release" should be used. It validates that the action only works in case the existing workscope is released.

It also validates that the new proposal is only allowed to be generated in case the current released workscope has been used to trigger the PM/CS Order. Upon clicking save proposal the workscope release number will be incremented to the next higher number in table /AXONXAPP/WRKSCP.

Delete Proposal

This button is used to delete the existing proposals. Validation will disallow deletion for the proposal if it has maintenance task, soft time, release life data associated in the section view.

Generate Orders

With this action, the work order view will be launched which shows the inducted equipment hierarchy. This hierarchy will show the network ID for the workscoped equipment's. After this the user needs to click the create PM orders button which in turn will generate PM/CS orders. The created orders will be shown in a subsequent log. Once the orders are created, the details of the order like maintenance tasks/modification documents can displayed on the detailed screen.

Complete Workscope

With this action, the release of the workscope data is checked. If workscope is not released, then close actions will not work. In case workscope is released, set the workscope status as "closed" for all the released workscope records.

Print Workscope

With this action, custom printing option is enabled. The workscope data from each proposal view is fetched.

Work Order View

Double-clicking on an order number in WBX takes you to the order view. WBX has additional sub-headings for routine and non-routine work in the bottom left hand screen area. There is also an additional tab showing the object list of the repair order in the top right screen area.

To workscope from the order view, select a notification, and then click the include Eng. order or repair button. Four options will appear, allowing you to select workscoping method.

To descope from the order view, select a notification, then click the remove from order action under the parent button update prev. embodied Eng. ord.

To remove operations from a work order during descoping, the operations must have been added by adding the corresponding notification to the order object list, and then removed by removing the notification from the order object list.

For further information on the work order view, please refer to the inspection workbench section.

Removing a Mod from an Order (Descoping)

Depending on the configuration, an unworkscope report is provided to highlight the impact of removing a mod from the workscope and trigger related actions such as updates to part progression, links to reservations, as well as task list removal and embodiment status update.

To remove a mod from an order, select the modification document and click on remove from order button, after which the unworkscope report is displayed. The report shows details of the order that the mod is currently workscoped against, including the negative reservation line item that will deliver the post-mod part into stock when the order is completed.

For further information on descoping and the unworkscope report, please refer to the inspection workbench section.

Descoping for Multiple Components

To descope a mod that relates to multiple components on an order, select the mod notification, and then click descope. After selecting the order, a message for confirmation will be displayed.

Click the tick icon, after which the embodiment status for all components on the order will be reset to 00 ("Planned").

Unworkscope Mods from Routine Orders

The unworkscope function for routine orders supports

- Reversal of the embodiment table record by removing the order entry.
- Placing the embodiment notification back in process and resetting the status 00.

Unworkscope Report

An enhanced version of the unworkscope function (UNPACK_NEW) calls the unworkscope report with additional features:

- Assess impact of unworkscoping the mod, including identification of related mods and affected supply / demand relationships.
- Trigger follow-on actions, including update demand part number (revert to pre-mod) and unsource repair order (which no longer meets build standard due to removal of a build standard mod).

A customizing option in the induction schema is provided to define the unpack function as either the "UNPACK" function or the UNPACK_NEW function.

Workscoping for Non-Serialized Materials

To workscope (non-serialized) material modifications, a feature is provided to create operative notifications based on configuration, which automatically creates a new notification during workscoping and links it to the mod document. In the absence of a serial number, the notification generated in this way acts as the unique identifier for the embodiment record on the part in question.

Task Based Workscoping Work Order View

For task based workscoping, an enhanced work order view gets displayed. The main work area (right pane of the screen) is composed of two panes:

- Order header information with documents like maintenance task, mod etc.
- Order operation details.

On the left pane the user can see the sales order with the complete equipment hierarchy. This also shows the orders and network ID in which it gets packaged.

From this view, the user can generate the PM/CS orders based on the workscope data.

Periodic Estimate (PEST)

Overview

Standard SAP scheduling uses the annual estimate on a measuring point to schedule a maintenance plan, in case of counter-based plans. The annual estimate on the measuring point is used to derive the activity per day, and this is evenly applied across the entire year and works on the basic assumption that the usage on a counter is a daily average for the year.

In the aerospace and defense industry, this assumption does not hold good considering that aircraft operating frequency is dictated by seasonal flight schedules, periodic downtimes, etc. To schedule more accurately, a mechanism of splitting this annual estimate down into smaller periodic estimates is required. The Periodic Estimate (PEST) component is intended to meet that requirement.

It provides a mechanism to select the counters for an aircraft or other asset and enter individual periodic estimates for each counter by custom validity periods.

Selection Criteria

Use transaction code /AXONX/PEST, to view and maintain the periodic estimates.

The selection screen is divided into four main areas:

- Technical Object Selection
- Measurement Point Selections
- Measurement Document & Periodic Estimate Selection
- Process Control

Technical Object Selection

This panel consist of fields for technical objects selection.

Measurement Point Selection

This panel consists of fields for measurement point selection.

Measurement Document & Periodic Estimate Selection

This panels contains fields which defines the period for active PEST selection.

Process Control

This panel is used to control the output layout.

It provides an option to display measuring points of the objects entered in selection screen, for which measurement reading transfers are supported.

Maintain Periodic Estimate – Output Screen

Maintain Periodic Estimate application toolbar

Add Period Button

Validity period is entered for the creation of periodic estimate node for a counter, to maintain period estimates.

Delete Button

This button is used to delete the periodic estimate node, created for the counter.

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

Refresh Button

Clears/refreshes the values maintained for new estimates field.

Split Period Button

The split period button will split the periodic estimate into two parts one before the current date, the other from the current date to the end of the estimate. Values of the new periodic estimates can be entered.

Left Pane (Hierarchy)

Based on the selection criteria, the list of technical objects selected is displayed on the left pane of the screen.
The following general functions are available on this screen:

- Display details of a measuring point
- Select the existing usage periods for a measuring point –
  To update an existing usage period, double click on the period node in the left navigation pane. This period is then copied over to the right pane. In here, the new estimate value can be entered, which would then overwrite the old estimate, which is shown in the column 'MeasPt. Estimate'.

Right Pane

All the details related to periodic estimates created for a counter within a specific period are displayed in ALV format in the right pane of the screen.

Copy from History Button

Use this button, to copy the value from the projected estimate column to a new estimate column.

No Usage Button

Use this button to create a no usage period for the technical object.

Clear New Estimate Button

This button is used to clear the values from the New Estimate field.

Activate Button

This button activates the deactivated PEST. When PEST is activated, the maintenance plan gets influenced.

Deactivate Button

This button deactivates the selected PEST. The deactivated pest influences the maintenance plan call dates.

Integration

Effect of PEST and No Usage on Maintenance Plan Scheduling

The add-on MRO PEST component is fully integrated into the standard SAP Maintenance Plan Scheduling solution and replaces the standard annual estimate on a measurement point. It will superimpose/overwrite the annual estimates given in the measurement point with the periodic estimates for calculation of scheduled dates for the maintenance plan.

Time Since Event

Automatically generated Periodic Estimates are based on Time Since Event component, which is displayed in right panel ALV. Such entries can be identified by the TSE column in the ALV display. Please refer to the Time Since Event section for more details.

Time Since Event (TSE)

Overview

The Time Since Event (TSE) component is designed to enable the capture of key maintenance metrics for better reporting and improved industry-wide communication. It facilitates the building of source data for reliability reports which can be communicated to interested parties across the aerospace industry inclusive of OEMs, maintenance service organizations and airlines. The creation of "Zero Measurement Documents" is an integral part of "Time Since Event" data capturing process during repair, overhaul, inspect/test, and installation of equipment/ component. Here the design capitalizes on the existing (and proven) process and structure of measuring points and measurement documents and enhances them through the addition of a catalog code group in the counters. The time since event solution can also create and modify periodic estimates, which in turn will influence usage data as well as planning, and includes a "Reset Counter, i.e., counter replacement functionality," allowing counter readings to be reset to zero.

Time Since Event during Disposition

TSE is triggered during disposition based on the disposition code. The system will determine whether the technical object is relevant for the time since event process. The various conditions to be fulfilled for TSE to be triggered are as follows:

- TSE should be active at client level
- Material schema determination for the material of the equipment should be possible
- Equipment should have a counter
- The Characteristics of the counter should be maintained in configuration for the combination of material schema and disposition

During disposition, the system prompts a dialog box for event code selection. Only those event codes are displayed which are maintained against the combination of material schema and disposition code in TSE configuration. If only one event code is maintained against the disposition, that event code will be selected by default.

When disposition is performed using event code system creates a zero-measuring document having valuation code based on configuration which acts as marker for an event. According to configuration, it can also create PEST and reset counter.

Reset Counter during Disposition

Reset counter functionality will be used to reset the counter reading and update the counter reading to zero.

Time Since Event during Installation

Equipment installation is performed using EWI or picklist workbench. If required conditions are maintained, the TSE will be triggered, and zero measuring document gets created along with PEST (if configured).

TSE will be triggered during installation when the following conditions are fulfilled –

- TSE should be active at client level
- Material schema determination for the material of the equipment should be possible
- Equipment should have a counter
- The characteristics of the counter should be maintained in configuration for Installation against the material schema

The valuation code maintained in the TSE configuration against the combination of material schema and characteristics will be populated in the measuring document. The measuring document will be a zero-measuring document.

PEST Cut / Validity Update

The PEST created will be based on the new estimate and no. of days maintained in the configuration. The PEST created from TSE process will have an indicator "T" in PEST ALV.

During disposition, creation of Periodic Estimate (PEST) is allowed dependent on configuration. The creation of PEST during disposition influences the usage for the period and hence influences the preventive maintenance scheduling. Therefore, if PEST is created via TSE, PEST overlap is allowed. During installation, if PEST created from TSE exists, the estimate and validity will be updated.

Time Since Event Report

TSE solution creates a pair relationship between dismantling and installation events, thereby enabling proper and effective reporting. The report can be accessed via transaction code /AXONX/TSE_REPORT.

Report Selection Criteria

The selection screen will allow users to select technical objects, event code along with the duration based on which the output screen will get displayed.

Also, the user can select the Installation checkbox to display the installation records in the output screen.

Report Output Screen

The report will appear in the form of an ALV. The ALV will include various details related to the technical object (such as status, material & serial no.), measurement point (characteristics, event counter reading, latest counter reading), disposition details (event code & notification), event (date & time), reference (date & time) & TSE – days.

In the report output, the calculation of **"Time Since Event"** is based on the following –

The value of the reference date and time to be used further will be based upon "To" date and time parameters mentioned in the selection screen.

- TSE in Days = Reference Date – Event Date
- TSE = Latest Counter – Event Counter

Maintenance Plan Enhancement (MPE)

Overview

The Maintenance Plan Enhancement is a collective term describing several discrete enhancements in the area of SAP Maintenance Planning, designed to cater for the requirements of airline engineering and aircraft maintenance repair and overhaul businesses, as well as other asset intensive industries.

In the maintenance plan, additional tabs and fields are introduced that can be activated based on the maintenance plan category. These fields enable the capturing of add-on MRO specific data which either triggers new functionality or forms a link with the function from which the plan was triggered or simply for reporting, for example call extension, demand details, lower and upper limit, etc.

Standard SAP maintenance planning and scheduling for counter-based plans is based on an annual estimate against the counter. However, in the Airline industry, various other factors influence maintenance planning. The add-on MRO maintenance plan enhancement takes the following factors into account in the scheduling process:

- Periodic Estimate
- Maintenance Slot or Revision

The maintenance plan enhancement also supports better reporting and analysis through functionality such as remaining life and life at NOCO.

The Maintenance plan enhancement also supports the standard SAP solution for tolerances and shift factor for multiple counter plans.

Note: The maintenance plan enhancement is only applicable for multiple counter plans.

Scheduling Period Determination

In MPE, the Scheduling period field populates automatically, when save is performed on the maintenance plan within the system.

When a maintenance plan is created or updated, the scheduling period is calculated automatically and updated in the maintenance plan.

The scheduling period is calculated based on the number of calls and the scheduling period Buffer specified in the configuration for the deadline monitoring program. The configuration is based on the maintenance plan category.

The scheduling period is calculated as follows:

{(call interval * call number) + [(call interval * call number) * buffer]}

Call number and **buffer** value are maintained against call interval in the configuration.

In case of multiple counters, if "OR" link is set in the scheduling parameters, the call interval is calculated for each counter, and the lowest value is determined and used for calculation of the scheduling period.

A plan is created based on two counters.

If "AND" link is set in the scheduling parameters, the call interval is calculated for each counter, and the highest value is determined and used for the calculation of the scheduling period. A plan is created

based on two counters.

Maintenance Plan Additional Screens

Limit Details tab

The limit details tab in the maintenance plan Item is used to generate the early alert monitor reporting in the maintenance planning workbench. The basic functionality involves the calculation of a lower limit date (i.e., an early alert date) based on a percentage of the cycle length and populating this date in the notification (call object) generated from the plan. When a maintenance plan is created, the counter details are populated automatically in the "Limit Details" tab. This tab is maintained at the maintenance Item level

When a plan is governed by multiple counters, the calculation of the lower limit is independent of operation type, i.e., 'Or link' or 'AND link.' Irrespective of the operation type, the lower limit is always calculated based on the first counter.

The counter number defaults from the header of the maintenance plan and the upper limit are set to the cycle length of the Plan. The lower limit can be maintained in two ways:

- **Auto calculate**: If the checkbox is checked, the field percentage will be available for input. When the percentage is maintained, the lower limit is calculated automatically as a percentage of the upper limit (cycle length).
- **Manual Input**: If the lower limit is to be maintained manually, the checkbox "Auto Calculation" is deselected. It makes the field "Lower Limit" available for input, and the user can maintain the desired lower limit. When the 'Lower Limit' is maintained manually. Then the percentage is calculated automatically. The default setting when a plan is created is auto calculation.
- When a maintenance plan is scheduled, call objects are generated. If the lower limit is maintained in the Plan, the lower limit date is calculated based on, the lower limit and is populated in the notification (call object). Both lower limit date and lower limit time get populated.

Demand Details tab
Demand details from plan-based modification

The 'Demand Details' tab contains the aircraft maintenance check type code. This code is used to identify the source of the maintenance demand (e.g., Aircraft C Check) and can either be maintained directly in the maintenance plan or can be populated by other MRO add-on functions. This check type code is further populated in the call objects (Notifications) when the maintenance plan is scheduled. The maintenance check type is particularly relevant when packaging work into revisions (e.g., all aircraft C check notifications could be packaged into a revision that represents the C check).

Mod Details tab
Mod detail in Maintenance Plan

The 'Mod Details' tab links the maintenance plan to the mod DIR that generated it. When a maintenance plan is generated from a modification in MBX, the modification details are populated in the 'Mod Details' tab of the plan.

Defect Details tab
Defect details from defect and deferral

The 'Defect Details' tab links the maintenance plan to the defect that generated it. Defect resolution actions can be a one-time event (Defect Notification with a single Work Order), Repeating process (Maintenance Plan) and repeating the process with termination event (2 Maintenance Plans). In the

cases where the Defect is deferred and creates a maintenance plan (or plans), the 'Defect Details' tab holds the link between the maintenance plan and the defect.

Call Extension tab

The 'Call Extension' tab is used to extend a call that has a notification generated, and whose planned dates are not in the past. In the case of a maintenance plan with multiple counters, the calculation of the call extension is based on the operation type, i.e., OR / AND link.

Call extension can be either approved or rejected using the "Approved" or "Rejected" check-box available in the call extension tab. "Plan Date" is updated in the 'Call Extensions' tab, with the new date and the earlier plan date is updated into the "Old Plan Date" after approval and re-scheduling of maintenance plan. The call extension is approved by selecting the checkbox "Approved." The approval is based on an MRO add-on authorization object J_2XMDGOBJ.

After the call extension is approved, the plan needs to be rescheduled for the extension to take effect.

Subsequent calls get extended only in case when "Consider NOCO date for Extended Calls" configuration is switched-on.

The following scenarios are supported for 'Call Extension' for calls with a due date in the future:

- As a percentage of the cycle length. The call extension percentage is displayed in the notification.
- As a fixed date. The fixed date is also displayed in the notification.

Both the percentage and fixed date call extension can be applied and processed from MEB (Maintenance Event Builder). The call extension button is available in the toolbar under both notification selection area and revision area.

Clicking on the call extension button after selecting call object (notification) opens call the extension pop-up window. The call extension pop-up has all the fields and features related to call extension like call extension tab under the maintenance plan.

Maintenance Plan Scheduling

'Maintenance Plan Scheduling' is the process of calculating plan dates and generating call objects based on maintenance plan parameters. In standard SAP, maintenance plan scheduling is based on an annual usage estimate stored against the counter (measurement point) and measuring documents posted against that same measurement point. This approach assumes a uniform distribution of maintenance demand over the year. The add-on MRO maintenance plan enhancement considers other operational factors in scheduling such as periodic estimate (PEST) and maintenance slots (revisions), to plan more accurately. The priority of the factors defined during scheduling are as follows:

1. Measuring Document
2. PEST
3. Revision
4. Annual Estimate

Maintenance Plan Scheduling based on Revision

'Maintenance Slot' or 'Revision' is considered as a zero-usage period. Hence, no calls are due or generated during this period. Any call falling in the revision period will get shifted. However, if the

plan's cycle unit is time-based, for example, day, during maintenance plan schedule, the revision will not be considered.

The first call generated through maintenance plan can be explicitly released, to avoid non-release of calls even after scheduling in certain exceptional situations. This is controlled through an additional check in configuration.

Maintenance Plan Scheduling based on Periodic Estimate

SAP scheduling uses the annual estimate on a counter to schedule a maintenance plan, in the case of counter-based plans. The annual estimate on the measuring point is used to derive the activity per day, and this is evenly applied across the entire year. The annual estimate works on the basic assumption that the usage on a counter is a daily average for the year.

In the aerospace and defense industry, this assumption does not hold good considering that aircraft operating frequency is dictated by seasonal flight schedules, periodic downtimes, etc. To schedule more accurately, a mechanism of splitting the annual estimate into smaller periodic estimates (PEST) is used.

Effect of Notification Packaging

When a revision is created for an asset, it is considered a no usage period. The maintenance plan scheduling is modified, and the subsequent calls are shifted so that no call is due within the revision validity period.

However, if a call is packaged in a revision, the plan date calculation of the subsequent call will depend on the configuration setting. If the configuration is activated, on packaging the notification to a revision, the next call planned date will be calculated based on the revision end date. While the context is valid if the notification is not completed. However, if the packaged notification is completed, the next call planned date will be recalculated based on the completion date of the notification.

Due Date is Past

In standard SAP, if a measuring document is posted in the past and the plan is started in the current date, all the calls due in the past are released with the planned date as current date. In the maintenance plan enhancement, the planned scheduling is modified so that the calls due in the past are released with the original past dates as planned dates.

Enhanced Deadline Monitoring for Maintenance Plan

A maintenance plan scheduling program is developed as a part of the add-on MRO maintenance plan enhancement. This scheduling program can be executed via transaction code /AXONX/IP30 or /AXONX/IP30_T and provides more flexibility in terms of the selection of maintenance plans for scheduling. The 'Deadline Monitoring' can start, schedule and release calls for a plan.

The following are the five groups of selection parameters required for maintenance plan selection scheduling:

1. **Maintenance Plan Scheduling:** Based on this selection parameter maintenance plans are selected for scheduling, depending on technical object or maintenance plan criteria.
2. **Processing Duration:** For the plans selected based on parameters, system will check whether calls are due within the duration specified in the selection screen or not. If no calls are due within this range, the plan will be eliminated and not considered for further processing. The duration is calculated based on the date and time of execution of the transaction.
3. **Call Interval:** From the list of plans selected based on "Maintenance Plan Scheduling" and

"Processing Duration," the system will identify those plans for which the call interval falls within the range specified in the selection screen. These plans will be selected for scheduling, and the remaining plans will be eliminated.

4. **Schedule Backdated calls:** Indicator is there to show whether the maintenance plans that correspond with the selection criteria are to be scheduled immediately, or whether a list of the selected maintenance plans is to be displayed.

5. **Additional functions:** This selection option is only available in transaction /AXONX/IP30_T. It provides an option to **log maintenance call calculation** for performance-based plan scheduling which gets influenced from other functions like PEST, revision etc., and provides the **deletion period** option, which defines (in days) how long the records will be kept in deadline monitoring call log table.

The selection for additional functions is controlled through configuration in /AXONX/IP30.

Remaining Life and Life at NOCO (Notification Completion)

The remaining life of an asset signifies the duration remaining before the next preventive maintenance is due. The duration can be based purely on time, or a counter value is reached. Remaining life is extremely helpful from a planning perspective as it provides forward visibility of upcoming maintenance demand.

Life at NOCO (Notification Completion) on the other hand provides the information of when a preventive maintenance call is completed. A comparison is made with the actual reading when the preventive job will get executed. Life at NOCO gives a clear picture of whether the call gets completed before or after the required date.

Remaining life and life at NOCO are captured in the same field. When the notification is open, it displays the remaining life, and after the notification has been completed, the same field will display the life at NOCO.

The parameters for calculation of remaining life and life at NOCO are configurable. The configuration involves defining the characteristics as fields, based on which the remaining life and life at NOCO will be calculated. From all the configured characteristics, A maximum of 5 characteristics can be identified dynamically from the measurement counters used in the maintenance plan and are used to calculate and display remaining life and life at NOCO.

Remaining life can be displayed in various transactions. The transaction codes can be maintained in the configuration in which remaining life needs to be displayed. Remaining life is also displayed in the MRO Maintenance Planning Workbench (MPW).

Call Log History Report

Selection

User can select maintenance plan for report.

Output

The report output is displayed in ALV format, highlights the calculation of the maintenance plan call dates, including all elements of the add-on's enhanced scheduling calculation (periodic estimate, revision, etc.).

Logbook

Overview

The SAP Logbook enables maintenance technicians to record defects and operational data against assets in operation and during maintenance activity.

The Enhanced Logbook functionality provided, caters for additional features which integrate SAP's Logbook with the surrounding add-on workbenches such as:

Feature	Electronic Work Instruction	Defect and Deferral
Integration	✓	✓

Logbook - Enhanced Features

The enhanced Logbook is an add-on component triggered by multiple events in the MRO landscape. The key elements of the MRO enhanced Logbook solution are:

Application Toolbar

Raise Defect Button

The engineer/ technician who discovers the defect raises defect records as log notifications from the logbook, which triggers the defect and deferral process. Log notifications are used to capture data about defective parts.

When the user creates a notification for a defective part, the system triggers the defect correction process by creating a notification to which a task list can be assigned and for which an order can create as per the add-on defect and deferral functionality.

The Defect pop-up is called from transaction /AXONX/EWI and LBK1 (logbook) and used to create defect notifications. While creating the defect notification, the planner group is either derived from the parent order (used to create the defect notification from EWI) or from the technical object for which the defect notification is being raised.

Defer Defect Button

If not completed in the same maintenance visit, the defect and repair work can sometimes be deferred. Optionally, a deferral work order is created to capture detailed requirements of the deferred work.

Deferred work can also include repeated tasks and final tasks.

Execute the EWI Button (Certifications and Completions)

After the completion of repair work, maintenance personnel can use the logbook to call the EWI workbench to complete the follow-on activities such as declare serviceable, technical completion, digital signature, clock off etc.

Pick List

Overview

Staging Area Pick List (Pick List) allows the user to mass process materials and tools (supplies) for reservations and deliveries (demand) in a warehouse or storage location. Pick List helps to organize the management of parts including searching for and finding the proper part, as well as helping to perform goods movements from the points of existing stock to the location or object where the part must be installed or is needed.

The two main functions of the pick list are stage and pick/install. Staging is the procedure to transfer supplies to another storage location or a kitting or staging location. Once the supplies are in staging/kitting location, those can be picked and installed.

The Staging Area Pick List workbench provides the following functionality:

- Picklist selection screen to search for demands by requirement date and numerous other criteria.

- Demands meeting the search criteria are listed in the Pick List, which is an ALV grid with columns that can be selected and sorted to suit the user.

- Various functions can be executed from the pick list ALV, like staging, pick / install, ATP check, sourcing, S\tock overview etc.

Staging Area Pick List Selection Screen

The Pick List selection screen contains '*Application Toolbar*' and is divided into *three sub-screens stacked vertically*.

Application Toolbar

Action buttons are in the application toolbar for easy access.

Execute

When data entries are ready and validated, execute button is used to view the pick list report.

Variant Name

The variant is a combination of preferred selection options and are created to operate the pick L\list.

Barcode Order

Barcode devices can be used to automate data collection, where manual recording can be time-consuming. In the pick list, inventory personnel can make use of bar code devices to read object numbers such as the work order.

Selection fields empty - revision, notification, superior network and activity, work order, work-scheduler if this option needs to be utilized.

Organization and Control Criteria

The Organization and Control Criteria panel is used to specify data in the selection screen. Using this panel, the user can filter the report by the organizational structure. The panel consist of multiple selection fields, wherein user provide details, to get data displayed in the form of output report.

The panel consist of **Pick List Schema** which controls functions like stage, unsource etc. in report output and manage the sorting of stock allocation and ALV list display.

If required, check the **Include outbound deliveries** to display all outbound deliveries.

Also, if required, check the **Include completed reservations,** to include fully withdrawn demand in report along with open reservation items.

Selection of reservations

In this group of fields, one can control what demand (i.e., reservations/delivery) needs to be considered for stock allocation.

Selection of special stocks

Specifically, control which special stocks are considered as valid supplies. The pick list schema determines how the checkboxes are defaulted. Pick List can read and retrieve stock data, for example, related to specific customer, sales order, project, or vendor consignment. Pick List only considers unrestricted stocks.

Staging and Picking List Output

The Pick List output report shows all demands per business rules that are defined in the pick list schema configuration. The output report lists all selected demands/reservations and sorts them according to the pick list schema. It shows the user in real-time the sourcing data and stock coverage of each reservation and allows the mass processing of goods movements against the reservations.

The Pick List report is tabulated with demand details (i.e., reservations/deliveries) using a default sorting order and stock allocation, from output report screen the user can perform all staging and picking functions.

On the toolbar above the report, the choose layout button enables the user to choose, change, save and manage the preferred layout of screen. The user can set one layout as default, which will be selected every time the user run the pick list. Double click, on a specific cell, will bring the user to the standard SAP transaction.

Application Toolbar

Pick List has several buttons in its application toolbar; all buttons can be found under the "Environment" drop-down menu.

Button - Refresh

Use this button to re-generate the pick list report with the same criteria as on the selection screen.

Button - Stage

Use this button to move stock(s) to the staging / kitting location.

The user can perform "Stage" on single or multiple demands — the goods movement items grouped by movement type.

Also, the user can implement their own grouping algorithm of goods movement item using BAdI.

To "Stage" a demand, select a single or multiple row with "Not staged" indicator, and click on the "Stage" button to move the allocated stock(s) to the staging/ kitting location.

Button - Pick/ Install

"Pick/Install" is another main function of pick list. It enables the user to withdraw staged stock and perform the installation (if necessary).

To perform Pick/Install, select a single or multiple row with "Staged" indicator and "Pickable" indicator, and click on the "Pick/Install" button to withdraw allocated staged-stock(s).

When the user clicks the "Pick/Install" button, the install/confirm parts popup is displayed, and the report gets automatically refreshed.

During "Pick/Install," Pick List updates the sourcing data (*/AXONXAPP/RESPLT* table) of the selected demand with the allocated stock(s).

Button - ATP Check
Use this button to view the ATP (Availability to Promise) quantities of all materials that can potentially satisfy the demand.

Button - Sourcing
Use this button to launch sourcing workbench for the selected demand to fulfill the demand displayed with the required supply. The Pick List report refreshes on exiting the sourcing supply list.

Sourcing data can be used to restrict what stock is to be allocated depending on the process sourcing data option in the pick list schema configuration.

Button - Reallocate Stock
This button instructs pick list to allocate all stocks based on the manually sorted report. Sorting plays an important role in matching demand against the available stock(s). The user can perform a manual sort and filter on the report to fulfill the unique needs at the time.

To start reallocating stock, the user can perform the sorting (if applicable). Select all demand, click the "Reallocate Stock" button to start reallocation of stock(s). Upon completion, the report refreshes with newly allocated stock(s) shown against the relevant demands.

Button - Display Element
Due to limited screen space in the pick list, information displayed is often limited. This button is to provide drill-down functionality on specific demand. Greater details of the demand are displayed in standard SAP transactions, dependent on the type of demand selected at the time the button is pressed.

Before drill-down, select a single row in the report. Press the "Display Element" button to display details of the demand in the standard SAP transaction.

Button - Stock Overview
Pick List utilizes the standard SAP transaction MMBE to display available stock for a specific material of a plant. Select a single row in the Pick List report and click the Stock overview button to view the available stock.

Button - View Allocated Stock
This button provides visibility of the stock allocated to a specific demand.
Button – Reverse Stage/Pick Stock
This button provides visibility of the stock already staged for a specific demand and allows the goods movement to be reversed.

Button – Unsource (configurable)
This button will reverse the process of sourcing, and related sourced Supplies for selected Demand(s) are deleted.

ALV Report Description

Demand Reading

The ALV report contains demand data details which comprise of reservations and outbound deliveries.

Also, the selection criteria of the details displayed on the screen are applicable for both (except some criteria, e.g., shipping point is only applicable for outbound deliveries).

Pick List only considers reservations with movement allowed, while outbound deliveries must have a picked quantity.

Stock Reading

Pick List retrieves all unrestricted stocks from the specified plant and special-stock-segment(s). In addition to the original demand material, interchangeable materials are considered as part of available stocks. Interchangeable materials include FFF (Form-Fit Function) classes and MPL (Master Parts List) alternates. Stock records are sorted by sort indicator, which is retrieved based on the storage location of the stock.

The sort of indicator in pick list staging/kitting locations plays an influential role in which stock gets allocated first.

Based on the configuration in sourcing for MPL determination, it will allow the user to select all the MPL nodes.

Stock Allocation

Demand (i.e., reservation/delivery) is automatically matched against supply (i.e., stock) top-down according to the sorting sequence. When both demand and supply have the same stock segment (i.e., special stock indicator & segment ID), the available stock is allocated to the demand. Transfer of ownership (i.e., across stock segment) is not available in the Pick List. This functionality is available in the MRO sourcing solution.

When the configuration is set to process sourcing data in stock allocation, then only unrestricted sourced stock will be allocated.

Once stock allocation is completed, the report is updated based on material and staging / kitting location of allocated stock(s). Due to the demand-split feature, a single demand could have multiple entries in the pick list report. Such a demand-split is necessary to enable goods movements to address the allocated quantities individually. Upon completion of demand-split, a specific traffic light is assigned based on allocated quantity and open quantity. "Stock coverage" from selection screen greatly influences the visibility of specific traffic lights. It is defaulted from schema details configuration.

Auto Slot and Auto Packaging

Overview

The MRO Auto Slot & Auto Packaging Solution is designed to underpin the process of scheduling complex maintenance tasks, particularly in the Airline industry. Due to the dynamic nature of Airline ground availability, it is important to generate slots for maintenance activities considering the availability of aircraft for maintenance. Once the slot plan for a maintenance event is fixed, the planner defines the content of work items for the slot, also referred to as work packaging.

For ramp maintenance planning, each ground stay can be treated as an individual maintenance slot, and then represented by a revision. So, for ramp maintenance, work packaging needs to be done in this short-term planning phase. Hence, the need for creation of slots automatically based on available notification data for maintenance and packaging.

Auto Slot & Auto Packaging is a tool which enables the planner to package routine and non-routine work items (notifications) into newly created slots (revisions) or into existing slots as for short term or long-term period.

Auto Slot Creation

Auto Slot creation can be executed for notifications, either as a background job or by executing transaction /AXONX/AUTOSLOT.

Notification Selection

Notifications can be selected based on values maintained on the selection screen. Notifications can either originate from a maintenance plan (single counter or multiple counter), MBX (fixed date or counter based) document, or can be created manually using transaction IW51. A match is determined, and a check is performed that the notification start date is within the revision creation horizon as defined in the configuration table based on notification type, planner group, check type and aircraft type.

Slot Creation

The slot is created for the selected notifications, depending on the selection mode. Selection modes influences the creation of revision and/or networks.

Selection Modes

- Typically, the slot is created using 'Normal Mode' in which an operative network and revision are created. The network is assigned to the revision and the selected notification is packaged into the created revision.
- 'Revision only' mode creates revision and packages the notification into the created revision.
- 'Project only' mode creates the operative network and assigns it to the revision if the notification is already packaged into the revision.

Parameters for Revision creation

Automatic Revision creation is based on settings maintained in Transaction */AXONX/SLOT_PACKAGE* explained as follows:

- **Revision Horizon & Time unit:** used to determine the maximum limit of creation of revision based on revision start date and time. If the revision horizon is calculated beyond the horizon from

current date, the revision will not be created. Maintain the unit of horizon for example day(s), month(s), year(s).

- **Revision Type:** This revision type is used for creation of Auto Slot.
- **Check Type:** This check type is used for creation of the Auto Slot. If both equipment and functional location are populated, then equipment number should be used for revision creation.
- **Work Center:** Work center is copied into the revision from the notification when the Auto Slot program is executed.
- **Operative Network Creation:** The system creates an operative network with reference to the standard network / alternative specified in the configuration table. It then populates the same operative network in the revision created for the call object.
- **Duration & Time unit:** The value in this field determines the validity of the revision created in Auto Slot. The revision end date can be calculated by adding the duration to the revision start date, which is the required start date of the notification.
- **HTL/**Executable Task-List **Duration:** The validity of the revision can also be calculated based on the work maintained in HTL/executable task-list operations. If this indicator is set and a task list is assigned to the notifications, then the total work maintained in the HTL/executable task-list is summarized and used to calculate the revision end date by adding the same to the revision start date, which is the required start date of the notification.
- **Maintenance Yield:** Maintenance yield is considered only when the notification is generated from a maintenance plan. The revision start date is determined by calculating the percentage of the difference between two calls of the plan. This field accepts both positive and negative values.

    - If the maintenance yield is positive, the revision start date is calculated by adding the maintenance yield to the planned start date of the call object.

    - If the maintenance yield is negative, the revision start date is calculated by subtracting the Maintenance Yield from the planned start date of the call object.

    It is to be noted that for the first call, the start date of the maintenance plan is taken as the reference.

    Maintenance yield has the lowest priority. However, if revision tolerance is maintained, it will be added / subtracted to the planned date calculated based on maintenance yield to determine the revision start/end date.

- **Revision Tolerance:** The value in this field determines the validity of the revision created in Auto Slot. This field also accepts negative value.

    - If the revision tolerance is positive, the revision end date will be calculated by adding the revision tolerance to the revision start date, which is the required start date of the notification.

        If the revision tolerance is negative, the revision start date will be calculated by subtracting the revision tolerance from the revision start date, which is the required start date of the notification.

Revision Start Date

If a revision tolerance or maintenance yield is set in the configuration, then the start date of the revision will be calculated according to the logic below:

- When there is no previous call (notification is for the first call in the maintenance plan), then the program determines the start date of the plan.
- For a second or subsequent call it picks the end date of the previous call object.
- If the notification is completed, then it picks the latest measurement document date before completion of the notification date and time and checks the next planned date.

- If the previous call object (notification) is still open, it picks the previous planned date & current planned date and then it calculates the yield.
- If the notification is packaged into the revision, then it picks revision end date (if the notification is not completed).

Revision End Date

Revision end date will be calculated as follows:

- If the duration is maintained in the configuration table, then the Auto Slot program will pick the duration from there (checkbox should not be ticked).
- If the checkbox for duration from HTL is activated, then it determines the task list assigned to the notification (either directly assigned or from the maintenance plan item) and creates a revision which has validity end date as the duration of operation defined in the task list.
- If executable task-list is maintained in notification, then it picks the summarized duration of operation and determines the end date of the revision.

Output Screen

The output screen showing revision information/message log is displayed, depending upon the 'Process Control Criteria' on the selection screen.

If the display result and display external log check boxes are checked, then first the revision information is displayed and then the user can view the message log, by clicking on the back icon displayed on the application toolbar.

Auto Packaging

The transaction /AXONX/AUTOPACKAGE enables the planner to package the routine as well as non-routine work items (notifications) into an existing revision (slot).

Notification Selection

A match is determined for the notification start date and the revision dates based on notification type, planner group, check type and aircraft type and the settings in /AXONX/SLOT_PACKAGE transaction. The matched notification is selected for packaging into the revision. The aircraft type is maintained in the additional data tab page against equipment type field.

The notification can either originate from a maintenance plan (single counter or multiple counter), MBX (fixed date or counter based) document or can be created manually using transaction IW51. If no match occurs for the notification the Auto Package function is not executed for the notification.

Auto Package Execution

The selected notification is packaged into the revision. The automatic packaging is executed based on settings maintained in transaction *ter /AXONX/SLOT_PACKAGE* explained as follows:

Parameters for Auto package

- **Package Yield in %:** Used only in the case of notifications created from maintenance plans. When a notification is generated from a maintenance plan then the Auto Package program will search for a suitable revision by calculating the % of the call interval and adding it to the plan date.
- **From Tolerance (%) and To Tolerance (%):** Tolerance is considered only when the call object (notification) is generated from a maintenance plan. For Auto Packaging based on tolerance, both from tolerance and to tolerance need to be maintained. Tolerance is used by the Auto Packaging program to determine a time period during which revisions will be searched. The revision start date will be determined by adding the tolerance to the planned start date of the call object. If

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

package yield is also maintained, then the tolerance will be added to the date determined based on package yield, rather than the planned start date of the call.

- **From Tolerance (+/-) and To Tolerance (+/-):** Tolerance in % for notifications not generated from maintenance plans. Tolerance will be used to determine a period within which the revisions will be searched. The revision start date is calculated by adding the from and to tolerance to the required start date of the notification. Tolerance logic will work only when both the fields from &To tolerance are maintained in the configuration.
- **Unit for Tolerance:** Unit of measure which is a time interval.
- **Revision Type:** The type of revision which is used for packaging of notification.
- **Priority or Tol.:** When multiple revisions are selected based on auto packaging logic, priority will influence the selection of the revision for packaging. Priority can either be based on revision tolerance.

Output Screen

The output screen showing revision information/message log is displayed, depending upon the 'Process Control Criteria' on the selection screen.

If the display result and display external log check boxes are checked, then first the revision information is displayed and then the user can view the message log, by clicking on the back icon displayed on the application toolbar.

Technical Object Change Management

Overview

The MRO add-on 'Technical Object Change Management' solution is a flexible framework providing the ability to trigger follow-up programs based on changes in either functional location or equipment master data. At the time of creation or change of the technical object, entries can be created in the MRO work list. Different changes can result in different types of work list entry, with different follow-up programs, based on the configuration of the technical object change management solution. In summary, technical object change management provides the following features:

- Supports generation of work list entries for equipment and functional locations based on:
  - Field changes
  - Characteristic changes
  - Status changes (User Status or System Status)
- Multiple work list entries can be generated for a single change in a field, characteristic or status.
- Supports characteristic inheritance for Equipment's. The characteristic can be inherited from the class assigned to the topmost technical object or the superior technical object. This includes the ability to define a fixed value at install or dismantle of the equipment based on configuration.
- Supports integration with technical object workbench based on work list entry.
- Supports creation of zero measurement documents for technical objects.
- Initiates background automatic processing of MPD Report functions on reading a worklist entry pertaining to MPD automation.
- Detailed SLG Log can also be viewed in TOW, for the technical objects (on create (or) change), the automatic MPD Reports processed in the background.

Generation of work list entry

A work list entry is created for an equipment or functional location, whenever a relevant field, characteristic or status is changed. Work list entries can be generated based on either field changes, characteristic changes, or status changes.

Integration with Characteristics Inheritance during Installation and Removal

This functionality is used to copy the characteristic values on the equipment being installed into or dismantled from a superior or topmost technical object. It is also possible to define a fixed value at install or dismantle of the equipment or copy the characteristic values into subordinate equipment based on configuration.

Integration of Technical Object Change Management with Technical Object Workbench

In cases where the change in the technical object requires user interaction; it is possible to create entries in the technical object workbench (TOW) using worklist entry.

Creation of Zero Measurement Documents for Technical Objects

A work list entry can be generated for creation of 'Zero Value' measurement document based on configuration. During the processing of worklist background job determines all the measurement points for the technical objects and creates a 'Zero Value' measurement document.

Detailed SLG Log for MRO MPD Report Modes

- Detailed application log per MPD Report Modes executed for the system date and time range between 00:00:00 hours until the above TOW Report executed system time per technical object (Equipment/Function Location), can be viewed in this new tab.
- This detailed log can be viewed for the MPD Report Modes run against technical object in both foreground and in the background.

Data Clean–up Utility

Each entry in TOW report gets created with a unique sequence number, this sequence number field can accommodate maximum of 7-digit number. There is possibility that after a certain period, sequence number reaches its maximum value and then starts overflowing. To avoid this situation, data clean-up/ utility program is used to deleted entries from TOW relevant table. Record with below conditions will be deleted during table housekeeping.

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

Maintenance Program Definition Enhancement

Overview

Airline maintenance and engineering departments, aerospace after-market support organizations and third-party maintenance, repair, and overhaul (MRO) service providers - as well as any organization which services, repairs, and overhauls complex equipment. Multiple objects and processes are involved in the planning or maintenance programs and the SAP Maintenance Program Definition (MPD) workbench is a central point of access for all these objects and functions. Maintenance engineers and planners use the MPD workbench to manage the maintenance plans associated with the maintenance programs they are responsible for, as well as to perform other related activity.

The MRO add-on maintenance program definition enhancement introduces additional reports and functionalities into the standard MPD framework and forms part of the industry solution for maintenance, repair and overhaul, MRO add-on, particularly for the aviation, aerospace, and transportation sectors. Additionally, introduces background jobs for the Maintenance Program Definition Reports framework processing and integration of its processing results into Technical Object Workbench for taking further manual actions.

In summary, the MRO add-on maintenance program definition enhancement provides the following features, the following additional reports have been integrated in the standard SAP maintenance program definition workbench:

- MRO effectivity
  - Link documents to technical objects
  - Link technical objects to documents
  - Switch between maintenance plans based on effectivity
  - Phase out technical objects based on object status.

- MRO unique start date
  - Specify start date for documents / technical objects

- MRO offset maintenance
  - Specify offset for start date

- MRO work status
  - View notifications and orders for maintenance plans

- MRO MP create
  - Create maintenance plan

- MRO MP update
  - Update maintenance plan

- MRO MP Start
  - Start Maintenance Plan

- MRO MP Update
  - Update Maintenance Plan

- MRO MPD Versioning
  - Update the active version of document for the Maintenance plan calls (Notification & order)

- iMRO MPD Compliance
  - Reports Compliance deviations for the critical compliance fields of the Maintenance requirement document and its previous version

Based on configuration of Document type an application log can be created for all the above reports. The log can be accessed using transaction SLG1.

Maintenance Program Definition Enhancement

The SAP Maintenance Program Definition (MPD) component provides a workbench that the user can use to transform complex maintenance requirements into maintenance plans within SAP.

The user can use the MPD workbench to ensure compliance with safety regulations and adherence to national requirements. The MPD workbench helps to prevent failures that cause disruptions to operations with minimum maintenance costs and downtime.

Input Screen

The input parameters for MPD can be one of the following:
- Document
- Functional Location
- Equipment

If a technical object (Functional Location or Equipment) is specified in the selection screen, the report shows all documents in the ALV display. If instead, a document is entered in the MPD selection screen, then the ALV display will show a list of the technical objects.

MRO Effectivity

MRO effectivity is available in the 'Reporting Mode' dropdown in the standard maintenance program definition workbench (Transaction *MPD*).

The MRO effectivity gives users the ability to link documents with technical objects (Equipment/Functional Location) based on the effectivity matching criteria. i.e., the characteristics of the document should exist in the technical object with the same values.

In the reporting mode, select the MRO EFFECTIVITY from the drop-down list. Having selected MRO EFFECTIVITY, click on Run button to display the results according to the selection inputs made in the left selection screen area of the MPD workbench

Linking Technical Objects to Documents

To link the document with the technical object, select the document or technical object (depending upon the selection option) and click the 'Update Object Link's button

A message is displayed to confirm that the selected document and technical objects are linked.

Switching between Maintenance Plans

Once a characteristics value on a technical object changes, the active maintenance plan may no longer be valid and a different maintenance plan from a linked controlling document needs to be activated. Switching activates/deactivates the correct maintenance plans based on current effectivity.

To switch between maintenance plans the select the document and click 'Activate/Deactivate MPlan' button. For switching, the controlling document must be maintained with method type 'Based on Requirement Relationship' in the 'Embodiment rules'2 tab and linked using horizontal relationship. The documents with method type 'Based on Single Document' cannot be switched but can be

'Activated/Deactivated' individually. For the document having method type 'Based on Single Document' method also needs to be additionally maintained, in the embodiment rules tab for the controlling document.

Upon deactivation, all the active notifications are updated with a configurable user status and are rescheduled with a future date 01.01.3169. On MPlan activation, the user status maintained for MPlan deactivation in customizing is removed and the user status for MPlan activation is set.

An activation flag for add-on is set/unset (instead of SAP standard activation/Deactivation of the Maintenance Plans). The flag is also visible on the report display.

The following methods for activation of maintenance plans can be maintained manually in the maintenance requirement document for method type 'Based on Single Document':

- Activate based on last NOCO date and zero consumption period
- Start based on activation date
- Custom activate/deactivate MPlan
- Bridging check
- Manual

MRO Unique Start Date

Unique start date is a report available in the standard Maintenance Program Definition Workbench (MPD in the reporting mode, select the 'MRO UNIQUE START DATE' report from the drop-down list. Having selected 'MRO UNIQUE START DATE', click on Run button to display the results according to the selection inputs made in the left selection screen area of the MPD workbench.

There are two sub reports for the MRO unique start date Report:

- No Start Date Report
- Start Date Report

No Start Date Report

This sub report displays the linked pairs of technical objects and documents (linked for example via the MRO add-on effectivity report as described above) for which no start date has yet been entered. Here the user can enter the start date of the maintenance plan that is to be created for the technical object as per the plan parameters in the document.

After entering the start date, save changes by pressing the 'Save changes' button. This also assigns the cycles specified in the document to the respective counters of the technical object. This assignation is based on the unit of measure of the cycle, and if there are multiple counters with same unit in the technical object, a pop up will be shown to the user, to select the appropriate counter.

A message showing the successful assignation of cycle to the counters will then get displayed.

Start Date Report

Once the start date is saved and intervals are assigned to the counters of the technical object, the start date report is displayed. The start date report displays the document and technical objects for which the unique start date has been entered and saved.

MRO Offset Maintenance

Offset maintenance report is available in the standard maintenance program definition workbench (MPD).

For a given document or technical object, the report displays the linked pairs of technical objects and documents for which the start date is saved, and cycles are assigned to the counters of the technical object. In this report the user can enter/edit the offset value to start the maintenance plan for a combination of cycle and measurement point.

MRO Work Status

Work Status is a report available in the standard maintenance program definition workbench.

This report displays the notification and subsequent order details that are generated from a maintenance plan for a combination of document and linked technical object. From and to dates for the report to display the details can be entered in the selection screen.

The display of subsequent orders of notifications is controlled by the get orders for notifications check box in the selection screen.

The errors/information messages can be viewed by clicking on the **Except. Log** button.

MRO MP Create

MP Create is a report available in the standard maintenance program definition workbench.

This report can be used to create the maintenance plan as per documents and effective technical objects based on maintenance plan decision. This report has an added feature over standard MP create report which adds the mod details in the customer enhancement screen of the maintenance plan.

There are a few prerequisites for this report:

1. Technical Objects should be linked with the document.
2. Unique start date should be maintained as well as unique start date decision maintained at document level and counter should be assigned to maintenance cycles.
3. The document should be released.

MRO MP Update Report

MRO MP Update is a report available in the standard maintenance program definition workbench. This report can be used to update the maintenance plan as per documents and effective technical objects. It creates or updates the mod details in the customer enhancement screen of the maintenance plan based on 'Maintenance Plan decision' and also updates the scheduling period if any cycle data is changed.

Following are the prerequisite for this report:

1. Technical objects should be linked with the document.
2. Unique Start Date should be maintained as well as unique start date decision maintained at document level and the counter should be assigned to maintenance cycles.
3. The MPD Workbench Flags are automatically updated, based on document information changes, for the current and for the new version of the document of MPD.
4. The document should be released.

MRO MP Start

MP Start is a report available in the standard maintenance program definition workbench.

This report can be used to start the maintenance plans created as per documents and effective technical objects.

These reports generate the number of call numbers as per the scheduling period calculated in the maintenance plan.

Note: Calls created are not released by this report.

MRO MPD Versioning

MPD Versioning is available in the reporting mode dropdown in the standard MPD transaction.

The purpose of this report is to present, flag and control the previous version operative notifications selectively using the business rule determination logic and transfer them to the new version of the 'MPD relevant' Maintenance requirement documents, assuming the maintenance plan decision set is as 'Always Transfer'. . Based on business rule determination an 'Exclusion flag' will be set automatically for those notifications (by status) which are not to be transferred to the newer version. These notifications will be excluded from further scheduling.

MRO MPD Compliance

MRO MPD Compliance is available in the Reporting Mode dropdown in the standard MPD transaction. These reports can be used for verifying deviations for the critical compliance fields of the Maintenance requirement document notification and its previous versions, assuming the maintenance plan decision is set as 'Always Transfer'.

The ALV of the compliance report presents the compliance fields information for the current version as against its immediate previous version as two rows for each operative notification. Any discrepancy between the previous and current version of the compliance fields for the document version and its affected operative notification, will cause the cell to be highlighted in RED along with an overall status icon and detailed message view.

The mandatory compliance fields are as follows:

Compliance fields	Compared between document versions	Compared between Notification's Mod Detail Tab & MOD Task List.
Planner group	Yes	
Maintenance work center	Yes	
Check type	Yes	
Due date		Yes
ATA System code	Yes	
Aircraft position	Yes	
Task list type		Yes
Task list group		Yes
Task list version		Yes

Background processing of MPD reports

The MRO MPD Effectivity, Unique Start Date, Unique Offsets MP Create and MP Start Reports are executed in the foreground through the standard transaction 'MPD', and in background through the Program /AXONXAPP/CALL_EFF_CHG_JOB_RPT. The report is triggered using the 'Technical Object Change' Framework.

The following functions are performed within the background job process, for the respective Technical object being created/changed:

- Link the technical objects to its applicable MPD Documents by matching effectivity characteristics values maintained in the document with that of the technical object.

- Generate MPD Cycle data and link the above applicable technical objects to it.

- Activate/Deactivate related Maintenance plan based on the changes in the characteristic values of the classification maintained in the technical objects.

- Sets the Unique start date (MPlan Start Date & the Effective Start Date for its scheduled calls) of the maintenance plan for that specific applicable technical object, based on configuration settings

- Takes the Header Offset as maintained in the document and defaults them for each selected technical object. Unique offsets are maintained manually if required.

- Create Maintenance Plan for the selected technical object.

- Start the Maintenance Plans. For generating the Plan, it is advised that the first call is set to be generated automatically in the configuration. Detailed log and any exceptions during processing the above individual MPD Reports in background are captured, stored and reported through TOW separately.

At the time of creation or change of the technical object, entries can be created in the MRO Work List. The worklist creation can be influenced based on customer defined logic using the BAPI_ALM_NOTIF_CHANGEUSRSTAT embedded in BAdi "MPD_RPT_TBOX-MP" for this purpose. Different changes can result in different types of Work List entry, with different follow-up programs, based on the configuration of the Technical Object Change Management Solution. And in case of the same called for the MPD document upon release, these are executed through background automation program 'Change Effectivity Report (/AXONXAPP/CALL_EFF_CHG_JOB_NAM 2). This report is triggered through the 'Document on Release' framework & the 'Technical Object Change' framework.

Note: The job for creating Zero Value Measurement document also should be set up as the pre-requisite for the above background MPD automation run.

Flight Sector and Line and Transit Package Generator

Overview

The MRO Flight Sector Solution (FLSC) is essentially a database to store seasonal flight schedules with integration to the MRO add-on flight planning app, logbook application and other SAP plant maintenance technical objects such as functional locations, equipment, measuring points and measurement documents. The MRO FLSC allows effortless generation of future seasonal flight schedules from the original seasonal flight schedule, as well as changes to these seasonal flight schedules.

The generated flight schedules are integrated and viewable from the logbook application.

The MRO 'Line and Transit Package Generator (LTPG)' is part of the MRO maintenance demand generator, a set of functions designed to support maintenance planning by automating the creation of the data required to perform the planning. LTPG is closely integrated with the flight sector solution and can be used to automatically generate maintenance slots (Revisions in SAP) and notifications for the planned downtime between scheduled flights.

Features Summary

Flight sector forms part of industry solution for Maintenance, Repair and Overhaul (MRO®), particularly for the aviation, aerospace, and transportation sectors as an add-on to SAP® Enterprise Resource Planning. In summary, organization flight sector provides MRO service providers, which are engaged with airlines either for fleet management or third-party maintenance, with a set of applications containing the following features:

- Allows generation of scheduled flight records either from a seasonal record with flight frequency pattern or interfaced from an external flight operation planning system.
- Manages flight schedule and actual data including departure and arrival locations, date/time/zone, hours, and cycles, turn-back, auto-land, extended twin operating etc.
    - Flight hours and cycles are recorded for gate, take-off and engine start/stop with option to add customer-specific measurements.
    - Hours and cycles measurements can be customized to automate measurement document and factored measurement
- Automatic posting of factored measurement documents for equipment such as APU, based on a pre-determined ratio of engine hours and cycles.
    - Factors are calculated based on look-up tables for any combination of tail number or aircraft characteristics, such as flight type, equipment category, operating condition etc.

Actual flight schedule influences maintenance plan schedule and line maintenance execution procedures in MRO maintenance planning workbench. Based on mapping the flight records such as engine start/stop or aircraft take-off/land, measurement documents can be automatically posted from the actual data recorded in the flight schedule.

Factored measurement documents are required when the rate of accumulating flights or cycles on one piece of equipment is a factor of another. For example, the APU cycles might equate to 1.4 times the number of engine cycles. Factored measurement documents can be automatically posted, cancelled, or reversed based on a source measurement reading multiplied by a factor, where the factor is in turn calculated in SAP based on tail number or equipment classification through an SAP variant table.

The planning department of MRO Add-on service providers can use the flight sector solution to plan for short-term line maintenance as well as for heavy maintenance based on the expected flight schedule.

Each flight record can be uniquely identified by a flight key. Each flight passes four stages, as follows:

- **Seasonal header information** records the valid from/to date and frequency of a flight (e.g., every day, every Monday and Wednesday etc.). Only applicable for flights planned in SAP.

- **Planned flight data** records the planned flight data, per the flight schedule.

- **Scheduled flight data** records changes to the planned flight data as a result of operational constraints – before the flight is taken.

- **Actual flight data** records actual flight data as it occurs.

From a process perspective the following activities normally occurs:

- Maintain seasonal flight master data with transaction code */AXONX/FLTMNT*3.

  - The system performs validation against the flight master data tables (carrier ID, organizational data, log entry type, station codes, reason codes, measurement characteristics, equipment, functional location etc.). Upon saving, the flight seasonal record will be generated.

- Generate flight data plan details based on the seasonal flight maintained earlier or via the flight operations system interface.

- Within the flight details or logbook application (with standard SAP transaction code *LBK1*). Maintain the scheduled and actual flight data. If the "With Log ID" indicator is checked, then a logbook ID will be automatically created.

- Through the LTPG component, transit check maintenance revisions and notifications can be automatically generated for the period between each flight, based on task lists maintained in the LTPG master table, via a background process.

- DFPS flight orders can be synchronized with the MRO add-on flight solution workbench.

The main features within the FLSC outlined in this section cover:

- Maintain seasonal flight master data.

- Generate planned and scheduled flight data from this seasonal flight master data with flight details as per frequency code and validity period maintained.

- Maintain actual flight data and generate Log IDs for integration with SAP Logbook application.

Maintain Seasonal Flight Data

Create Seasonal Flight Data

Airline operators produce seasonal flight schedules (e.g., for every quarter of the year) which indicate departure and arrival stations, and frequency of travel to the destinations. In these seasonal flight schedules, aircraft types are specified as well. New seasonal flight records are created with the frequency of a flight change, for example, during a period when travelling patterns change or to reflect changes to the airlines timetable.

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3 Please enter /n and then followed by then transaction code itself for all MRO Add-on transaction codes. For example, transaction code */AXONX/FLTMNT*, should be entered as */n/AXONX/FLTMNT* in the command field.

With this information, short and long-term plans for maintenance (for both line and base maintenance, either for fleet or third-party aircraft) can be derived. Equipment or aircraft usage ratios (annual estimates in SAP) can be calculated based on each seasonal record and the planned number of flights and flight hours during the season.

Equipment (aircraft equipment or master equipment records) can be optionally assigned to the flight seasonal header record. Flight operators would only do this, if the same equipment is being used for a given flight throughout the entire season, though equipment assignments can be edited on individual flights.

Use transaction code /AXONX/FLTMNT to maintain seasonal, planned, scheduled and actual flight data.

Note: The user must have authorization object **J_2XFLTSCH** assigned to the user ID in-order to run this flight sector transaction.

In the flight sector initial screen, select radio button "Maintain seasonal flight" and enter the mandatory carrier ID field for the airline for whom the seasonal schedule needs to be maintained.

Click the "Execute" button in the initial screen, in the next screen select the "Create" icon and enter the details for the seasonal flight schedule in the mandatory and appropriate fields. Once entries are completed, then save them and the data will be populated in flight seasonal header table. A message will be displayed that flight header has been successfully created.

Flight Attributes
The following fields in the flight database have special meanings:

Departure date/time	Date and time of departure in the time-zone of the departure station (literally, time of pushing back from gate).
Arrival date/time	Date and time of arrival in the time-zone of the arrival station (arrival at gate). Flight duration is automatically calculated based on arrival date/time minus departure date/time.
Take off & landing	the actual takeoff and landing times may be optionally recorded separately to the flight departure time.
Engine start / stop	the actual engine start and stop time, and cycles, may be optionally recorded separately to the flight times.
ETOPs indicator	Indicator for extended twin engine operations (ETOPs) on the flight. Only aircraft equipment which are certified for ETOPs can be used for ETOPs marked flights. This field is used for reporting purposes.
AWOPs indicator	Indicator for weather operations for the flight. Special requirements apply to all weather flight operations. This field is used for reporting purposes.
Autoland indicator	Indicates that auto-land is required. In aviation, auto-land describes a system that fully automates the landing phase of an aircraft's flight, with the human crew merely supervising the process. This field is used for reporting purposes.

De-ice indicator	Indicates that de-icing may be required before take-off because departure station is in a cold weather zone.
Turn-back indicator	Indicates that the flight was turned-back to the departure station.
Touch and go cycles	Training etc. flights may incorporate numerous cycles (touch and go).

Change Seasonal Flight Data

The user can perform changes to existing seasonal flight data through the following steps:

- Identify the appropriate flight number on the left navigation pane and double click on the seasonal record valid-from date.
  The seasonal flight details will then be populated in the right pane of the screen.
- Select the "Change" icon in the application toolbar. All fields except carrier ID, flight number, valid-from date, sector number and frequency code are enabled for update.
  Perform the necessary changes.
- Click Save, the system will perform validation, if data has already been generated for this, the system will prompt: "If the user would like to change the seasonal data".
  Data saved will be populated in the flight header table and a message log will be displayed stating that changes have been successfully updated.

Generate Planned Flight Details

The next step is to generate flight details for the seasonal flight master data maintained earlier, with planned data for one flight being generated on each date within the valid-from and valid-to date range of the seasonal record, as per the customization of the frequency code.

- Use transaction code */AXONX/FLTMNT.* Select radio button "Generate Flight Data" and click on execute after maintaining the Carrier ID (mandatory) and flight number (if known).
- In the left pane of the generate flight data screen, identify the flight number and valid-from date, if more than one seasonal flight record exists.
- Double click on the seasonal flight record. The details will get populated in the right screen area.
- Click on the generate flight data icon in the application toolbar. One planned flight is automatically generated for each date between valid-from and valid-to, according to the frequency code.

Please note that the planned date for each generated flight is the planned departure date of a flight which crosses over mid-night.

- A report with status of each generated planned flight is shown on the right screen area.
- In the event this is the initial generation for flight data details, the status "traffic light" displayed will be green. However, if the planned flights previously existed and are being regenerated, then the report displayed will have traffic light status as follows:

  o **Green traffic light** – Planned flight details does not yet exist and will be generated upon saving.

  o **Grey traffic light** – Planned flight details already exists (this occurs when regeneration is performed).

  o **Yellow traffic light** – Planned flight details will be updated or deleted.

  o **Red traffic light** –Flight actuals already exist and cannot be deleted.

Maintain Scheduled and Actual Flight Data

The user can maintain or update the scheduled and actual flight data details created earlier, using the following steps:

- Use transaction code */AXONX/FLTMNT*.
- Select the "Flight Schedule" radio button, input Carrier ID (mandatory) and flight number (if known) and click on the execute icon in the application toolbar.
- Once *EXECUTE* is pressed, the planned flights for the selection are displayed in the left-hand hierarchy window.
- Identify the flight number and double click on the planned (departure) date in the left navigation pane.
  The right area will be populated with details for that actual start date.
- Click on the "Change" icon in the application toolbar to open fields for maintenance of scheduled and actual flight data.
- Change the scheduled or actual departure or arrival date, or time, time-zone, or airport (station and terminal). Any changes will prompt a pop-up window requesting the user to select the reason (select F4 key) for the flight change, delay, or diversion. The customized reason codes are required to be maintained.
- Maintain the fields in the technical details sub-screen to create log ID upon saving. The remaining option of 'Un-assign log entry' is displayed.

To maintain the actual flight details, follow the steps:

- Go to the initial selection screen of *AXONX/FLTMNT* and select the 'Flight Schedule' radio button, also select the check box 'With Transit revision & order' and then click execute.
- After the details have been entered in the flight schedule screen a popup for logbook creation is presented. System displays the success messages for measurement documents posting.

Flight Order Integration

Flight orders are special type of maintenance orders that contain an aircraft's flight-specific data. They support the planning, execution, and completion of actual flights. In order to generate the flight orders, the EA-DFP (DFPS-LM-GEN) business function needs to be activated.

Flight orders generated in the SAP DFPS industry solution can be integrated with the MRO add-on flight solution. Based on the configuration of the MRO add-on flight solution, it is possible to generate flight records based on flight orders.

Integration with Logbook

The SAP logbook application is used to capture operational data against measurement points, which in turn trigger maintenance plans. Integration to the logbook application in MRO FLSC allows the user to create log entries from the FLSC, to view the flight detail and to edit the flight actuals from the SAP logbook application. This solution can trigger the creation of a Log ID in the SAP logbook. Authorization checks can restrict access to create Log IDs.

To view the associated flight data in the Logbook application, use transaction code *LBK1*:

- Identify the logbook (functional location logbook), click on the selection icon in the left navigation pane.

Once the tail number (functional location) is identified, the user can view the log entries in the left navigation pane listed by logbook IDs generated from the MRO FLSC.

To work on flight detail:

- Select the relevant log entry with the appropriate date in the left navigation pane and click on the edit icon in the application toolbar.
  The logbook screen will show the actual flight data in the right pane.
- Maintain the actual flight data.

Flight Linkage to Logbook ID

The user can create, cancel, assign and un-assign log entry from the flight detail screen in FLSC by selecting on the down menu of the button in the technical details sub-screen.

Create log entry

- Select the create log entry, a new log entry is created either with internal numbering or the external ID that is entered.
- The flight details table gets updated with the log ID that has just been created.
- If the external log ID entered on the screen already exists in the system for a different carrier, an error message is issued to the user. If it belongs to the same carrier, a warning message is issued.

Un-Assign log entry

The un-assign log entry is performed, in case the tail number re-assignments to flights are made.

In such a case, the user might wish to un-assign a previously created log entry from a tail number.

Creation of Measurement Documents

Measurement documents are posted with actual flight data to record aircraft equipment utilization, such as actual flight hours and cycles. Although measurement documents can be posted via the standard SAP transaction (*IK11* or *IK14*) or via the flight operations data interface, the MRO add-on flight schedule solution enhances the SAP logbook measurement document generation feature to generate measurement documents for any utilization characteristics.

Creation of Factored Measurement Documents

Factored measurement documents are used to record measurements on pieces of equipment on the aircraft whose utilization depends on a "factor" or multiplication of an aircraft characteristic. For example, the number of flight cycles on an auxiliary power unit (APU) might be 1.2 times the number of flights the aircraft itself takes, to account for additional APU cycles normally taking place on the ground.

Factored measurement documents are automatically calculated and posted in place of recording actual utilization of the equipment with factored measurements. If the number of APU cycles is being physically recorded, then no factoring is required.

If required, factored measurement documents are calculated as follows:

- The aircraft measurements (such as flight hours and cycles) are inherited down the equipment structure to the equipment which contains factored measurements (e.g., APU). This inheritance is

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set up using the *MeasReadTransf. Copying required* indicator4 in the lowest level measuring point to transfer the values. The equipment in question should contain both inherited and factored measurement characteristics.

- A factor is calculated as follows:

  - Classification of the aircraft equipment is determined and compared to characteristics specified in the variant table for the measurement point category in the MRO add-on factored measurement document customizing,

  - The variant table is read to determine for any characteristic values on the equipment, the value of the factor. The factor is represented by the characteristic specified in the MRO add-on factored measurement document customizing.

The original measurement document value is multiplied by the factor and the result posted against the factored characteristic on the target equipment (e.g., APU).

The system will then validate the customizing table, if factored measurement documents are activated, call a function module5 to create an entry in the MRO add-on work list. Then, a background job (program */AXONFLT/FMDOC_BGJOB*) will gather data from the worklist database (*/AXONXAPP/WLDB*) and create factored measurement documents. The creation of factored measurement documents can also be triggered by an SAP event. Set the event via transaction *SM62*.

Post Factored Measurement Documents

Upon saving, factored measurement documents will be posted. The system will validate if all equipment's have characteristics.

In this scenario, the system will select the measuring point with the closest and lowest match of characteristic value. If all equipment's have only some of the characteristics, then it will take the measuring point with blanks as wildcard.

This is because measurement readings can only be copied from one measuring point to another if both measuring points have the same characteristic. Counter readings can only be copied from one counter to another if both counters have the same characteristic. Note that the status code in the measurement document will now be X.

Reverse/Cancel Factored Measurement Documents

The system can reverse or cancel factored measurement documents via the same program described above.

The user can reverse a factored measurement document by calling transaction code *IK12*, and in the menu bar selecting *Measurement Document > Functions > Reversal Indicator > Set*.

Upon saving, system will set the factored measurement document status code to R.

SSIM Upload procedure

This functionality enables the user to upload the flight header details. Use transaction code /AXONFLT/SSIM.

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[4] To ensure that measurement readings can be transferred, you must assign another measuring point to the current measuring point, from which the measurement reading difference can be transferred. Then, in the higher-level measuring point Additional Data dialog box, maintain the number of the measuring point that the data should be copied from. Of course, you need to make certain that the characteristic of the measuring point, at which the measurement reading was entered, must correspond to the characteristic of the receiving measuring point. If it does not, then the transfer will not be possible. For details on setting up data inheritance from measurement point to another to inherited measurement documents, please refer to SAP online help.

[5] Function module: */AXONXAPP/CREATE_WORKLIST*

SAP Enterprise Asset Management, add-on for MRO 8.0 by HCL for SAP S/4HANA 2022

- Create a text file containing the entries to be uploaded and select the file name in the selection screen of the transaction /AXONFLT/SSIM.
- Also, select the fleet type.

  Please note this fleet type should match with the uploaded template fleet type value.

- Select the file and fleet type then execute. Select the file from the desktop. Once the upload has completed you can view the success / error log details.
- The user can view the uploaded flight details in transaction code /AXONX/FLTMNT under seasonal flight.

Component Induction App

Overview

The Component Induction app provides an easy way to induct a third-party component for maintenance, repair, or overhaul. The Component Induction app allows the user to perform the following actions:

- Create Notification
- Create Sales Order
- Create Return Delivery
- Goods Receipt
- Repair Order
- Stock Movement
- Goods Issue

Landing screen

Advanced search - Advanced search provides a set of filter criteria to filter the notification list. Following filters are available:

Notification, notification type, material, serial number, equipment, functional location, sales order, notification date, revision, order, planning plant and customer.

Notification list table - Notification list table displays a list of notifications as per the selection criteria entered.

Click on the notification list will navigate to the notification details screen if the notification type is an induction notification.

Create Notification button

Create notification button launches a new screen to create a new induction notification. After entering the mandatory information, a notification is created by clicking on save button. User has an option to navigate to the detail screen by clicking 'Notification' button in the message Popup.

Notification details screen

This screen consists of notification header details, workflow tab bar and execution step form.

Notification header details provides key details of the notification.

Workflow tab provided the possible execution steps for the induction notification based on configuration. Icons in the workflow tab will appear in three colors:

- **Amber** represents an executable step.
- **Green** represents a completed step. User has an option to navigate to the completed step to view the information of the corresponding step.
- **Grey** represents a step currently not available for execution in the current step.

Execution step form

Execution step form will have screens and/or forms for the various execution steps configured.
- An action button toolbar is available on the execution step to perform related actions on the current form. Each step can have the following buttons in the action button toolbar:**Save button:** User must maintain the input and click on the save button in 'Action Button Toolbar'

to complete the execution step. The button is available if the form has any input fields.

- **Execute button:** The button is used to execute the action of the step where no input fields are present.
  Note: Either save or execute button will be present on the execution step action button toolbar.
- **Cancel button:** It can be used to clear the input fields in the form.
- **Planner comments:** User can enter planner comments by clicking on the planner comments button in the action button toolbar
- **Release button:** To release repair/sub-order. The button is only present on 'Repair order' execution step and is only active if order is not automatically released upon creation.

Following are the execution steps available in the app:

Create Sales Order

In third party scenarios, the sales order is used to track the work progress, and as a basis for billing and invoicing the customer once the maintenance is complete.

User needs to enter the organizational information and reference data to create the sales order.

Create Return Delivery

When creating a return delivery, a screen is opened with all the data pre-populated entered while creating the sales order. User has an option to change the delivery date. Clicking on save button will create the delivery.

Goods Receipt

Executing this step will receive the material into stock against the return delivery and on the click of 'Execute' button a material document will be generated.

Repair Order

This action is used to create a single repair order for the inducted component(s).

In component scenarios where the main order is a refurbishment order, additional orders can be created as sub-orders to the main refurbishment order. Task list details corresponding to the service material is displayed. Order number is updated once the repair order is created. If the config is set to not release the order upon creation, then user needs to click on 'Release' button in the action box toolbar to manually release the order in order to perform goods issue.

Stock Movement

Executing this step will move stock from restricted to unrestricted, to be executed prior to issuing components to the repair/sub-order. This action allows the goods issue to be carried out on unrestricted use stock, as opposed to blocked stock as required by the SAP standard refurbishment process.

Goods Issue

Execution of this step will issue end item component(s) to the repair/sub order before work can commence. The component(s) will need to be in unrestricted use stock.

Line Maintenance App

Overview

The Line Maintenance app provides a simplified user interface that is technician friendly and provides the required information to the line technicians to perform their job from one place.

The app provides features to view flight schedule details, maintenance history of aircraft, and logbook functionality.

Landing screen

Variant management

Users can create variants in the Line Maintenance app as required and set as default. Whenever the user launches the app, the saved variant will be applied automatically to get the list of flights. If no variant is available, then user needs to enter filter criteria to generate the flight list. At least one filter criteria are required to generate the list. Multiple variants can be created and used as required. The app provides features to create, update and load the variant manually.

Advanced search

Advanced search provides a set of filter criteria to filter the flight list.

Following filters are available:

- **Flight Key**
- **Functional Location**
- **Flight Station**
- **Flight Date**
- **Flight Time**
- **Carrier ID**
- **Flight Number**

Flight list

Flight list table displays a list of flights as per the selection criteria entered.

Clicking on the flight list will navigate to the general information tab of the flight detail screen.

Flight Detail

Flight details display the key header information for flight and corresponding details in the following tabs:

- **General Information**
- **Technical Log Defects**
- **Maintenance List**
- **Deferred Defects**
- **Technical Log History**
- **Work List**
- **Material Document List**

Notifications with completed system status (NOCO) are displayed with green color and all other statuses are displayed with amber color.

General information

In this tab actual, scheduled and planned details of the flight is displayed along with the functionality to update actual values for date/ time, oil, and fuel uplift.

Edit Button

Edit button allows to enter the details of actual departure date/time, departure station, arrival date/time, arrival station, oil uplift 1, oil uplift 2, oil uplift 3, oil uplift 4, fuel uplift. Click on Save to save the data. Click on 'Cancel' button to cancel the user input without saving. Click on Save & Cancel button will navigate to general information screen.

Oil Uplift Button

This will display the oil uplift values for all the engines for the flight (Log Entry) in the form of bar chart. It will show all values for oil uplift. User can filter the oil uplift values by selecting a specific engine from the chart dropdown.

Fuel Uplift Button

This will display the fuel uplift values for the flight (Log Entry) in the form of bar chart. It will show all the values for oil uplift.

Technical log defect

This tab display List of all technical log defects created for the flight (Log Entry) along with the functionality to create new defects using create defect button. User can also check the inventory for a specific material using Inventory check button.

Create Defect Button

Create Defect button launches a 'Create defect' screen. After entering the mandatory information, a notification is created by clicking on save button. User can also attach the pdf documents from the local machine related to the defect. User can also create the defect order.

Inventory Check Button

Inventory check functionality is only available for defect notification for which an order exists. Select a defect which has an order created and click on the Inventory check button. It will launch a new screen inventory search. Enter the material number and click on 'Execute' button to get the 'Available Stock list'.

Maintenance List

Displays a list of notifications (open and closed) created for the aircraft which can be filtered based on date range. By default, notification for past two weeks get displayed. User has an option to select the open and historical Notifications.

Deferred defects

Displays List of all notifications created from defect deferrals.

Technical log history

Display the collapsed hierarchy for the technical object. User can expand the hierarchy to see the log entry, notification, measurement document with their corresponding object Information in the right pane.

Hierarchy Object	Level of the Hierarchy object
Technical Object	Level 1
Log Entry	Level 2
Notification, Measurement Document	Level 3

Work list

Displays the list of all revisions created for the flight along with the packaged notifications and orders.

Material Document list

Displays the list of all goods movement posted against the work orders packaged inside the revision for the flight.

APIs Delivered

API Name	Functionality Description
/AXONUIBC/NOTIF_DEF_CRE_GET /AXONUIBC/NOTIF_DEFECT_CREATE	Read & Create
/AXONUIBC/LMA_DEFECT_LIST	Read
/AXONUIBC/LMA_DEFER_NOTIF	Read
/AXONUIBC/NOTIF_DEFECT_READ	Read
/AXONUIBC/LMA_DEF_NOTIF_STATUS	Read
/AXONXAPP/ESTN_F4	F4 Help, Read
/AXONUIBC/LMA_FLIGHT_DETAILS	Read
/AXONUIBC/LMA_FLIGHT_LIST	Read
/AXONUIBC/LMA_FLTSCHD_READ, /AXONUIBC/LMA_FLTDET_UPDATE	Read & Update
/AXONXAPP/FLIGHT_SCHED_UPD_GET, /AXONXAPP/FLIGHT_SCHED_UPD	Read & Update
/AXONUIBC/LMA_FLT_WORKLIST	Read
/AXONUIBC/LMA_FUEL_OIL_GRAPH	Read
/AXONUIBC/LMA_MSRMNT_DOC	Read
/AXONUIBC/LMA_READ_MES_PT	Read
/AXONUIBC/LMA_NOTIF_LIST	Read
/AXONUIBC/LMA_PART_ONOFF_DET	Read
/AXONUIBC/LMA_REVISION_LIST	Read
/AXONUIBC/LMA_ROUTINE_DUE_LIST	Read
/AXONUIBC/LMA_STOCK_MATERIAL	Read
/AXONUIBC/LMA_TECH_LOG_HIER	Read
/AXONUIBC/LMA_TECH_LOG_HIST	Read
/AXONUIBC/LMA_FLT_TECH_OBJ_LT	Read
/AXONUIBC/LMA_VARIANT_READ /AXONUIBC/LMA_UPDATE_VARIANT	Read and Update
/AXONUIBC/LMA_FLT_WORKLIST	Read

/AXONUIBC/LMA_ASSET_LIST	Read
/AXONXAPP/CARRID_F4	F4 Help Read
/AXONXAPP/ESTN_F4	F4 Help Read
/AXONUIBC/LMA_FLIGHT_LIST_API	Read
/AXONUIBC/LMA_FLIGHT_LIST	Read
/AXONXAPP/FLTKEY_SH	F4 Help Read
/AXONXAPP/FLTKEY_F4	F4 Help Read
/AXONFLT/FLTNUM	F4 Help Read
/AXONXAPP/FLTNUM_F4	F4 Help Read
/AXONXAPP/FUNCTIONAL_LOC_F4	F4 Help Read

Asset Disposition App

Overview

The Asset Disposition app is useful for complex assemblies for technicians and inspectors on the shop floor who will remove and/or receive the stripped parts, for inspection and disposition using 'As – Maintained' view of an equipment hierarchy.

The Asset Disposition app supports third party primary repairable, serviceable, unknown, and scrap dispositions; for serialized, valuated, batch managed materials into sales order stock.

Use the asset dismantle tile on Fiori launch pad to open the 'Asset Dismantle' landing screen.

Landing screen

The landing screen consists of following areas:

- Advanced Search
- Notification list tab
- Notification history tab

Advanced search

Advanced search provides a set of filter criteria to filter the notification list. Notification, notification type, material, serial number, equipment, sales order, notification date, revision, order, planning plant and customer filters are supported.

Disposition is supported for open/in-process induction and component tracking service notifications. For any other notification type or notification status equipment hierarchy is not displayed.

Notification list tab

Notification list tab displays a list of notifications as per the selection criteria entered. Upon clicking a notification from the list, the 'Part Detail' screen is displayed.

Notification History Tab

Notification history tab displays a maximum of ten previously processed induction notifications (having Sales order/Sales document maintained) for the logged in user.

Technical Object part screen consist of the following screen areas:

- Object hierarchy
- Header
- Process Execution Area

Object Hierarchy Area

The primary navigation or left screen area displays the hierarchy of the asset associated with the end item or component tracking notification. User has the option to view equipment number, material number and serial number fields.

Upon selection of an equipment from the hierarchy a 'Disposition Code' pop-up is displayed with the list of applicable disposition codes6.

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[6] The disposition codes of Disposition type Repairable, Serviceable, Unknown, and scrap for where the 'Create Reservation' is set to 'Always Create' and 'Determine Order' is set to 'Build order' are displayed in the pop-up.

Header screen Area

The header section displays the details from the end item or component tracking notification and material being dispositioned.

Process Execution Area

This section at the bottom right pane has input fields for the disposition process. The section is divided into multiple tabs as follows:

- Material Tab
- Order Details Tab
- Conformity Check
- Target Build Tab

Material tab and order details tab is available by default. Conformity check and target build tab are available depending upon configuration settings for the disposition code and inspection schema. Additionally, the target build information should also be available in the respective packaged maintenance requirement document.

On the selection of disposition code from the pop-over in 'Object hierarchy' upon selection of an equipment the following fields are populated:

Material Tab

- **Storage location** field is populated from the disposition code else user gets an option to select it from the list of all relevant storage locations at the plant.
- **Quantity/UOM** field is populated is defaulted to '1' (for serialized materials).
- **Valuation Type** field is also populated from the disposition code.
- **Serial No** field is auto populated for serialized materials in case it is maintained, else the user must input the field as it is a mandatory field.
- **Time since event**: On selection of equipment, system will determine whether the technical object is relevant for time since event process.

  The various conditions to be fulfilled for TSE to be triggered are as follows:

  - TSE should be active at client level
  - Material schema determination for the material of the equipment should be possible
  - Equipment should have a counter
    The characteristics of the counter should be maintained in configuration for the combination of material schema and disposition.

  After the above conditions are satisfied, the field would be visible to user for selection. Only those event codes will be displayed which have been maintained against the combination of material schema and disposition code in TSE configuration. If only one event code is maintained against the disposition, that event code will be selected by default.

- **Text field** is auto populated on selection of disposition code. It is a combination of material number, disposition code, serial number, quantity, and time stamp. The field is editable and is updated in the tracking notification task long text under the object disposition tab in service notification display transaction.

- **Create Reserve check box is** auto filled based on disposition code configuration. Reservation field is mandatory for disposition so that a demand could be created or build/demand order.
- **Closed Loop check box** is populated from the disposition code configuration. Network field is applicable only in case of closed loop for repairable disposition.

Order Details Tab

- **Build/Demand Order** captures the order on which the demand would be created. The field is only relevant in case the reservation check box is checked. The field is mandatory for disposition. If only one build order is available for the technical object it is automatically defaulted.
- **Network Order** captures the network associated with the end item notification. The field is only applicable if the repairable disposition is performed in closed loop. Based on the disposition code setup the network is updated in the repair order.
- **Work center/Plant** is used to create the repair order. The field is auto populated from the disposition code, else all available work centers are available for selection by user.

   Note: If disposition code is maintained with a default work center in configuration then that work center will be auto populated otherwise all work center at plant level will be displayed.

- **Disposition Attachment** fields provides user with the ability to attach documents to the tracking notification while doing disposition.
- **Install Material** is same as the dismantled material number. The option to change this material is presently not available in the app.

   During primary serviceable disposition UpMod field appears, where the target material can be selected (provided that all the pre-requisites are fulfilled).

Conformity Check

The check is triggered in case the conformity check rule is configured in the disposition code. The key attributes of the check are defined in the conformity check rule. Customer can review the messages shown against the equipment and proceed to execute the disposition. The messages for conformity check are shown against the equipment and user prevented to proceed with disposition if any error messages exist.

Target Build Tab

If a target build information is available in the maintenance requirement document and corresponding configuration is active, then this tab is visible. The maintenance document should be packaged using WBX workbench.

Target Build tab has details such as document key, document type, document part, document version, post mod material. Upon selection of select document from post mod line then disposition code button will be available.

Perform Disposition and Message Display

Depending upon the disposition execution status success messages are presented to the user in a popup.

Flight Planning App

Overview

The Flight Planning app provides an overview of all flights for any set of stations within a planning horizon. The user can use this app to see flight and associated maintenance work, work center capacity (available and required) in graphical form.

This app provides work center capacity in different time horizons (i.e., hourly, daily, and weekly).

Filters

Multiple filters are provided for users to list the flights for maintenance planning. User can filter the data based on stations, planning horizon, flight number, functional location, carrier ID, sector, main work center/plant, operational work center/plant.

Based on above criteria flight information is displayed in capacity planning tab (Graphical form) and flights tab (List).

My work-center button

A pop over opens when user clicks on this button, work centers can be added in this work center.

Flights Tab

Flight List

This view lists all the flights as per the filter criteria entered by the user. List contains key information about flight.

Object Navigation Flight

By clicking on the individual flight, a user can navigate to next page where flight and work items are displayed in Gantt form.

Capacity Planning Tab

This view would provide the list of flights and associated maintenance work items in hierarchical form and Gantt chart. User has the option to personalize the tree table columns based on business requirements. Detail information pop over are available for the user.

Hierarchy Pane

This table displays flights and associated work item in hierarchical format. Other key information of the work items is provided in the table.

Work items are displayed in the hierarchical tree as per following table.

Work Item	Hierarchy level
Flight Key	Level 1
Revision	Level 2
Notification	Level 3
Order	Level 3
Order Operation	Level 4

Sorting feature

User can sort the tree table by selecting any attribute of the flight, this will sort the flights on the attribute and will not have any impact on the child nodes. The child nodes will always follow the respective sorted flight (key).

Inter-APP navigation

User can select a flight key, notification, or order to navigate to respective apps. Following navigations are supported.

Navigation to Line Maintenance App

By clicking any flight key in hierarchy table user is presented with a pop up, user can navigate to general information tab of the flight detail screen of line maintenance application.

Navigation to display service notification

By clicking any notification in hierarchy table user can navigate to SAP Standard application for displaying service notification.

Navigation to Display Order

By clicking any order in hierarchy table user can navigate to SAP Standard application for displaying order.

Work Item Gantt Pane

This view displays all the work items in the Gantt chart. Work item type text is displayed on the individual Gantt bar.

Work Item details in pop over

Double clicking on a Gantt bar opens a pop over, which contains the key details of the work item.

Capacity View Button

A side panel open when user clicks on the capacity view button. This panel displays the capacity utilization line chart for the work centers defined in my work center section. Side panel contains following buttons.

Legend

Clicking this button toggles the legends for the chart on or off.

Setting button

Click on the setting button the 'Settings' pop over opens, which provides the following functionalities:

- **Capacity summarization option –** Capacity can be summarized based on hour, day, and week. A drop down is available to select the required option.
    - o **In case of hourly summarization –** Capacity is displayed for 24 hours.
    - o **In case of daily summarization –** Capacity is displayed for 7 days.
    - o **In case of weekly summarization –** Capacity is displayed for 4 weeks.

    Clicking on next or previous button will capacity is displayed for next or previous time segment based on summarization level.

- **Capacity utilization display option –** Capacity utilization can be displayed as utilization percentage of available vs required capacity. Radio button has been provided to choose the required option.

SAP Enterprise Asset Management, add-on for
MRO 8.0 by HCL for SAP S/4HANA 2022

Toggle to switch between full page and side panel

Clicking on the button enables users to toggle capacity data display between full page and side panel.

Toggle button for table and chart

Capacity data display can be toggled between table and chart form using this button.

APIs Delivered

API Name	Functionality Description
/AXONXAPP/AIRCRAFTSUBTYP	Aircraft type
/AXONUIBC/MPW_CAPACITY_VIEW	Capacity view
/AXONXAPP/CARRID	Carrid ID
/AXONXAPP/CARRID_F4	Carrid ID F4 help
/ACCGO/UIS_SH_MATERIAL_DESC	Material text
FARR_SH_DURATION_UNIT	Duration unit
/AXONXAPP/SHELP_TIME_UNIT	HORIZON
/AXONXAPP/EQMNTYP	Equipment type
/AXONUIBC/MPW_FLIGHT_DATA	Flight data
/AXONUIBC/LMA_FLIGHT_DETAILS	List of flight
/AXONXAPP/FLTKEY_SH	Flight key
/AXONXAPP/FLTKEY_F4	Flight key F4 help
/AXONFLT/FLTNUM	Flight number
/AXONXAPP/FLTNUM_F4	Flight number F4 help
/AXONXAPP/FUNCTIONAL_LOC_F4	Functional location F4 help
/AXONUIBC/MPW_NOTIF_DATA	Notification data
/AXONUIBC/MPW_ORDER_DETAIL	Order detail
H_T024I	Purchasing group f4 help
/AXONXAPP/PLAN_PROFILE_F4	Planning profile F4 help
H_T001W	Plant F4 help
/AXONUIBC/MPW_REVISION_DATA	Revision
/AXONFLT/SECTOR	Sector F4 help
/AXONXAPP/ESTN_F4	Station f4 help
VTTZZ	Time zones F4 help
/AXONUIBC/MPW_ARBPL_SEARCH	Work center F4 help
/AXONUIBC/MPW_FLIGHTKEY_LIST	Landing page, Flight planning hierarchy
/AXONUIBC/MPW_ASSET_VIEW	Asset details

Work Item Planning App

Overview

The Work Item planning app allows maintenance planners to view the packaged work item hierarchy and unpackaged induction notifications on a Gantt chart based on event for a defined planning horizon.

This app also provides work center utilization and displays the capacity details based on the week, month, or day.

Upon clicking 'Work item planning' tile on the launchpad the landing is displayed as explained below:

Filters

Multiple filters are provided for users to list the work items for maintenance planning. User can filter the data based on the date, 'Induction notification', 'Revision' and 'Exclude Notification' filter.

'Exclude notification' filters any non-induction notifications.

Search Help

The induction notification search help displays only the induction notifications, for which Planning plant and technical object is maintained. If only induction notification filter is maintained both packaged and unpackaged induction notifications are displayed in the output list. If revision filter is maintained with or without induction filter, only the induction notifications packaged into revision are displayed.

Based on entered criteria work item information is displayed in tree table and in graphical format.

My work-center button

A pop over opens when user clicks on this button, work centers can be added.

Hierarchy and Gantt pane

This view would provide the list of maintenance work items in hierarchical form and Gantt chart. User has the option to personalize the tree table columns based on business requirements.

Hierarchy Pane

This table displays work items in hierarchical format. Work item views can be selected using exclude notification filter. Other key information of the work items is provided in the table.

1. Work item view with all the Notifications.

Level	Induction notification is Packed into revision	Induction notification is not Packed into revision
Level 1	• Revision	• Induction notification
Level 2	• Revision>Network • Revision>All packaged notification • Revision>All unpackaged notification • Revision>Orders for packaged notifications without network	

Level 3	• Revision>Network>Network activity	
Level 4	• Revision>Network> Network activity>Order assigned to network activity	

Application adjusts the network activities dates with time 24:00:00 to next date with 12:00:00 time.

Hierarchy Pane table column personalization Setting Button

To get the more details about the work item, columns can be added/removed using column personalization setting button. However, the column personalization cannot be saved in the variant and is available for a browser session only.

Work Item details in pop over

Clicking on a work item number opens a pop over, which contains the key details of the work item.

Inter-APP navigation

User can select a notification or order to navigate to respective apps. Following navigations are supported.

Navigation to display service notification

By clicking any notification in hierarchy table user can navigate to SAP standard application for displaying service notification.

Navigation to Display Order

By clicking any order in hierarchy table user can navigate to SAP standard application for displaying order.

Work Item Gantt Pane

This view displays all the work items in the Gantt chart.

Capacity View Button

A side panel open when user clicks on the capacity view button. This panel displays the capacity utilization line chart for the work centers defined in 'My Work Center' section. Side panel contains following buttons.

Legend

Clicking this button toggles the legends for the chart on or off.

Setting button

Clicking on setting button opens 'Settings' pop over, provides the following functionality.

- **Capacity summarization option –** Capacity can be summarized based on week, day, and month. A drop down is available to select the required option.
  - o **In case of monthly summarization –** Capacity is displayed from the first day of the month of the start date to last day of the month of End date entered in planning horizon.
  - o **In case of daily summarization –** Capacity is displayed for the planning horizon entered by user.
  - o **In case of weekly summarization –** Capacity is displayed from the first day of the week of the start date to last day of the week of end date entered in planning horizon.
- **Capacity utilization display option –** Capacity utilization can be displayed as utilization percentage

of available vs required capacity. Radio button has been provided to choose the required option.

Toggle to switch between full page and side panel

Clicking on the button enables users to toggle capacity data display between full page and side panel.

Toggle button for table and chart

Capacity data display can be toggled between table and chart form using this button.

APIs Delivered

API Name	Functionality Description
/AXONUIBC/WMPW_API_CAPACTYVIEW	Capacity view
/AXONUIBC/WMPW_BC_LEGEND	Color setting
/AXONUIBC/WMPW_API_NOTIF_FLTR	Filter notification type
/AXONUIBC/WMPW_BC_GET_WORKITEM	Read (using for landing page)
/AXONXAPP/WMPW_SRCH_INDUC_NOTI	F4 Help for induction notification
/AXONXAPP/WMPW_SRCH_REVISION	F4 Help for revision

Electronic Work Instruction FIORI App (EWI)

Overview

The Electronic Work Instruction FIORI app provides an electronic view of the work order combining all necessary information into a single user interface.

The App is based on Fiori 2.0 architecture using Fiori elements. It supports UI adaptation as per standard process to enable/disable sections, rename, regroup, and add fields.

Order List Page

The application can be launched through SAP Fiori Launchpad and consists of a filter bar and order list.

Filter Bar

The app consists of multiple filter fields based on which the order list can be fetched, and additional filters can be added using adapt filter button.

List of Maintenance Orders

Based on the filter criteria, orders are fetched and displayed in a list. Users can add or remove the table column by using setting button. The column selection is only available for the browser session.

Order Details Page

Users can select any order from the list and navigate to order list page which has following sections available.

- Details
- Status
- Objects
- Operations
- Notification Header
- Defect Notification
- Documents
- Inspection lot
- Components
- PRT

Details

The order detail page is divided into object header and details. The header area displays key fields related to organization elements, status, and reference objects.

Header Information

The order header contains basic information about the order. It also has action button to edit/update the order details.

Comment

This section provides the comments history with log line for order header. New comments can also be added.

Status

This section shows user status information with and without number as subsections. The user status can be maintained from this section.

Object

This section displays the list of technical objects attached to order. The table consist of segmented button which shows List and header in the table It has the following navigation.

Detail

This displays the reference object details available in the order.

Classes

This drop-down option provides information about the classes assigned to the technical objects in the order.

Partner

This drop-down option provides information about the partner assigned to the technical objects in   the order.

Measurement Documents

This tab displays a list of the measurement documents for the technical object assigned in the order.   The list can be filtered based on measurement date in the selected period (last month, last week or   all).

Operation

A list of all the operations in the order is displayed. By selecting appropriate operation, the user can delete, clock on, clock off, digitally sign off & revoke. User can also perform the disposition. As well as new operation can be added in the list by create button.

The user navigates to operation details screen on selection of operation.

Details

This section displays the basic information of the operations that can be updated as well.

Comments

This sub section provides the comments history with log line for operations. New comments can also   be added.

Components

The component section displays the components assigned to the operation. The user can delete an existing component by clicking the 'Delete' button. A new component can be added to the operation using the create button.

Production resources tool (PRT)

This section lists all the PRTs assigned to the operation. PRTs can be removed from the operation using the 'Delete' button.

Equipment, material, document and other PRTs can be assigned to the operation using the 'Add PRT' button.

Operation confirm

Partially confirmed or unconfirmed operations can be confirmed on this section. If an operation is already finally confirmed, then the latest confirmation is displayed.

Digital Signature

This section provides function to signoff an operation. The number of signature levels is defined in the   signature strategy.

Digital Signature log

This section displays the signoff log history.

Labor Clocking

This section displays previous clock on/off events in a list.

Inspection recording

Results can be recorded for multiple master inspection characteristics assigned to an operation. An inspection lot must be already available in the order.

Header Notification

This section displays the order header notification. There   is a 'NOCO' button on the form header to mark the notification as complete.

Notification Header will be shown only if the notification is directly linked to the order.

Comment

This subsection provides the comments history for notification with log line. New comments can be added here.

Defect Notification

This displays a list of defect notifications created against the order. On clicking on any of the defect notifications, it displays the notification details, cause code and notification task table in different sections. User can create a new defect notification against the order by clicking the create button on table header.

Details

Details of the defect notifications created against the maintenance order will be displayed in this section.

Cause Code

Displays the list of Cause Codes corresponding to the defect notification.

Notification Task

Details of the tasks completed under the defect notification will be displayed.

Documents

This section displays a list of originals against the document PRTs assigned to the order operations. These originals will be downloaded on the click of hyper link against filename.

Components

This section displays a list of components assigned to the order operations.

Inspection Lot

This section displays the inspection lot and all the master inspection characteristics which need to be recorded for the entire order.

PRT Section

This section displays all the PRTs required for the order.

Workscoped Documents

This section displays the workscoped documents in the order and the embodiment status can also be updated.

Demand

This section displays all the demands created on the order. These demands can be sourced. The sourced demands can be unsourced, and parts can be booked.

Wrappers Delivered

Wrapper Technical Name	Functionality Description
/AXONUIBC/EWIV2_ORDER_LIST	List of orders based on input criteria
/AXONUIBC/EWIV2_ORDER_RELEASE	Order Release
/AXONUIBC/EWIV2_ORDER_TECO	Order TECO
/AXONUIBC/EWIV2_ORD_UPD	Order Update
/AXONUIBC/EWIV2_ORDER_COMM_GET	Order Comments Read
/AXONUIBC/EWIV2_ORDER_COMM_UPD	Order Comment Create
/AXONUIBC/EWIV2_ORDER_LTEXT	Order Long Text Read
/AXONUIBC/EWIV2_STAT_WITHNUM	User Status with Number Read
/AXONUIBC/EWIV2_STAT_WITOUTNUM	User Status without number Read
/AXONUIBC/EWI_USERSTATUS_UPD	User Status Update
/AXONUIBC/EWIV2_OBJECT_LIST	Object List
/AXONUIBC/EWIV2_MEAS_DOC	Measurement Document
/AXONUIBC/EWIV2_TECH_OBJ_CHAR	Technical Object Characteristics
/AXONUIBC/EWIV2_TECH_OBJ_PART	Technical Object Partner
/AXONUIBC/EWIV2_OPER_LIST	Operation Read
/AXONUIBC/EWI_OPER_INSERT	Operation Create
/AXONUIBC/EWIV2_OPER_UPDATE	Operation Update
/AXONUIBC/EWI_OPER_DELETE	Operation Delete
/AXONUIBC/EWIV2_OPER_COMM_GET	Operation Comment Read
/AXONUIBC/EWIV2_OPER_COMM_UPD	Operation Comment Create
/AXONUIBC/EWIV2_OPER_LTEXT_GET	Operation Long Text Read
/AXONUIBC/EWI_ORDER_CONFIRM	Operation Confirm
/AXONUIBC/EWIV2_OPERCNFRM_LIST	Operation Confirm Read
/AXONUIBC/EWIV2_NOTIF_DET_LTEX	Notification Read

/AXONUIBC/EWIV2_NOTIF_UPD	Notification Update
/AXONUIBC/EWI_NOTIF_COMPLETE	Notification Complete
/AXONUIBC/EWIV2_NOTIF_COMM_RD	Notifications Comment Read
/AXONUIBC/EWIV2_NOTIF_COMM_UPD	Notification Comment Update
/AXONUIBC/EWIV2_NOTIF_LTEXT	Notification Long Text Read
/AXONUIBC/EWIV2_NOTF_LTXT_UPD	Notification long text update
/AXONUIBC/EWIV2_DEFECT_NOTIF	Defect Notification List
/AXONUIBC/EWIV2_NOTIF_DEF_CR	Defect Notification create
/AXONUIBC/EWIV2_NOTIF_CAUSE	Notification Cause Code
/AXONUIBC/EWIV2_TASK_CODE	Task Code

/AXONUIBC/EWI_DOC_DETAILS	Document Read
/AXONUIBC/EWI_INSPLOT	Inspection Lot
/AXONUIBC/EWI_COMP_LIST_ORD	Component Read
/AXONUIBC/EWI_V2_COMP_DELETE	Component Delete
/AXONUIBC/EWI_V2_COMP_INSERT	Component Create
/AXONUIBC/EWI_PRT_DEL	PRT Delete
/AXONUIBC/EWIV2_DSIG_SIGNOFF	Digital Sign off
/AXONUIBC/EWIV2_DSIG_DETAIL	Digital Signature Read
/AXONUIBC/EWIV2_DSIG_LOG	Digital Signature Log
/AXONUIBC/EWI_REVOKE	Revoke
/AXONUIBC/EWI_CLOCKING_SET	Labor Clock On-Off
/AXONUIBC/EWI_CLOCKING_GET	Labor Clock Read
/AXONUIBC/EWIV2_COMP_INSERT	Adding components
/AXONUIBC/EWIV2_COMP_LIST_READ	Fetches component list based on order
/AXONUIBC/EWIV2_DOC_DETAIL	Read Document for an order
/AXONUIBC/EWIV2_HR_MINI_MASTER	HR Mini Master
/AXONUIBC/EWIV2_INSPLOT	EWI - Inspection Lot
/AXONUIBC/EWIV2_NOTIF_COMM_GET	Read Notification Comment
/AXONUIBC/EWIV2_PRIO_SH	Search Help Exit for Priority search help
/AXONUIBC/EWIV2_PRT_INS	Add PRT to Order Operation
/AXONUIBC/EWIV2_PRT_LIST	List of PRT for Order
/AXONUIBC/EWIV2_PRT_LIST_READ	PRT List for Operations
/AXONUIBC/EWI_V2_PRT_LIST	PRT List for Operations

APIs Delivered

API Name	Functionality Description
/AXONXAPP/ORDER_REL	Order Release
/AXONXAPP/ORDER_TECO	Order TECO
/AXONXAPP/OBJECTLIST_DETAIL	Object List
/AXONXAPP/COMMENT_READ	Order Comments Read
/AXONXAPP/ORDER_HDR_LTEXT_GET	Order Long Text Read
/AXONXAPP/USERSTATUS_READ	User Status with Number Read
/AXONXAPP/USERSTATUS_READ	User Status without number Read
/AXONXAPP/USERSTATUS_UPDATE	User Status Update

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/AXONXAPP/EWI_V2_MEAS_DOC	Measurement Document
/AXONXAPP/EWI_V2_OPER_LIST	Operation Read
/AXONXAPP/OPER_INSERT	Operation Create
/AXONXAPP/EWIV2_OPER_UPDATE	Operation Update
/AXONXAPP/OPER_DELETE	Operation Delete
/AXONXAPP/OPER_LTEXT_GET	Operation Long Text Read
AXONXAPP/ORDER_CONFIRM	Operation Confirm
AXONXAPP/EWIV2_DEF_NOTIF_CR	Defect Notification create
/AXONXAPP/EWI_V2_OPERCNFM_LIS	Operation Confirm Read
/AXONXAPP/NOTIF_CHANGE	Notification Update
/AXONXAPP/NOTIF_COMPLETE	Notification Complete
/AXONXAPP/EWI_V2_NOTF_COM_READ	Notifications Comment Read
/AXONXAPP/NOTIF_LTEXT_READ	Notification Long Text Read
/AXONXAPP/EWIV2_DEF_NOTIF_CR	Defect Notification create
/AXONXAPP/DOCUMENT_DETAILS	Document Read
/AXONXAPP/INSPECTION_LOT	Inspection Lot
/AXONXAPP/COMPONENT_LIST_ORD	Component Read
/AXONXAPP/COMPONENT_DELETE	Component Delete
/AXONXAPP/PRT_DEL	PRT Delete
/AXONXAPP/EWIV2_DSIG_SIGNOFF	Digital Sign off
/AXONXAPP/EWIV2_DSIG_LEVEL_DET	Digital Signature Read
/AXONXAPP/DSIG_REVOKE	Revoke
/AXONXAPP/CLOCKING_SET	Labor Clock On-Off
/AXONXAPP/CLOCKING_GET	Labor Clock Read