twogether

Paper Technology Journal

think in paper – The future of paper begins at Voith Paper.

News from the Divisions:
LEIPA-Schwedt PM 4 – LWC production line of the new generation.

Maxau PM 6 – A challenging project and its implementation.

Bohui BM 1 – A benchmark in China for the paper industry worldwide.

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Deep-frozen, dried – and saved.

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Hans Müller

Dear Customer, Dear Reader,

The 19th issue of the twogether magazine in front of you clearly depicts the wide array of products and services Voith Paper Technology offers and successfully supplies to its worldwide customer base.

On the one side of the spectrum is the world-class installation of the LEIPA LWC production unit in Germany that performed from the very beginning to its expectations. Using 100% recovered paper as raw material, it is a trend-setting novelty in its product segment. Voith Paper Technology supplied the engineering as well as all the equipment starting from the recovered paper handling to the roll wrapping and transportation system. It is the success of the One Platform Concept in combination with the Process Line Package (PLP) that allowed seamless project management, start-up and commissioning as well as process optimization.

On the other side of the spectrum is a small paper production line supplied to Turkmenistan for the production of printing and writing paper based mainly on cotton linters as raw material.

Voith Fabrics contributes its part to a demanding puzzle together with our Rolls and Roll Cover Division to make sure that throughout the production process the web is in touch with optimally engineered surfaces be it rolls, fabrics or felts.

Looking back at our business year 03/04 we owe thanks our customers for the continued support and confidence in us. This past business year has been one of our best. We will invest approx. 50 Mio Euro into a new Paper Technology Center to continue our support of an industry which we are convinced will play an important role in the advancement of mankind and its standard of living.

Hans Müller
on behalf of the Voith Paper Technology team

think in paper –
The future of paper begins at Voith Paper

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On October 26, 2004, the foundation-stone for a unique project for the future by Voith Paper was laid in Heidenheim: the Paper Technology Center (PTC). With the laying of the foundation-stone the go-ahead was given for the world's largest and most modern paper research center, which will commence operations in a year from now. With an investment totaling around 50 million euros, the PTC marks the highest single investment made so far in the field of research and development in Voith's corporate history.

Approximately 60 guests from politics, industry and the press were invited to Heidenheim for this historic event. Dr. Hermut Kormann, President and CEO of the Corporate Management Board of Voith AG, and Dr. Hans-Peter Sollinger, Member of the Corporate Management Board of Voith Paper, together with the mayor of Heidenheim, Bernhard Ilg, welcomed the guests and jointly embedded an annual report, coins and a Heidenheim daily newspaper in mortar in the prepared foundation-stone.

The Paper Technology Center opens up completely new dimensions in research & development at Voith Paper. *"The PTC, as a milestone, marks a highlight in our development from machine builder to process and service supplier"*, Dr. Hans-Peter Sollinger explained to the audience. At this research unit it will, for the first time, be possible to test and optimize the complete paper production process under real conditions in advance – from the furnish to the machine configuration, the automation system and machine clothing from Voith Fabrics up to the final product. With the Paper Technology Center, it is intended to recognize customer requirements and the challenges of the paper industry at an even earlier stage and to implement future-oriented solutions. The engineers and scientists will be concerned with, among other things, increasing the share of recovered paper, raising productivity and quality as well as reducing energy requirements.

Other points of emphasis of the research will be the reduction of the water requirements and closed water cycles in paper production. All these subjects and many more will make the paper production process of the future more economical and, at the same time, protect natural resources. With the Paper Technology Center, Voith Paper will further expand its role as a leader in technology and innovation.

Laying the foundation-stone:
(from right to left):
Dr. Hermut Kormann,
Dr. Hans-Peter Sollinger,
mayor Bernhard Ilg.

40 years of Voith in São Paulo – a reason to celebrate

The celebration starts with a press conference on September 16, 2004.

Mrs. Martina Mann (left), a daughter of Hans Voith, and her niece Ofelia Nick (right) visit the school Friedrich von Voith.

In September, Voith celebrated 40 years of the Brazilian subsidiary company. Even before its establishment here, Voith already took part in crucial projects for the Brazilian market through its partnership with Bardella.

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The prediction of Mr. Hugo Rupf, Voith AG president at the time could not be more correct. Today, Voith Brazil is the center of competence and manufacture for several products, exporting not only capital assets but also technology and know-how. The events related to the celebration of 40 years of Voith Brazil were attended by distinguished visitors, including customers, members of the Voith family, Voith AG directors, Brazilian authorities and foreign authorities, stressing the importance of Voith Brazil and its cooperators to the Brazilian society, as well as to the Voith Group.

Press Conference

The conference was attended by Voith AG representatives Dr. Hermut Kormann, President and CEO of the Corporate Management Board, Dr. Michael Rogowski, Chairman of the Supervisory Board and Mr. Friedrich-Karl Finck, Corporate Communications, as well as by the directors of the four Voith companies in Brazil. They offered to the Brazilian and foreign journalists an optimistic and enriching scenario about the new plans and business foreseen for the country. The journalists left the event very impressed, not only by the corporation history, but also by the figures related to investments, production and orders.

An unforgettable night

One of the events for the celebrities was the gala dinner held at the Credicard Hall Theater on September 16th. The highlight of the evening came from Mrs. Martina Mann, who, in a touching speech, told

the story of her involvement with Brazil, including the occasion when she first came to the country on a trip with her parents in the 1950's. Fifteen years later, she became involved in meeting the children of the school named after her grand-father, Friedrich von Voith, assisted by the Labor Project, sponsored by Voith.

The governor of the São Paulo state, Mr. Geraldo Alckmin, was also present at Credicard Hall. He mentioned in his speech the importance of Voith to the development of Brazil, creating employment, income, wealth, and playing a great social role.

Tropical sun and samba rhythm

Besides the gala dinner, the guests were invited to visit the Voith São Paulo facilities, where a special meeting place, including a presentation hall, was built, to meet the tour guides and enjoy a special lunch.

The employees of the Brazilian subsidiary had their celebration day too. On September 18th, Voith offered an Open Doors party to the employees and their families. Around 10,000 people attended the event. There was music, raffles, live performance of samba dancers, souvenirs, playing activities for children, barbecue and a lot of beer. Joy and excitement contagiously involved all the participants.

Affected by the samba school rhythm, the grand-daughter of Hans Voith, Ofelia Nick, described Brazil and the Voith subsidiary: everything is very different, beautiful, and everybody is happy and receptive, and she also would like to learn how to dance samba.

In a speech to the employees, Mr. Johannes Hammacher, representing the Voith family, said in Portuguese: *"Always remember that Voith cannot exist without you. Brazil will always have a special place in the hearts of the Voith family."*

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Thai Kraft Paper Industry, Wangsala – Significant cost savings by upgrading the approach flow systems of 4 paper machines to Voith C-bar technology

The Siam Pulp and Paper Public Company Ltd is Thailand's oldest and largest producer and converter of packaging and fine papers. Companies in the Group include the paper mills SKIC (Siam Kraft Industry Co) Bangpong, TKIC (Thai Kraft Paper Industry Co) Wangsala, TUPI (Thai Union Paper Industries) Wangsala and Bangkok, as well as TPC (Thai Paper Co.) Bangpong. The paper mill UPPC in Calumpit, Philippines also belongs to the Group.

Voith Paper and Siam Pulp and Paper have enjoyed a close and trustful partnership for decades. A number of Voith stock preparation lines and paper machines are installed in the customer's mills.

Upgrading the stock approach flows of PM 4, 5, 6 and 7 in Wangsala

To keep up with the constantly increasing demands on paper quality and at the

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Fig. 1: *Thai Kraft Paper Industry, Wangsala.*

Fig. 2: *Layout of the stock approach flow systems for PM 4, 5, 6 and 7.*

Fig. 3: *Screen upgrade package for the backliner of PM 6, consisting of C-bar basket, MultiFoil rotor and belt pulley.*

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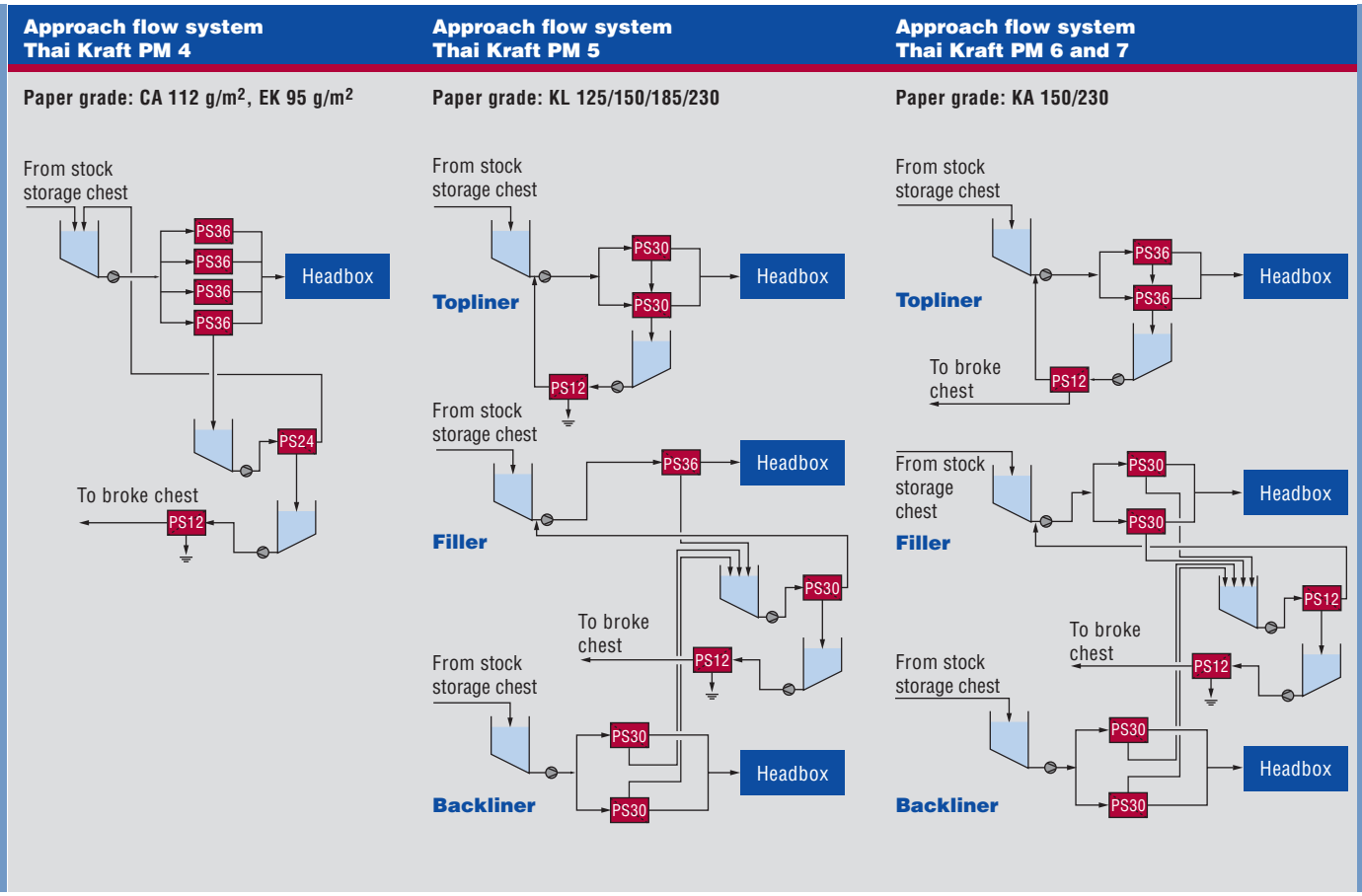

same time reduce production costs, Thai Kraft initiated an optimization programme for the approach flow systems in Wangsala. This involved upgrading all the competitor pressure screens in the approach flow systems of PM 4, 5, 6 and 7 to Voith C-bar technology.

Up till then the screens all operated with rotors with four continuous foils each, together with milled baskets. Despite large slot widths of 0.45 mm, the mill could only achieve the required throughputs by running the screens with very high rotor speeds which meant a high specific energy consumption.

This resulted in disturbing pulsations, while screening efficiency was not sufficient for the high paper qualities demanded by the market. In addition, the rotors and screen baskets exhibited very heavy wear.

Fig. 2 shows the approach flow layouts of PM 4, 5, 6 and 7 together with the paper grades produced. PM 6 and 7 are identical.

Energy savings using C-bar technology

Trial delivery for PM 6 backliner

The optimization phase began in February 2002 with a trial delivery of two optimization packages for the screens in the backliner system of PM 6 approach flow (Fig. 3).These were upgraded to Voith MultiFoil rotors and 0.30 mm C-bar slotted baskets. At the same time the rotor speed was reduced by 29 %. Motor load dropped immediately by 47 % from 75 to

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Location		Machines	Power consumption [kW] before	after	ΔP	kWh saved per year (350 days)
Topliner	1st stage	2 x size 36	2 x 92	2 x 57	2 x 35	588,000
	2nd stage	1 x size 12	16	12	4	33,600
Filler	1st stage	2 x size 30	2 x 74	2 x 40	2 x 34	571,200
	2nd stage	1 x size 12	21	20	1	8,400
	3rd stage	1 x size 12	21	20	1	8,400
Backliner	1st stage	2 x size 30	2 x 75	2 x 40	2 x 35	588,000
Paper grade: KA 150/230						**Total 1,797,600**

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Total energy savings	
PM 4	1,354,920 kWh/year
PM 5	1,873,200 kWh/year
PM 6	1,797,600 kWh/year
PM 7	1,797,600 kWh/year
Total	**6,823,320 kWh/year**
Overall cost savings	**Euro 103,600 per year**

40 kW, representing energy savings of 588,000 kWh per year.

In view of this enormous reduction in energy and the technological improvements described in the following, the mill completely converted the approach flow systems of PM 4, 5, 6 and 7 to C-bar technology.

Energy balance for PM 6 and 7

Fig. 4 shows the energy balance for the approach flows of PM 6 and 7, – a total saving of 1,797,600 kWh per PM and year.

Overall energy balance for PM 4, 5, 6 and 7

The energy balance shows overall energy savings of 6,823,320 kWh per year for all four approach flows (Fig. 5), representing energy cost savings of approximately Euro 103,600 per year.

Overall energy balance in the light of the Kyoto Protocol

At this point it is interesting to consider the significant reduction in energy requirements in the light of the reduced CO_2 emissions and the Kyoto Protocol. The following observation is based on 100 % power supply from a coal-fired power station.

Certain parameters such as the relationship between energy output in the form of electrical and thermal energy and primary energy input (overall power station efficiency) and the relationship of electrical energy to thermal energy output (power coefficient), are based on values taken from similar plants and therefore may vary from those in Wangsala. The following estimate is therefore intended to give an idea of the additional potential cost savings as a result of the savings in electrical energy. The following figures have been used as basis:

- CO_2 emission from coal combustion per kWh primary energy = 0.335 kg CO_2
- Overall power station efficiency = 75 %
- Power coefficient = 0.5
- Expected emission charges = between Euro 5 and Euro 12.5 per ton CO_2.

The previously mentioned energy saving of 6,823,320 kWh per year is equivalent to a primary energy requirement of 27,293,280 kWh per year. The resultant CO_2 emission amounts to 9,143 metric tons per year.

Assuming an emission charge of Euro 8 per ton CO_2 for the emission certificates, an additional savings potential of Euro 73,146 per year is possible.

Technological improvements by upgrading to C-bar

The following describes the improvements in quality obtained in terms of stickies removal efficiency. In the backliner trials for PM 6, the stickies removal efficiency was improved from 25 % to 63 %. This can be attributed to the following:

- MultiFoil rotor speed reduced by 29 %
- Gentle operation of the MultiFoil rotors
- High screening efficiency of the C-bar basket thanks to its flow-optimized profile
- Slot width reduction from 0.45 mm to 0.30 mm.

Based on the positive trial results with PM 6 in Wangsala, PM 4 was the first paper machine to be completely upgraded, achieving an impressive increase in stickies removal efficiency.

For example, stickies removal efficiencies of 13 % and 34 % in the first screening stage of PM 4 improved to 63 % and 75 % respectively. The residual stickies content dropped to less than half the original value (Fig. 6).

The resultant reduction in deposits on the drying cylinders and doctors significantly reduced the number of paper breaks and considerably increased the overall production efficiency of PM 4. The same very welcome improvements were also obtained on upgrading the approach flow systems on the other PM's 5, 6 and 7.

The optimization with C-bar technology also reduced overall fibre losses. Taking PM 4 as an example, overall fibre losses (Bauer McNett R14/R30/R50) dropped from 0.4 % to less than 0.1 % (Fig. 7). There was not much change in CSF accepts freeness either compared with the inlet values, despite the significantly reduced slot width. This was a further welcome factor.

Overall fibre losses were much lower than the forecast and guaranteed values, providing a further appreciable cost savings advantage.

The reduction in overall fibre losses from 0.4 % to 0.1 % means a savings in raw material of 1,507 b.d. metric tons per year. Raw material costs in Thailand are about Euro 85 per metric ton and pro-

Fig. 8: *From left to right: Wiriyaumpaiwong Sangchai, Production Department II Manager, TKIC Wangsala. Dheerakiatkumchorn Dumrongsak, Engineering Division Director. Günter Held, Voith Paper Fiber Systems. Kao-U-Thai Montri, TKIC Wangsala Mill Director. Manomayanggoon Nakorn, Production Department I Manager, TKIC Wangsala.*

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		Before rebuild 0.45 mm milled basket + 4-foil rotor 5.9.2002	6.9.2002	After rebuild 0.30 mm C-bar basket and MultiFoil rotor 18.9.2002, 2 pm	18.9.2002, 6 pm
Paper grade	[g/m²]	CA 112	CA 115	EK 95	EK 95
Stickies in inlet, 1st stage	[mm²/kg]	8,809	22,538	11,462	14,379
Stickies in accepts, 1st stage	[mm²/kg]	8,147	15,663	4,501	3,923
Screening efficiency*	[%]	13	34	63	75
Stickies in inlet, 2nd stage	[mm²/kg]	37,591	58,147	103,186	117,487
Stickies in accepts, 2nd stage	[mm²/kg]	28,424	33,771	24,689	25,176
Screening efficiency*	[%]	46	59	89	83
Stickies in inlet, 3rd stage	[mm²/kg]	824,027	833,463	1,226,880	819,463
Stickies in accepts, 3rd stage	[mm²/kg]	738,889	482,037	100,626	108,728
Screening efficiency* *mass flow related	[%]	30	55	93	87

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		Before rebuild 0.45 mm milled basket + 4-foil rotor 5.9.2002	6.9.2002	After rebuild 0.30 mm C-bar basket and MultiFoil rotor 18.9.2002, 2 pm	18.9.2002, 6 pm
Paper grade	[g/m²]	CA 112	CA 115	EK 95	EK 95
Freeness in inlet, 1st stage	[CSF]	123	141	138	162
Freeness in accepts, 1st stage	[CSF]	105	113	131	147
Overall fibre losses	[%]	< 0.4	< 0.4	< 0.1	< 0.1

Fig. 4: *Energy balance for the approach flows of PM 6 and 7.*

Fig. 5: *Overall energy savings for the approach flows of PM 4, 5, 6 and 7.*

Fig. 6: *Improvement in stickies removal efficiency for PM 4.*

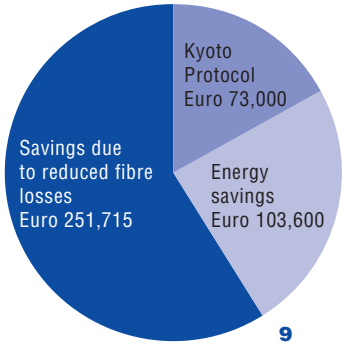
Fig. 7: *CSF freeness and fibre losses in the approach flow of PM 4.*

Fig. 9: *Total cost savings of Euro 428,315 per year.*

cessing costs are around Euro 82 per metric ton. Overall savings attributable to the reduction in fibre losses total about Euro 251,715 per year at Wangsala.

Summary of the advantages gained

- The extremely low pulsation characteristics of MultiFoil rotors provide an improved MD/CD profile of the finished paper
- The higher screening efficiency of C-bar baskets ensures better paper machine runnability, and therefore increased tonnage off the reel
- Reduced speed means reduced wear of rotors, baskets and bearings
- Cost savings due to reduced energy consumption, reduced CO_2 emission and higher fibre yield (**Fig. 9**).



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LEIPA-Schwedt PM 4 –
LWC production line of the new generation

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On July 30, 2004 the first LWC paper was wound on the Sirius reel of PM 4 at LEIPA Georg Leinfelder GmbH in Schwedt an der Oder, Germany. PM 4 produces 300,000 tons of high-quality LWC paper per year on a wire width of 8.90 meters. Production can be based on up to 100% recovered paper. To produce the highest product quality, Voith bases the entire production process on the One Platform Concept.

Everything from a single source – Process Line Package

With this order, LEIPA Georg Leinfelder GmbH placed its trust in this project model of the future and, with the Process Line Package, transferred overall responsibility for the new LWC production line to Voith.

The scope of supply included, in addition to the complete paper machine, also the stock preparation system, the approach flow with broke system as well as the winder and roll transport and wrapping system. A comprehensive automation solution as well as the initial machine clothing from Voith Fabrics completed the order package.

Fig. 1: *LEIPA-Schwedt PM 4.*

Fig. 2: *Schematic of PM 4.*

Within the framework of the Process Line Package, however, Voith not only took responsibility for its own scope of supply. Rather the sub-suppliers were also incorporated into the overall planning and project processing performed by Voith.

The Process Line Package gave LEIPA solid advantages: Voith was responsible for the coordination of all sub-suppliers. In this way, the interfaces with suppliers that arose during planning, delivery, installation, start-up and optimization of the production line, were minimized. The convincing result is a very fast and cost-effective implementation of the project. The smooth handling of the project with the Process Line Package made a major contribution to the fact that the production line was able to go into operation as early as 4 weeks ahead of the contractually agreed start-up date.

Systematically to success – LWC from 100% recovered paper

LEIPA and Voith together faced a major technological challenge with this project. For the first time, it was intended to produce first-class LWC paper from up to 100% recovered fibres with a production line of this dimension. To translate this idea into reality, LEIPA and Voith entered into a **system partnership**.

Within the framework of this system partnership, comprehensive trials were conducted on the Voith pilot machines and work was carried out on product development in intensive cooperation.

The system partnership forms the basis for the further successful development of the project and includes the following core elements:

- Joint planning and conduct of trials
- Optimization of the machine even after start-up to achieve a steep start-up curve
- Support by Voith for technological objectives and further developments beyond the agreement.

To achieve a good start-up curve, Voith also carried out **Performance Management** for the new production line. For this, the experience gained from the start-up and operation of comparable machines was evaluated for the LEIPA project in order to determine the optimal start-up parameters for PM 4 in advance.

Common expertise of LEIPA and Voith paired with innovative Voith technology ultimately led to the success: a state-of-the-art LWC production line that sets new standards in the LWC paper marketplace. The LWC paper produced by LEIPA on the basis of 100% recovered paper meets the same quality demands as LWC paper based on virgin stock. Consequently, PM 4 produces an economical and high-quality, competitive product. Laboratory analyses as well as the extremely satisfied customers of LEIPA today confirm the excellent quality of the LWC paper produced on PM 4.


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The new DIP 2

DIP 2 can supply both PM 4 and also the existing PM 1. Although one chemical pulp line exists, the joint objective, however, is to produce LWC paper from 100% recovered paper on PM 4 with a quality equivalent to that of customary virgin stock-based LWC papers.

The DIP went into trial operation (Fig. 4) at the end of June 2004 – a few weeks before start-up of the new PM 4. For the start of PM 4, high-quality stock was, therefore, already available.

Engineering and scope of supply

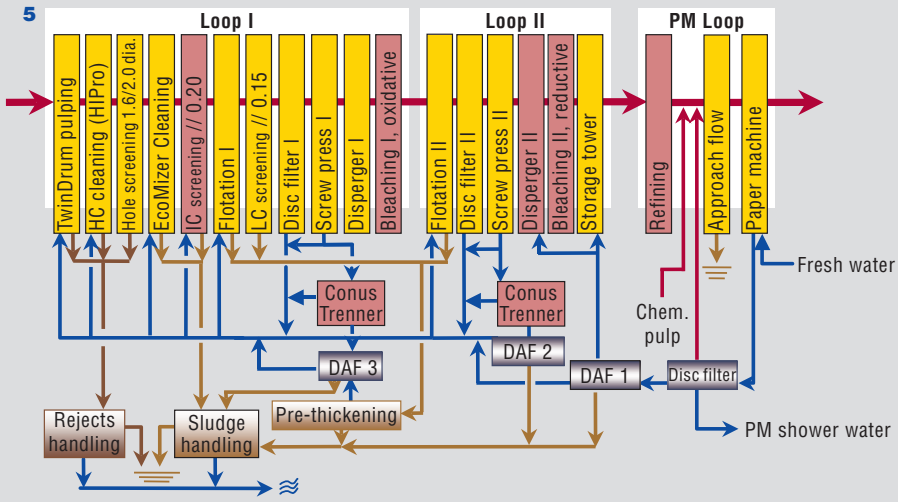
In DIP 2, with a capacity of up to 850 t/24 h o.d. finished stock, intermediate chests have been largely dispensed with. Intelligent placing of the individual components has considerably reduced the necessary space. Short piping distances in conjunction with the use of frequency-controlled pumps lead to low specific energy costs. The overall engineering was based on a 3D model (Fig. 3).

The individual machines have been combined in just a few group starts. An overall production control system ensures a high degree of operator convenience. Close cooperation between process engineering and automation resulted in a very short planning time. An important module – the system for dewiring and intermediate storage of the incoming recovered paper and feeding it to the DIP – was designed in close partnership with LEIPA. The overall engineering and supply of the additive preparation system required for the preparation process was also Voith's responsibility. The rejects are handled with a concept developed and implemented completely by Voith's partner Meri.

A chemical pulp line for slushing and refining of up to 150 t/24 h was also supplied.

The technological concept

Based on the results of extensive trials, a 2-loop deinking system with the following key components was designed jointly with LEIPA (Fig. 5):



- The innovative TwinDrum slushing concept combines gentle breaking down of the paper into the individual fibres with reduced additive requirement
- The revolutionary EcoMizer cleaner concept ahead of Flotation I
- One of the largest EcoCell flotation systems (throughput up to 1000 t/24 h in Loop I)
- Thickening using Thune Bagless disc filters and a further development in Thune screw presses
- 2 dispersion systems with a new disperger concept and SpeedHeater for efficient stock heating and additive blending
- The proven C-bar screen baskets in IC and LC slotted screening.

Brief outline of the process

After the bales of recovered paper have been dewired and mixed with loose paper, the mixture is stored in bays. A wheel loader loads the furnish from the storage bays onto a conveyor belt which feeds the TwinDrum. Here the recovered paper is gently broken down into individual fibres at a consistency between 25-28%. This high stock consistency as well as good mixing of the stock thanks to the integrated displacer achieves excellent printing ink detachment.

Once coarse contaminants have been removed from the stock using 2-stage heavy particle separation and 2-stage hole screening systems, it is then stored in the dump chest. The subsequent stock cleaning at a consistency of 2% using EcoMizer cleaners provides efficient dirt particle removal and protects the following IC slotted screening system. One of

Fig. 3: *Part of the 3D model for DIP 2.*

Fig. 4: *Partial view of DIP 2.*

Fig. 5: *Block diagram of DIP 2.*

Fig. 6: *SpeedSizer.*

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the world's largest EcoCell flotation systems then ensures efficient removal of the detached printing inks.

A 4-stage LC screening system provides economic removal of stickies.

Ahead of the subsequent dispersion stage, the stock is thickened to a stock consistency of 30% using both disc filters with wear-free Bagless segments and screw presses. A SpeedHeater is used to heat up and homogenize the stock and to blend in bleaching agents. In Disperger I, any printing ink residues still on the fibres are now detached and optically disturbing particles are reduced in size to below the visibility limit. At the same time, peroxide is added directly in the disperger for the oxidative bleaching stage.

The crumbly stock is then fed via a screw system to a new type of high-consistency bleaching tower with MC discharge. In Flotation II the ink particles detached by dispersion are removed.

At the end of the process, thickening to a consistency of >30% ensures strict water separation between DIP and paper machine. Dispersion II is responsible for a further homogenization of the DIP stock. A final reductive bleaching stage ensures a further increase in brightness.

Special attention has been given to water cleaning. Each loop has its own Deltapurge microflotation. The pick-up and make-up water is also completely cleaned. ConusTrenner machines in both loops reduce the ash content in the finished stock when required.

Tightly-closed circuits can lead to extreme heating up of the loops. A consequent philosophy of process cooling using heat exchangers has therefore been implemented.

LEIPA's chosen concept ensures a stock with optical properties close to that of virgin fibres. The strength characteristics needed to meet the requirements of PM 4 are achieved by post-refining of the DIP stock. The LWC paper produced is certainly a match for the qualities so far available on the market.

Technology that convinces – One Platform Concept

The new PM 4 is based on the One Platform Concept. With the One Platform Concept the economic efficiency of the system and the quality of the end product are of prime importance. The use of proven and tested modules permits, precisely with this new, innovative production process, a maximum of planning certainty and reliability. With PM 4, an all-online concept is followed, i.e. precalendering, coating and calendering take place online.

The DuoFormer TQv with ModuleJet at the headbox, which permits a uniformly controlled CD basis weight profile, is followed by a TandemNipcoFlex Press. The wire and press section are equipped with DuoCleaners for the cleaning of all wires and felts. The second press is equipped in the bottom position with a transfer belt. The ModuleSteam ensures a uniform moisture profile at the end of the TopDuoRun pre-dryer section. The first four dryer fabrics have been equipped with DuoCleaners for optimal cleaning.

ProRelease Stabilizers reduce the web tension and in this way allow an increased speed potential. Immediately after the pre-dryer section follows the EcoSoft calender for precalendering, which was, for the first time, designed as a soft calender for LWC papers. The EcoSoft calender has 45° inclined framing (Delta Design) for easier roll changing. The SpeedSizer coating unit is equipped with an automatic coat weight CD profiling device.

The combination of coater, Profilmatic R control software and the associated actuator system of the ModuleCoat ensure that the high demands made on the quality of the paper are met. Between the two hot-air dryer hoods is the Module IR infrared profiling unit. This selectively eliminates moisture streaks in the CD profiles after the coating operation.

BASF, one of the world's leading manufacturers of paper chemicals, supplied a tailor-made chemical package for the new PM 4. It covers the entire process from the wet end up to the coating station. In accordance with the basic concept of the machine, the system idea is in the forefront also in the case of the chemicals.

The online calender Janus MK 2, equipped with 10 rolls, ensures maximum calendering quality. Following this, the Sirius reel winds parent rolls of up to 3.5 m in diameter.

Via an automatic rail transport system, the parent rolls are forwarded to the two

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VariTop winders. Afterwards, the slit rolls are transported to an automatic weighing device and labeling unit and finally to the Twister 2 Line roll wrapping system. The finished wrapped rolls are then sent with the help of chain conveyors over a connecting bridge from the PM building into the finished goods warehouse.

As part of the Process Line Package, LEIPA received a production line, that not only included the complete automation solution and the machine clothing but also had these components optimally matched to the paper machine in preliminary trials. For a trouble-free startup curve, forming fabrics, press sleeves, press felts and dryer fabrics from Voith Fabrics were used as initial machine clothing.

The extensive Voith Automation solution includes the process, quality control and information system and extends from the preparation of the raw material to the finished end product. The web browser makes all current and historical machine, process and quality data mill-wide available in the information system. This facilitates easy access to data for the planning of optimization work and for trouble-shooting. The automation system was subjected to extensive functional tests in „Factory Acceptance Tests“ at Voith so that a tested and pre-optimized system could be successfully installed.

Ahead of time

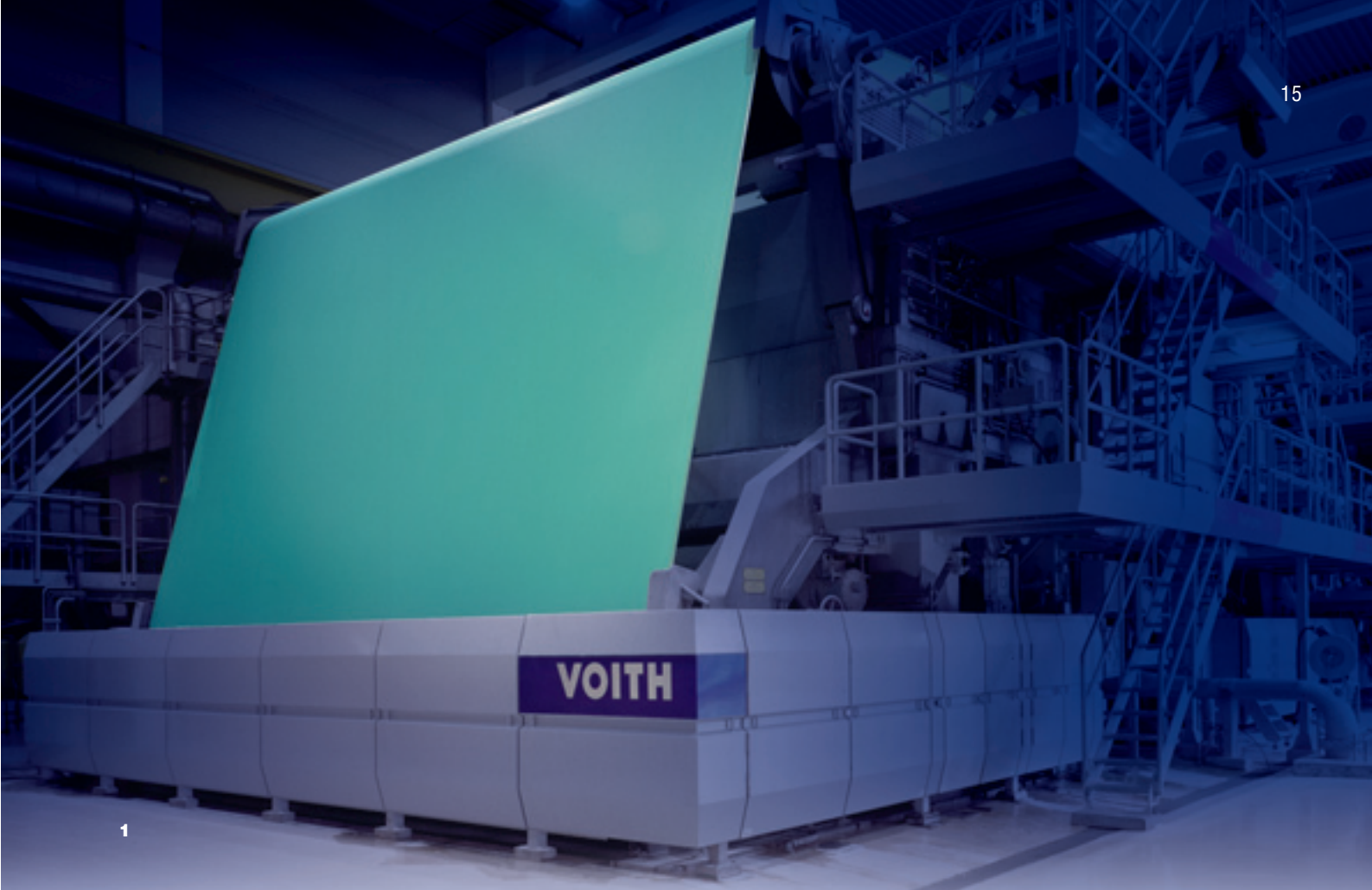
Project handling with the **Process Line Package**, proven technology based on the **One Platform Concept** as well as a successful **system partnership** have proven very successful at LEIPA. Since production commenced as early as four weeks ahead of the agreed date, the further optimization phase also went off very successfully.

The intermediate trial 1 was brought forward by 7 weeks and intermediate trial 2 even by 6.5 months: on October 13 the two trials were successfully completed together.

Fig. 7: *Reel section with Janus MK 2 and Sirius wind-up system.*

Fig. 8: *VariTop winder.*

Fig. 9: *Roll wrapping station Twister 2 Line.*



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Four: the winning number!

Successful start-up of the world's most modern LWC paper machine with Voith Fabrics

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From beginning to end of this gigantic project, 4 was the magic number. On July 4, 2004 LEIPA's PM 4 started up without a hitch, thanks to 4 decisive factors: the Leipa, Voith Paper and Voith Fabrics teams, plus a brilliant idea. The idea of building an LWC paper machine using up to 100% recovered paper – a world premiere.

Fig. 1: *LEIPA-Schwedt PM 4 – the world's most modern LWC paper machine.*

For Voith, the start-up actually began 18 months earlier, with extensive research to check the feasibility of this machine concept. The Voith Paper VPM 4 test machine in Heidenheim was converted accordingly, and Voith Fabrics adapted the machine clothing in all three sections to the new requirements.

From test machine to print shop

The quality of the paper produced on VPM 4 was repeatedly checked using the latest analysis equipment. Towards the end of the preliminary project phase, paper samples were sent for printing and afterwards analyzed in the laboratory for print-

Fig. 2: *PM 4 machine hall on the LEIPA-Schwedt site.*

Fig. 3: *Happy teamwork between LEIPA and Voith Paper Technology. From left to right: Josef Reinartz, Voith Paper, Manfred Schäfer, LEIPA-Schwedt, and Martin Serr, Voith Fabrics.*

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ability. This extensive project sequence ensured full satisfaction not only for LEIPA-Schwedt, but also for its customers – the print shops. *"Voith's effort in this project, already before it began, was enormous"*, said Manfred Schäfer, PM 4 production manager. *"Comprehensively and in full detail, all interrelationships between the machine concept, raw material and fabrics were investigated to ensure optimal cleaning, optimal service life and optimally consistent paper quality even before the actual installation work"*.

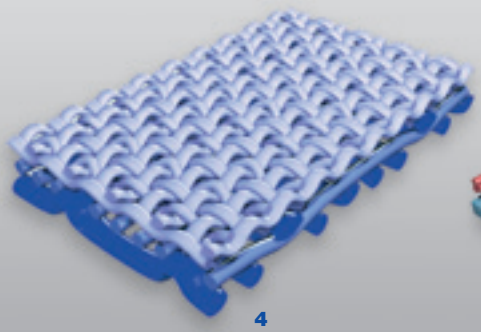
Thanks to these efforts, PM 4 was started up four weeks earlier than planned, and produced saleable paper right from the beginning.

3

A special challenge for fabric suppliers

As shown in recent years, fabrics are decisively important for the successful start-up of modern paper machines. Voith Fabrics has gained a lot of experience in this connection. For example, all significant new machines and rebuilds in Germany during the last two years alone started up with Voith Fabrics as a supplier – both for graphic grades and for board and packaging papers.

"Modern paper machines are a special challenge for fabric suppliers", confirms Schäfer, *"the latest machine concepts are not easily adaptable to suit the fabrics. That is why I am so glad we chose Voith Fabrics, who took over everything for us without problem"*.



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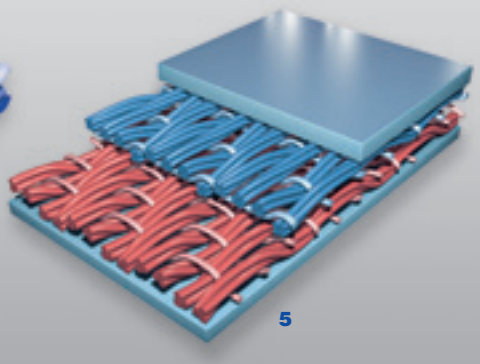
PrintForm H in the former

LEIPA's PM 4 started up with structurally integrated SSB wires in the TQv former. Voith Fabrics PrintForm HC inner and outer wires more than satisfy all the main parameter requirements for a modern forming wire. The combination of numerous sheet support points and minimal wire thickness make excellent paper quality at high production speeds possible, without interference by entrained water. *"Voith Fabrics is first class not only with regard to the former wires"*, comments Schäfer, *"but also in consistent production quality and adaptability to new challenges. Voith is extremely reliable in my experience."*

PrintFlex O in the press

The tandem-NipcoFlex press was started up with PrintFlex O double layer felts, which are also well proven with Rhein



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Papier in all positions. PrintFlex O felts have excellent start-up behaviour, with stable drainage characteristics over their entire service life. Their good conditioning behaviour and constant permeability have ensured a consistent moisture cross-profile. Currently, felts from four different suppliers are being tested in the press section.

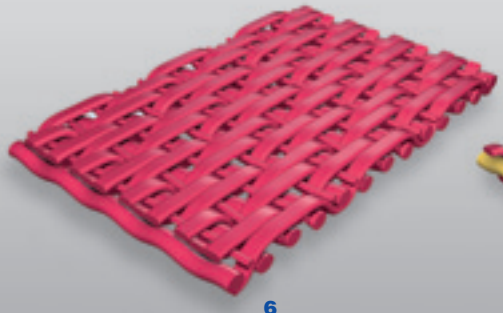
Voith Fabrics has already received follow-up orders for both presses. *"We are still in the test phase"*, says Schäfer, *"and we shall certainly not keep all four suppliers. Decisive in the end is the overall concept – forming, pressing and drying have to be mutually complementary and harmonious."*

PrintTech Q in the dryer section

The first four dryer groups were started up with Voith Fabrics PrintTech Q2 and PrintTech QC. Once again, these high-speed fabrics proved themselves with outstanding web control, dependable press-to-drying transfer, and easy cleaning. Their abrasion resistance and running stability were continuously improved, so that operation today is characterized by exceptionally long service life and outstanding reliability. *"I have to rely totally on the dryer fabrics and related service"*, emphasizes Schäfer. *"I gladly delegate felt change scheduling to the supplier – in whom I place my compete trust. It takes time to build up such confidence, but after more than thirty years in this business, I know the quality and reliability of Quantum or PrintTech fabrics."*

A strong team

For Voith, the success of this project is a matter of prestige. *"We are well aware that at the present time the eyes of the world are focused on LEIPA's PM 4"*, says Martin Serr, Voith Fabrics marketing manager Germany, Austria, Switzerland. *"The experience and know-how we acquire working together with the Voith Paper teams will also help to boost production for our other customers. At the next start-up at the latest, we again can say: four's the winning number!"*.



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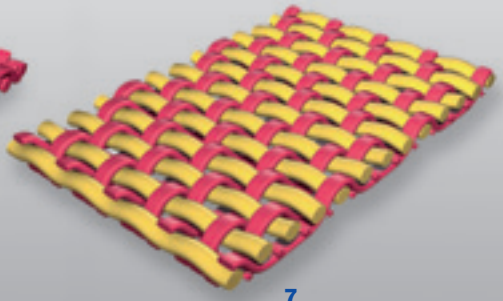

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Manfred Schäfer

Production Manager PM 4 LEIPA-Schwedt

Right though the PM 4 project, Manfred Schäfer has repeatedly praised the good teamwork with Voith.
"Problems occur with every new project, but the way the supplier solves them is decisive. And that is what really impressed me about Voith. They always took our needs very seriously and worked out solutions together with our team. Furthermore, it is an enormous advantage when the supplier brings along his own felts for start-up. In short, the service provided by Voith Paper and Voith Fabrics is exemplary – both with regard to speed and quality. Together, we have mastered all the challenges of this project. And that is what I call teamwork!"

Fig. 4: *Voith Fabrics PrintForm H – structurally integrated SSB forming wire.*

Fig. 5: *Voith Fabrics PrintFlex O – double-layer press felt for demanding start-ups.*

Fig. 6: *Voith Fabrics PrintTech Q2 – dryer fabric for high-speed paper machines.*

Fig. 7: *Voith Fabrics PrintTech QC – dryer fabric with high resistance to dirt and abrasion.*

Contribution by our partner BASF – Using paper chemicals intelligently yields top performance

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Most modern paper chemicals used in the production and finishing of paper and board are functional polymers. Carefully fine-tuned to each individual paper machine, they control operational performance and paper quality. Planning begins at the design stage of a new production plant. An example of this is Voith Paper's joint project with BASF for starting up LEIPA's new PM 4 in Schwedt in eastern Germany.

Investing in big, state-of-the-art machinery has to pay off – and fast. What this means for machine suppliers is obvious. The operating features of the machines and the required paper qualities are both crucially dependent on the materials used. And these are first and foremost raw materials. Without, however, a customized paper chemical system to control it, even the most modern paper machine cannot fully exploit its quality and performance potential. This is particularly true when recycled paper is the only raw material used, as with the new LEIPA PM 4. The paper, after all, has to satisfy the demands of the market. Printability, whiteness, tear resistance, surface feel and many other properties are specified by customers in order to make the chances of successfully marketing their products calculable.

Cooperation generates added value

The trend towards consolidation in the paper industry and fierce competition between suppliers has intensified the push towards further increases in efficiency across the entire process. Along with Voith Paper, we see this as an enormous opportunity – not least due to the positive experiences made during joint projects in the past. Bundling the resources of both partners within the framework of efficient project management generates added value for the paper industry. There is particularly strong potential in cooperating on the planning and launch of new paper machines – for their mutual customers.

As a specialist for modern paper chemicals, BASF has developed a chemicals system for LEIPA that spans the entire process from paper production to paper coating. What is crucial is ensuring that the various parts of this complex system – raw materials, process technology and paper chemicals – are meticulously fine-tuned.

Even before the PM 4's first trials, BASF and Voith successfully met the paper quality required by LEIPA. The tests were carried out under realistic conditions in both companies' pilot plants. The subsequent printing trials confirmed that our formulations delivered the desired results. These pre-trials made a vital contribution to preventing delays in the

Fig. 1: *Pilot coater at Voith Paper, Heidenheim.*

Fig. 2: *Pilot coater at BASF AG, Ludwigshafen/ Rhein, Germany.*

Fig. 3: *The BASF AG site at Ludwigshafen/ Rhein, Germany.*

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ambitious timetable and to ensuring a stable operating performance from the machine's very first start-up trials.

The example of the No. 4 machine at LEIPA clearly shows that working together with the machine supplier, our strategic partner Voith Paper, means we can achieve ideal results more quickly and more efficiently. Our timing was spot-on and in fact we were even several weeks ahead of schedule. Together with our customer, we now plan to identify further room for improvement and to implement the necessary measures swiftly.

New ideas for tomorrow's projects

Of course we do not persist in our current level of knowledge. Along with our strategic partner Voith Paper, we are working on development projects that will benefit our customers in the future. One of these is the curtain coater, a technology in which Voith is a leader and which was largely developed at its pilot plant in Heidenheim, Germany. Here too, we will be taking advantage of the synergies created by the research and development potential of our two companies and in this way improving considerably the chances of introducing new technologies. Our partnership with Voith Paper is both successful and open.

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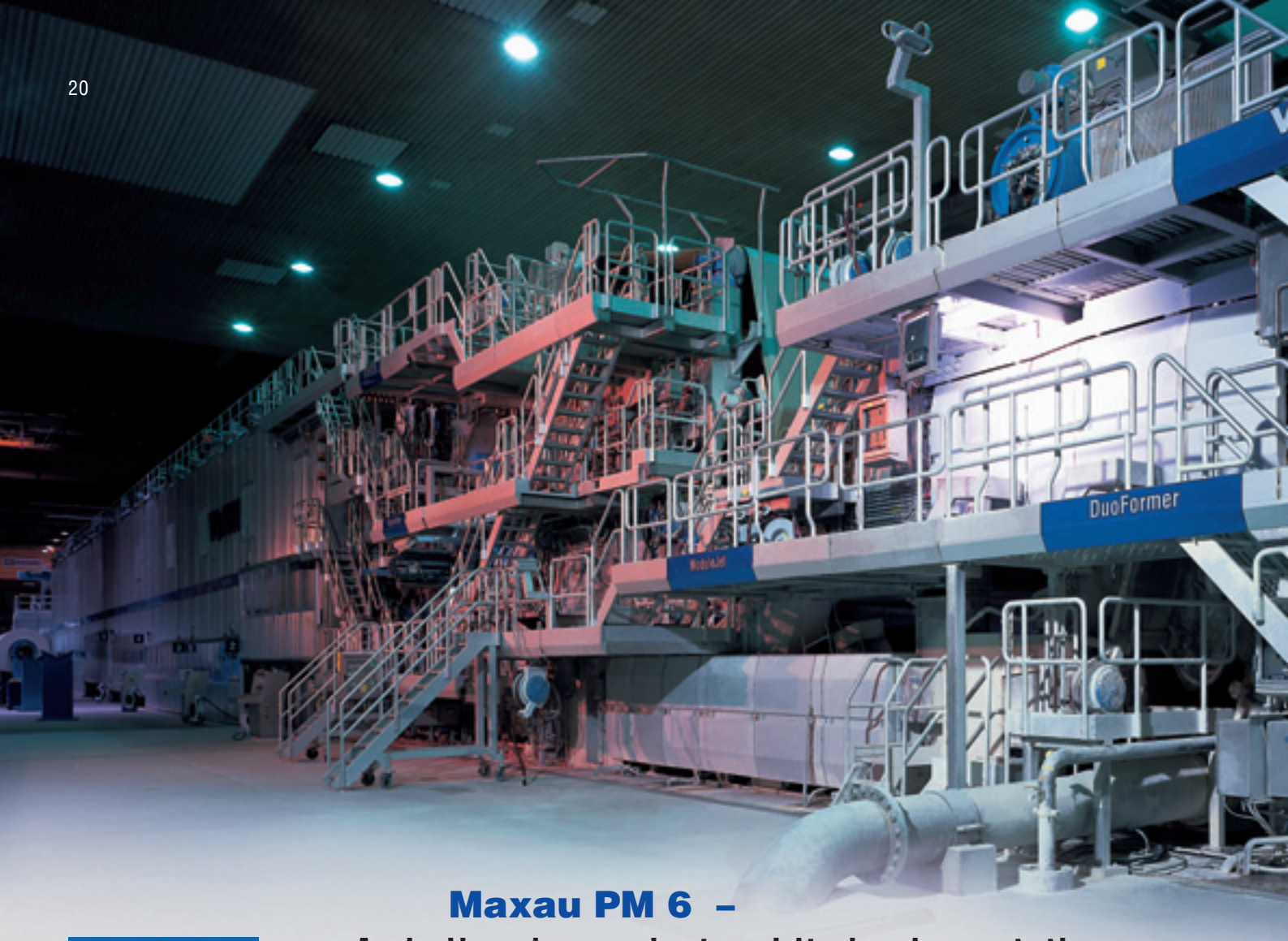

Maxau PM 6 –
A challenging project and its implementation

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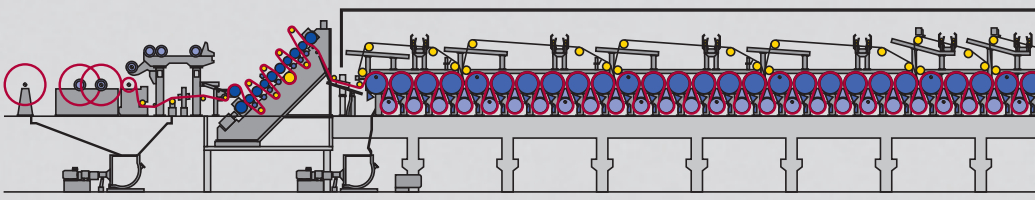
In March 2003, Stora Enso placed an order with Voith Paper for the replacement of Voith PM No. 850 supplied in 1968 with a high-capacity paper machine for magazine papers.

The project

To dismantle a complete paper machine including the peripheral machine sections in an extremely short rebuild time and hand it back to the production process requires an enormous effort in planning as well as good organization in the dismantling/installation phase, as well as during start-up.

Our customer set ambitious goals for this project:

- Doubling annual production to 260,000 t (plus further expansion reserves)
- Increasing the trim width by 300 mm to 7,200 mm
- Fitting the new PM into the existing building



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- Project duration max. 18 months
- Shutdown time max. 65 days, incl. the extensive civil engineering work.

The project developed, based on these targets, from the first day on into a superlative for design, planning and logistics. Voith was able to convince the customer in the project phase that this could only be achieved by minimizing the interfaces, i.e. by Voith Paper supplying all the equipment and taking overall responsibility. The order covered not only the paper machine based on the proven One Platform Concept with DuoCentri-

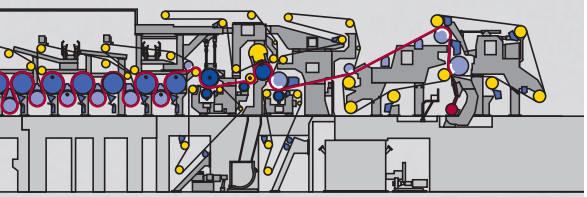

Fig. 1: *Maxau PM 6.*

Fig. 2: *Schematic of Maxau PM 6.*

Fig. 3: *Wire change.*

NipcoFlex Press and Online Janus Calender, but also all auxiliaries, the approach flow system including broke pulper as well as the complete production line engineering. As part of the Process Line Package (PLP), the scope of supply also covered the process pumps, tanks, piping and air system equipment as well as the entire installation work, start-up and personnel training.

Project handling

Cramped space conditions and the linkage of the process piping and wiring with paper machines 7 and 8 that have grown over the years rendered the implementation of the rebuild activities difficult.

During the planning phase further basic knowledge of the extent of the construction work to be carried out in the peripheral system became transparent. This necessary civil engineering work required detailed progress and deadline schedules. Optimal implementation of the activities between civil engineering and mechanical engineering was required to meet the time frame.

When the old PM was shut down on July 2, 2004, a meticulously planned rebuild action began. The first machine parts in the wet end had hardly been dismantled when the civil engineering work began with excavators lifted in through the roof to demolish almost the complete machine framing.

The dismantling of the cabling, which has grown over the decades, had to be prepared in tricky detailed work. Tracing of

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cable routes, existing dead cables, identifying the cables and safety-conscious dismantling of the cables called for months of preparation work. The result was extremely positive. Neither of the two paper machines still running was stopped, and the safety requirements were all met.

The reel section with Sirius reel and Janus calender were already installed when the construction workers were still working on the wet-end foundations.

At times more than 1,300 erectors, civil engineering workers, electricians, pipe layers, etc., were performing the impossible on a daily basis in cramped space conditions: punctually on August 31, 2004 the main part of the installation work was finished and the start-up team could begin with the check-outs.

4

Automation

On the basis of a uniform and constant operating and engineering interface for the machine controls, the process and quality control system, Voith Paper Automation supplied the entire automation for the Maxau PM 6 production line.

The OnQ quality control technology is matched to the production process in such a way that short control loops and thus fast response times on changes in the quality parameters are possible. Besides the OnQ quality measuring frames, numerous CD and MD controls are used in production. Thus an SC paper is produced on PM 6 that is perfectly suited to further processing in the rotogravure printing process.

The automation concept is completed by the OnView Information System with machine and process status monitoring as well as a sheet break analysis and sheet inspection system. With this, all product, process and machine data can be collected, analyzed and prepared. In addition, the VariTop winder has been completely renewed with the latest control and visualization technology meeting after the rebuild the demands made on winders of the new generation.

The result

On September 15, Voith Paper again proved with the production of the first paper roll on the new PM 6 their professionalism in the processing of such complex projects. The first printing tests turned out to be positive and allow us to expect an optimal conclusion to the project.

The production line of PM 6 includes the following modules of the One Platform Concept:

- ModuleJet headbox
- DuoFormer TQv
- DuoCentri-NipcoFlex press with 4th press
- TopDuoRun dryer section
- Janus calender
- Sirius reel
- VariTop winder (rebuild)
- Complete engineering for PM and peripherals as well as almost complete delivery
- Complete engineering and delivery of the electrical control and power section
- Increasing the capacity of the DIP stock production, including disc filter rebuild work.

Stock preparation

As deinked recovered paper is also used as the main furnish besides bleached groundwood and chemical pulp, the capacity of the existing recovered paper preparation system also had to be expanded because of the significant increase in the paper machine capacity.

The production rates have been continually raised over the past few years and all three DIP systems have been operating significantly beyond their original layout specifications. The additional capacity increase by about 20%, spread over two DIP lines, therefore presented a great challenge.

First, a detailed project study and balance of the actual condition of the two selected DIP lines 1 and 3 were carried out.

Technical specifications of PM 6

Wire width	8,100 mm
Untrimmed web width	7,300 mm
Drive speed	1,800 m/min
Design speed	2,000 m/min
Planned annual production Phase 1	260,000 t
Planned annual production Phase 2	280,000 t
Basis weight	45-56 g/m^2
Quality	SC-B (rotogravure)
Start of production	September 2004

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Fig. 4: *Reel section with Janus MK 2 and Sirius reel.*

Fig. 5: *TopDuoRun dryer section.*

Fig. 6: *The EcoCell primary cells for post-flotation in DIP 3.*

Based on this, the rebuild concept for them was prepared.

For the capacity increase not only the existing machines but also all the peripherals had to be taken into consideration. This was undertaken within the framework of the basic and detail engineering, also carried out by Voith.

The major bottlenecks in DIP 1 were pulping, MC slotted screening and thickening, in DIP 3 thick stock cleaning, pre- and post-flotation and likewise thickening.

By re-arranging the process layout and modifications to existing machines, the extent of new investment has been reduced to a minimum. Voith supplied a Fiberizer for DIP 1 to assist pulper discharge operations as well as a vat thickener which was installed in parallel with the existing thickener. The supply for DIP 3 mainly consisted of an EcoCell primary flotation stage for post-flotation, consisting of five cells and the recently developed EcoGaus foam killer, which effectively destroys the foam directly in the foam collecting channel. The existing flotation cells that became free were split up and installed in parallel with the primary cells in the pre-flotation stage as well as providing a new secondary stage for post-flotation. This now allows the mill to operate a separate loop layout.

As part of the expansion of the deinking plants DIP 1 and DIP 3, Voith Paper Automation provided the entire control and instrumentation engineering, including the logic diagrams. The new components have been seamlessly integrated into the existing process control system and the group controls for new and old conponents optimally combined. In DIP 1 the old process control system has been completely exchanged for a new one.

Installation and start-up were also carried out by Voith.

The results are convincing: both the contractually agreed production increases and also the promised quality parameters were reached shortly after start-up of DIP 1 and 3.

6

Carsten Wenk

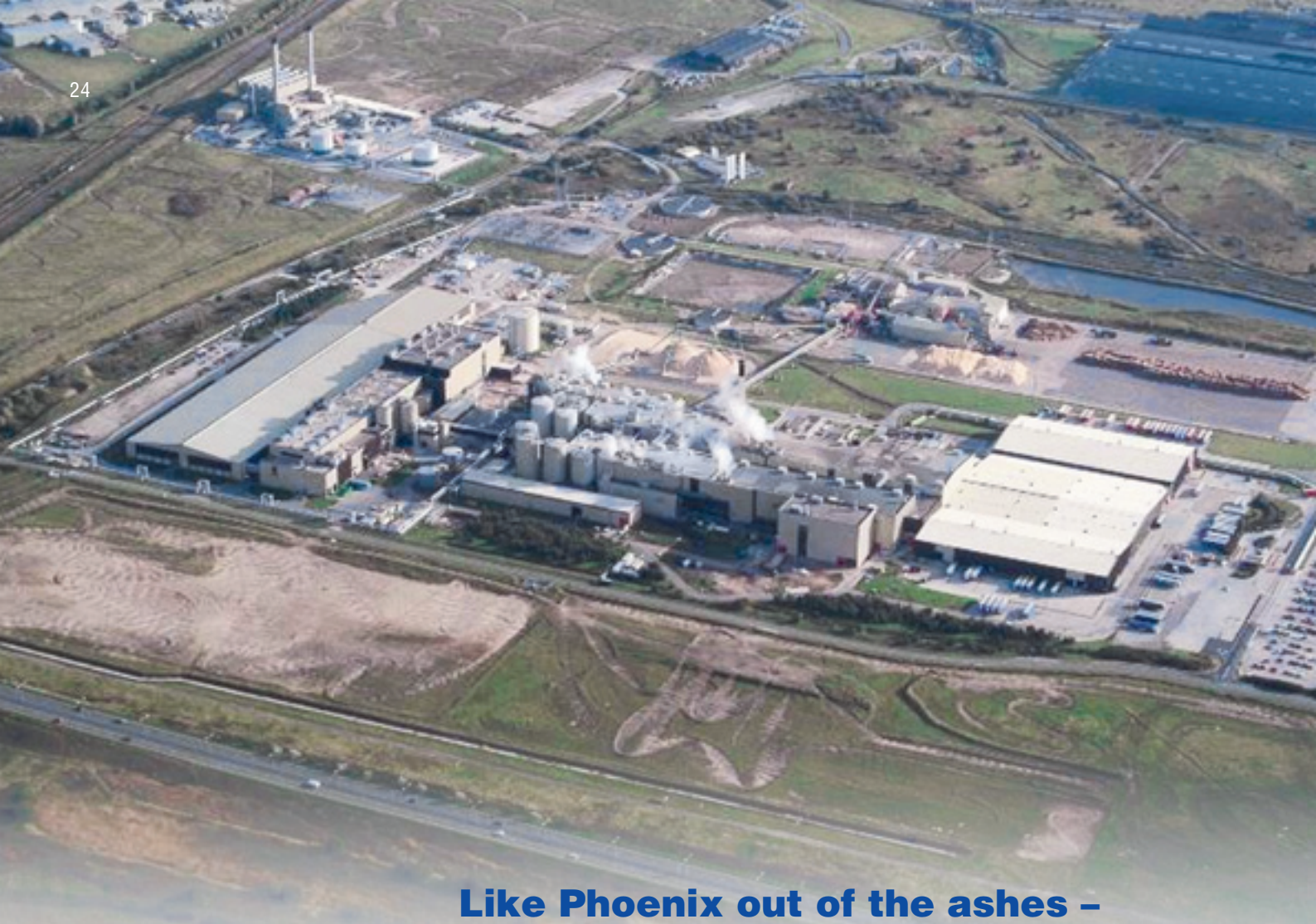
Production Manager Stora Enso Maxau Mill

"With a great deal of commitment and competence on the part of all those involved, the time pressure was successfully withstood. Even if the originally planned deadline for ‚Paper on Pope' was delayed by three days, the start-up team brought forward by two days the goal of producing salable paper by September 24 at the latest. From ‚Stock on Wire' up to the first salable roll in eleven days – that is top performance. A good quality approved by our customers has been uninterruptedly produced since September 24, 2004."

By modifying the pulper helix and installing the additional Fiberizer in DIP 1, pulping capacity significantly increased and pulping quality as well as contaminants discharge were further improved.

Initial stickies tests showed a 50% reduction of the stickies content in the finished stock, – a factor mainly attributable to the modifications in the individual screening stages.

Although the production of both DIP plants was significantly increased, brightness of the finished stock has been maintained at a high level. In addition, by re-arranging the pre- and post-flotation stages in DIP 3, bleaching chemicals have been significantly reduced. Achieving the required objectives in such a short time was only possible thanks to a smooth and close cooperation between supplier and customer.



Like Phoenix out of the ashes –

UPM Shotton PM 2 was rebuilt at the end of 2003 and now achieves ambitious goals

Kerst Aengeneyndt

Paper Machines Graphic
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The UPM Kymmene Shotton mill is located in North Wales. About half an hour's drive west of Manchester and a short distance south of Liverpool, a paper mill was set up here on a former steel works site as part of Mrs Thatcher's programme. In 1985, the mill started with one paper machine, followed in 1989 by a second one.

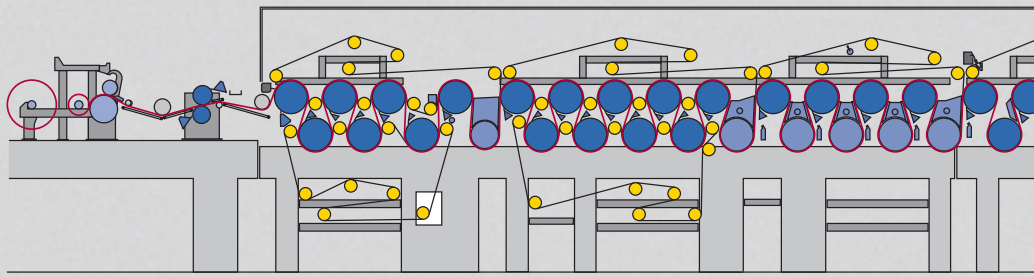

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Fig. 1: *Shotton Paper 2003.*

Fig. 2: *1980 (Steel plant).*

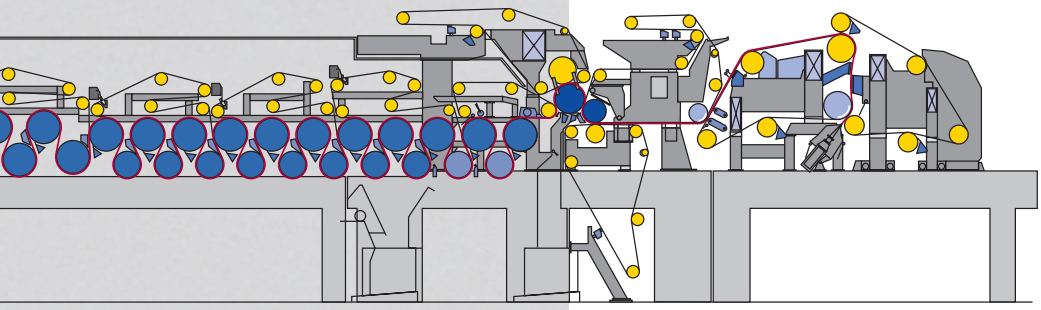
Fig. 3: *Schematic of PM 2.*

Within a short time, UPM Shotton developed into one of the largest and most important suppliers of newsprint based on TMP and recovered fibre.

In 2002, UPM established the "100% Shotton" Project. This means that, in future, Newsprint will be produced exclusively from domestic recovered fibre. A new, third recovered fibre system has been installed *(see twogether issue 18/04)*.

Within the three-week November 2003 shutdown, the PM 2 was rebuilt:

- the third press was converted into a shoe press (max. linear load 1,050 kN/m),
- the fourth press was replaced by an additional dryer group with two ProRelease boxes,
- the fifth dryer group was converted from two-tier to single-tier,
- a ropeless threading system was installed,



Technical Data PM 2

Construction year		1989/2004
Manufacturer/Rebuild		Valmet/Voith
Press		Sympress + NipcoFlex
V_{reel} (m/min)	actual	1,623
	target	1,700
PC (km^2/m/d)	actual	2.05
	target	2.15
Tons (t/d)	actual	770
	target	807
Basis weights	(g/m^2)	42.5-48.8
Paper grade		Newspaper

Fig. 4: *PM 2 Wet end section.*

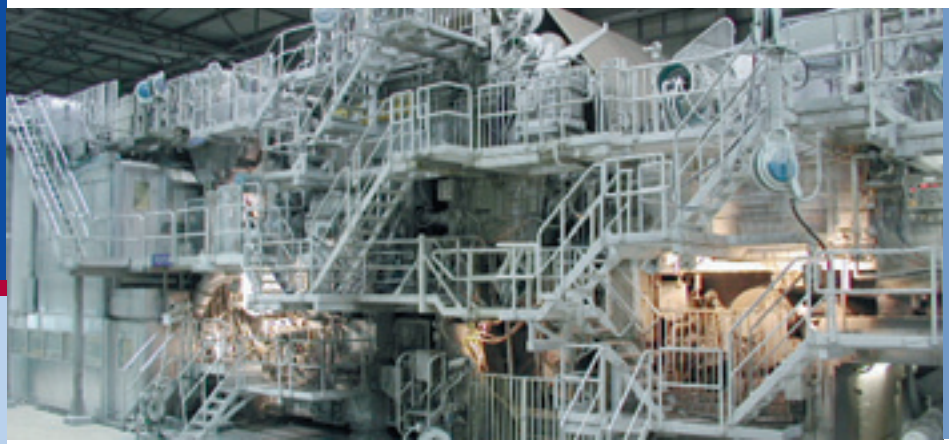
Fig. 5: *PM speed.*

Fig. 6: *Specific production.*

Fig. 7: *Number of breaks.*

Pasi Häyrynen

Project Manager UPM-Shotton PM 2



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"Shotton PM 2 partnership with Voith has been a very successful process. In practical terms this partnership has meant that we have had a Voith start up engineer on site since the start up. This has allowed us to bring up any issues with the new equipment immediately and problems have been solved much faster. Also, issues left from the project have been followed up in a very professional way and feedback has been quick and actions have been taken to correct problems as soon as possible. We have been able to address any additional training issues immediately and this is still ongoing. Voith engineer has become an important member of our area team."

- the gap due to the missing breaker stack was closed by dryers and DuoStabilizers,
- four DuoCleaners were added for the first dryer groups,
- a water-jet tail cutter and
- a HiVac were installed.

The particular challenge was that many existing parts had to be reused and, therefore, the time frame was very tight due to extensive adaptation work.

PM 2 went into operation after a short, effective start-up. The first weeks after start-up were convincing and promising. The speed distinctly exceeded the self-set target. The number of sheet breaks, the duration and number of unscheduled shutdowns showed that there was further need for optimisation.

In the subsequent optimisation phase in a system partnership between UPM Shotton and Voith Paper, measures and improvements were worked out that helped PM 2 toward stable running and high efficiency within a few months.

In the meantime, the specific production of PM 2 is stably above 2.00 km^2/m/d.

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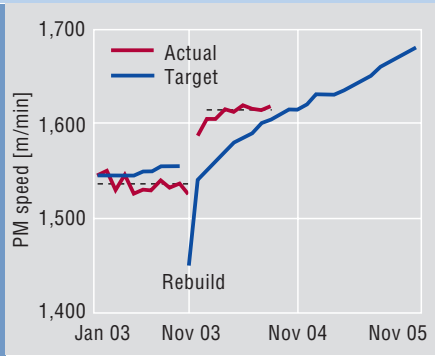

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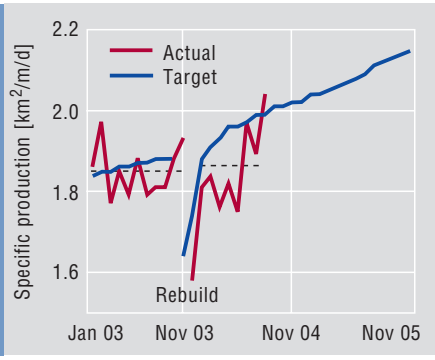

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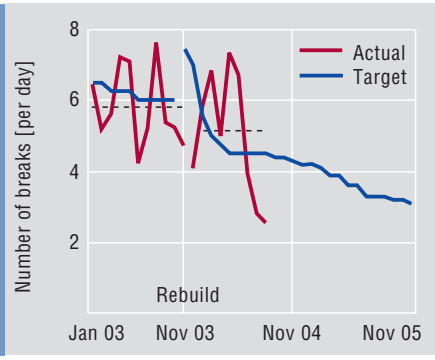

"Perhaps you remember me. I've been here before..."

The project goals of 2.15 km²/m/d and 1,700 m/min at the reel are certainly realistic.

After just six months, the official acceptance test of the machine was carried out and, almost simultaneously, in the presence of HRH Prince Charles and a large number of British and international guests from industry and politics, UPM Shotton celebrated the inauguration of the new recovered fibre preparation system. Prince Charles, who opened the new mill 25 years before, began his speech with the amusing words *"Perhaps you remember me. I've been here before..."*

The system partnership included the optimization of the two paper machines from the approach flow system to broke reduction. The success of PM 2 also "spilled over" to PM 1, which has not yet been rebuilt by Voith. The strict separation of stock supply and also the water and broke systems play here an important part. In addition to a consistent shutdown management, the optimisation of the chemicals' balance produced the major breakthrough.

With these latest successes, UPM Shotton and Voith have demonstrated their potentials.

Like "Phoenix out of the ashes", UPM Shotton has moved with a powerful beat of its wings into the realms of Europe's most efficient paper mills and will in future not have to comply with standards but will set standards.

Voith Paper is proud to have participated in the past and will participate in the future history of success as a reliable partner to UPM. On Voith's side, UPM will be continuously and competently supported in all matters of paper production and technology.

Velsen PM 2 with new drive concept –
When gearwheels become superfluous

Dr. Thomas Elenz
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Papierfabrik Crown Van Gelder, Velsen, Netherlands, is well known for its excellent woodfree papers, that are used for graphics as well as industrial purposes: e.g. labels, endless laser printers, boarding passes, writing and office papers. With the multi-year investment plan 2 the annual capacity will be increased by 20,000 t/year. As the first step, Voith received an order for the rebuild of PM 2 in September 2003.

The following major objectives have been achieved:

- increase in production capacity,
- distinct savings in steam through heat recovery and new drying technology,
- shortening of the threading times,
- increased automation,
- greater safety for the operators,
- downtime reduction with new drive.

The work was focused on the dryer section, but the press was also improved with the use of the mill-proven G2000 roll covers and expansion of the vacuum system. After an extremely tight delivery time of seven months plus one month installation time, PM 2 went into successful operation on June 5, 2004.

For the first time, Voith implemented the drive of the entire dryer section without gear wheels, drive shafts and gear units, but with the electric drives called “attached drive” **(Fig. 3)**. The great advantage is that the motors are simply slipped onto the journals of rolls and dryers both on the front side and on the drive side.

As gear wheels are not used with this concept, lubrication is no longer necessary and gear wheels as wear parts no longer exist.

Finally, the noise levels have been so enormously reduced that Klaas Flens, Senior Production Engineer at Crown Van

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Gelder says: *"Our PM 2 is now so quiet that we can even hear if a sheet break happens on PM 1 behind it."*

Another important goal of the rebuild was the new air and drying system, which has been installed in a new, external "air house". The esthetic design – similar to a roll of paper – has been arranged by Voith outside of the building above the offices. The enormous heat recovery system and the new air system with stabilizers allowed us to easily achieve our goals.

With this order, Voith implemented for the first time the PLP Concept (Process Line Package) in a major rebuild. Voith was the overall supplier of all components and services inside the machine building, inclusive of mechanical and electrical drive, sectional electric drive, DCS expansion, air system and heat recovery. The advantages for the customer, such as the elimination of interfaces, one contact partner and shortening of the project time also show up in the excellent start-up curve.

The new drive technology fulfils all expectations up to now and is classified as a trendsetter for future projects. Six months after start-up all monthly results are fully according to plan.

Miklas Dronkers

Operations Manager Crown Van Gelder N.V.

"The rebuild of PM 2 is the largest project we have had for 15 years. As a key element of our investment Master Plan II, the rebuild will contribute to increase our production by 20,000 t/year. Just ten days after paper was wound up on the reel, the targeted production speed of 1,000 m/min was reached.

It was a great experience for all of us at the paper mill to witness how smoothly this success was achieved and how the important modernization of our PM 2, in cooperation in a spirit of partnership with Voith, was implemented."

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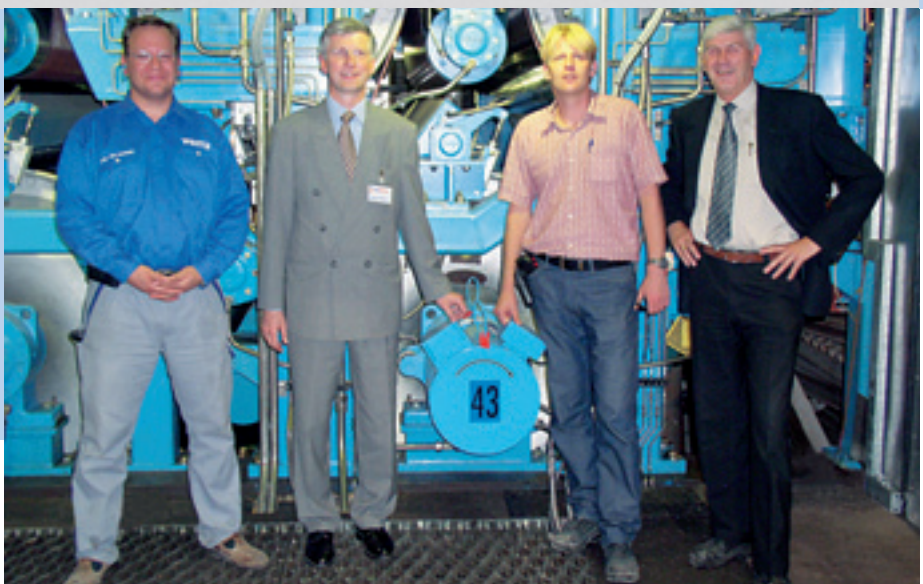

Fig. 1: *Miklas Dronkers in front of the new "air house".*

Fig. 2: *Velsen PM 2 after-dryer section.*

Fig. 3: *From the left, in front of the "attached drive" at dryer 43: Axel von Noorden, head of start-up engineers at Voith Paper; Dr. Thomas Elenz, Sales Benelux countries at Voith Paper; Miklas Dronkers, operations manager Crown Van Gelder; Andre Duiker, project manager at Crown Van Gelder.*

New frontiers –
new paper mill at Yaslik in Turkmenistan

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A small member of the Voith family made a contribution to bring the name Voith to the new frontiers. At the end of August 2002, Voith Paper Schio in Italy signed a contract with Çalik Holding of Istanbul for the delivery of a complete paper production line from headbox to winder in Turkmenistan, a country of the Commonwealth of Independent States of the ex-USSR.

Çalik Holding is a Turkish entrepreneur who is investing in industrial plants in several Moslem and Arabian countries. In Turkmenistan this company operates a large textile plant for several years producing jeans for the United States. In addition they have fertilizers plants, buildings and power generation plants under construction.

The supplied paper production line was integrated in a green field paper mill, the first paper mill in Turkmenistan. This was in any case a success because in only 14 months Voith Paper, Schio, was able to deliver and to erect with the customer the whole machine. All equipment was delivered to Turkmenistan by about 100 trucks, a part coming from Heidenheim

Fig. 1: *The paper machine in Yaslik shortly before official handover.*

Fig. 2: *DuoFormer D.*

and Krefeld (Germany) and Schio (Italy) and the rest from São Paulo (Brazil) by ship via Bandar Abbas (Iran). All 100 trucks arrived without major accidents. This was the first positive point. Also the excellent constructed building was finished in time.

The production line was designed to use the two local raw materials straw pulp and cotton linters.

The stock preparation plant for bleached straw pulp came from India and the line for cotton linters came from Spanish and French suppliers. Fortunately the stock preparation plant is also suitable to produce long and short fibre pulp. This helped to start the production line in the foreseen time. Machine erection was done by an Indian company, SFE, well known by Voith. In crucial moments, more than 230 people were on site in order to complete erection in time. Voith provided one erector supervisor, Mr. M. Lago, responsible for the complete erection of the paper machine from the headbox to the winder. Mr. A. Antoniazzi, responsible for the complete commissioning, instrumentation and check-out, played a crucial role to start up the production line. Technological support came from some specialists from Europe.

At present, the final product of writing and printing papers is made from 35% straw and 35% cotton. Already a basis to reach the project target: Paper production from 50% straw and 50% cotton. An early start-up has been made possible by the edition of long and short fibres, bought on the market, to the above men-

Technical Data	
Untrimmed width	3,550 mm
Operating speed	600 m/min
Design speed	900 m/min
Daily production	180 t/day
Basis weight	60 g/m^2

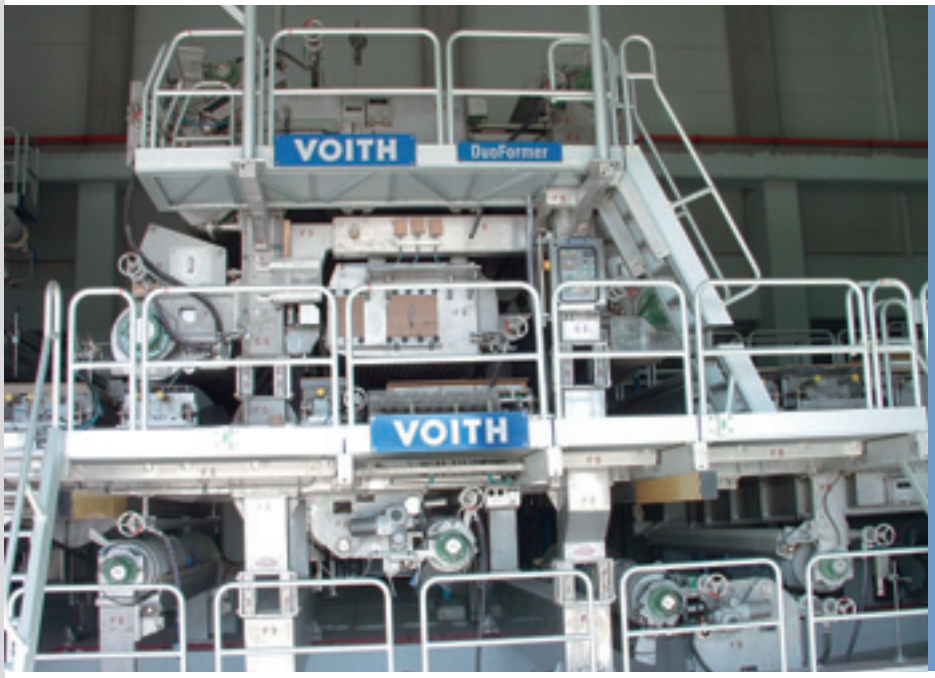

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Fig. 3: *Çalik Holding, plant Yaslik in Turkmenistan.*

Fig. 4: *DuoCentriNipcoFlex press.*

Fig. 5: *Winder.*

Vahit Gokhan

Project Manager GAP INSAAT, Çalik Holding

"For our new paper machine we have decided on the solution by Voith as Voith's was the one we trusted most. They were in a position to meet all our requirements by cooperating in a spirit of partnership with us. In retrospect I must say that we made the right decision. The project was a complete success."

tioned raw materials, the resulting paper comes up to all expectations.

To everyone's satisfaction, the production line was inaugurated on 21st May 2004 in an unforgettable ceremony, in the presence of the Turkmenistan President Mr. Saparmyrat Türkmenbaşy and Dr. Hermut Kormann, President and CEO of the Corporate Management Board of Voith AG. The mill is now a good reference and can be visited by potential customers of the Middle East area.

For this PM Voith has delivered:

- Masterjet FB Headbox with ModuleJet dilution water technology for best basis weight distribution and fiber orientation, lamellas to improve paper structure and a Profilmatic control concept.
- Fourdrinier and Duoformer D for a good formation and symmetric dewatering.
- DuoCentriNipcoFlex press to ensure highest dry content, since straw pulp has a high content of fines.
- Double tier pre- and after dryer section, SpeedSizer, rope tail-transfer system.
- DuoSoftNip Calender with thermo rolls heated with warm oil in order to minimize two-sidedness.
- Reel wind-up diameters up to 2,600 mm, jumbo rolls magazine, Unwind and Variflex S Winder.

The order included also lubrication system and basic process engineering.

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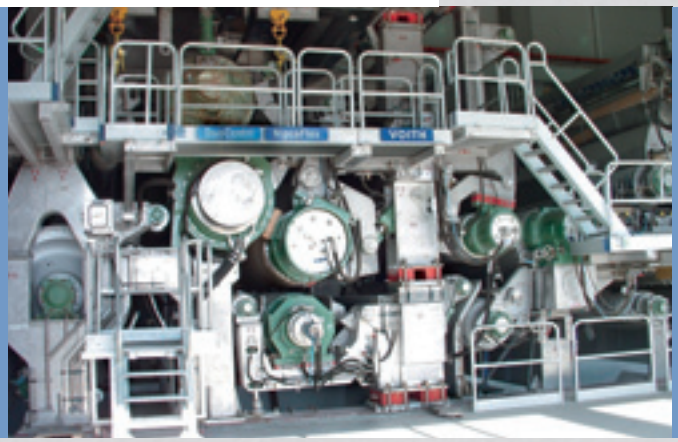

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Reader opinion survey

twogether customer magazine:
helpful, useful, interesting, or...?

Dear Readers,

This year, *twogether* magazine celebrates its tenth birthday – how time flies! Since the first issue in 1995, readership worldwide has almost tripled. The editorial team is of course very proud of this growing interest, but we shall certainly not rest on our laurels. In order to ensure ongoing improvement, we would like to ask you two questions: Does *twogether* magazine in its present form meet your information needs in full? Which aspects could or should be expanded in your opinion to meet your own needs and those of readers in general?

In order to find out as much as possible about your needs and wishes, we have launched a reader opinion survey on our homepage at
www.twogether.voithpaper.com

We depend on our readers to help us make *twogether* magazine even better. So please spend a few minutes of your valuable time answering the straightforward questions we have prepared for you.

As a small tribute of thanks, we will raffle off **a wellness weekend for two and several other attractive prizes** among those responding to this call. Maybe you will be one of the lucky winners!

We shall carefully evaluate all replies received. The results will be reflected in our editorial planning for *twogether* magazine as well as its content and graphical layout. Many thanks for your valuable assistance!

Last deadline June 30, 2005

1st prize:
Wellness weekend for two.

2nd prize:
Sony DSC-T3 Cyber-shot digital camera in silver-finish housing only 17 mm thick.

3rd prize:
iPod mini (blue), 4 GB, for Mac and PC.

4th to 10th prizes:
1 USB 128 MB memory stick.

SAICA PM 10 – another complete production line for the Spanish packaging paper manufacturer

Helmut Riesenberger

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Benito Rodriguez

Fiber Systems
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Never change a winning team! True to this motto, the Spanish paper manufacturer SAICA (Sociedad Anónima Industrias Celulosa Aragonesa) again decided with its new production line in favour of the reliable Voith technology and trusted cooperation when it placed the order for the supply of the new PM 10 line with Voith in May 2004.

After the throughout positive experience with the PM 9 that went into operation in 2000, there was a wide range of reasons for continuing the successful cooperation. On the one hand, the One Platform Concept has been more than proven at SAICA, reflected in the fact that the existing PM 9 has been running at the highest level of productivity since its start-up and is actually the world's most productive line for the production of corrugating medium. Furthermore, SAICA is again relying on the exceptionally good cooperation with Voith that was demonstrated in particular during the optimisation of this world-class line.

For the new PM 10, that will go into production in May 2006, Voith will supply the stock preparation system and the paper machine, including an automation package, and hence practically the whole process technology. The paper machine is laid out for a wire width of 8,550 mm and a design speed of 1,800 m/min. The operating speed is 1,500 m/min. With basis weights between 75 and 145 g/m^2, up to 400,000 tonnes of high-quality corrugating medium and testliner can be produced per year from 100% recovered paper.

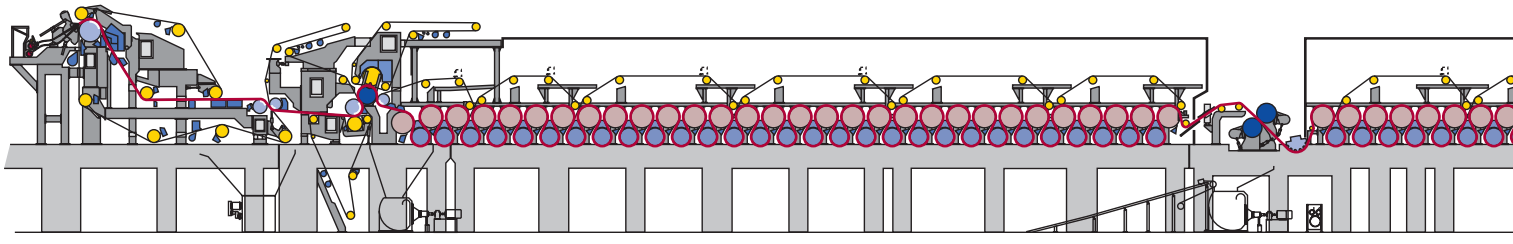
Stock preparation

The new stock preparation system has a capacity of 1,440 t/24 h. Its design is essentially based on the successful concept of the line supplied for PM 9, where record efficiencies are being achieved today. Voith's scope of supply for the new line includes:

- Virtually all the process machines for
  – recovered paper preparation
  – the Advanced Wet End Process (WEP) including suspension deaeration
  – broke pulping and preparation
- Basic engineering

Fig. 1: *Schematic of PM 10.*

Fig. 2: *Only positive experience with the PM 9 that went into operation in 2000.*



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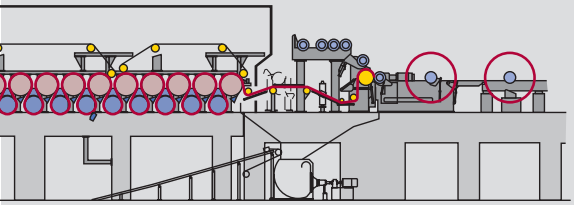
- Erection and erection supervision
- Start-up support.

The process modules for the recovered paper preparation technology ordered from Voith are:

- Pulping in two continuous LC pulpers, each with a TwinPulp III discharge system for removing the majority of contaminants from the process at the earliest possible stage, minimizing at the same time fibre losses
- 2-stage HC cleaning with the Protector system
- Hole screening with deflaking-action disc screens. Combisorters are installed in the final stage for removing the high concentration of contaminants at a high dry content
- Double fractionation using 0.15 mm slotted C-bar screen baskets for an extremely clean short fibre fraction and a high long fibre concentration in the long fibre fraction
- LC heavy-particle cleaning of long and short fibres with EcoMizer cleaners for high separation efficiencies at higher than usual stock consistencies
- LC slotted fine screening in the long fibre line using C-bar screen baskets. This provides gentle screening, especially for the efficient removal of stickies that have built up here, thus contributing to a high paper machine runnability
- Long fibre refining with two TwinFlo double disc refiners for increasing strength characteristics
- Long and short fibre thickening, each with Thune Bagless disc filter technology.



Paper Machine

In the former section, a MasterJet M2 two-layer headbox with ModuleJet dilution-water control system and the proven gapformer DuoFormer Base ensure optimum CD profiles and strength values and economical use of raw materials.

High dryness while simultaneously saving bulk of the paper web are achieved with the DuoCentri-NipcoFlex press. A closed web run ensures high operational reliability.

The TopDuoRun dryer section uses the single-tier concept in both the pre-dryer and the after-dryer section. This configuration together with ProRelease boxes, DuoStabilizers and the ropeless threading system ensures optimum runnability. A Speed-Sizer will be used for uniform starch application on both sides. The scope of supply also includes a ModulePro P for moisture profile control in the after-dryer section.

In addition to the basic engineering for the control system Voith Paper Automation will deliver the hydraulic and pneumatic control systems for the paper machine and the CD profile control system:

Francisco Carilla

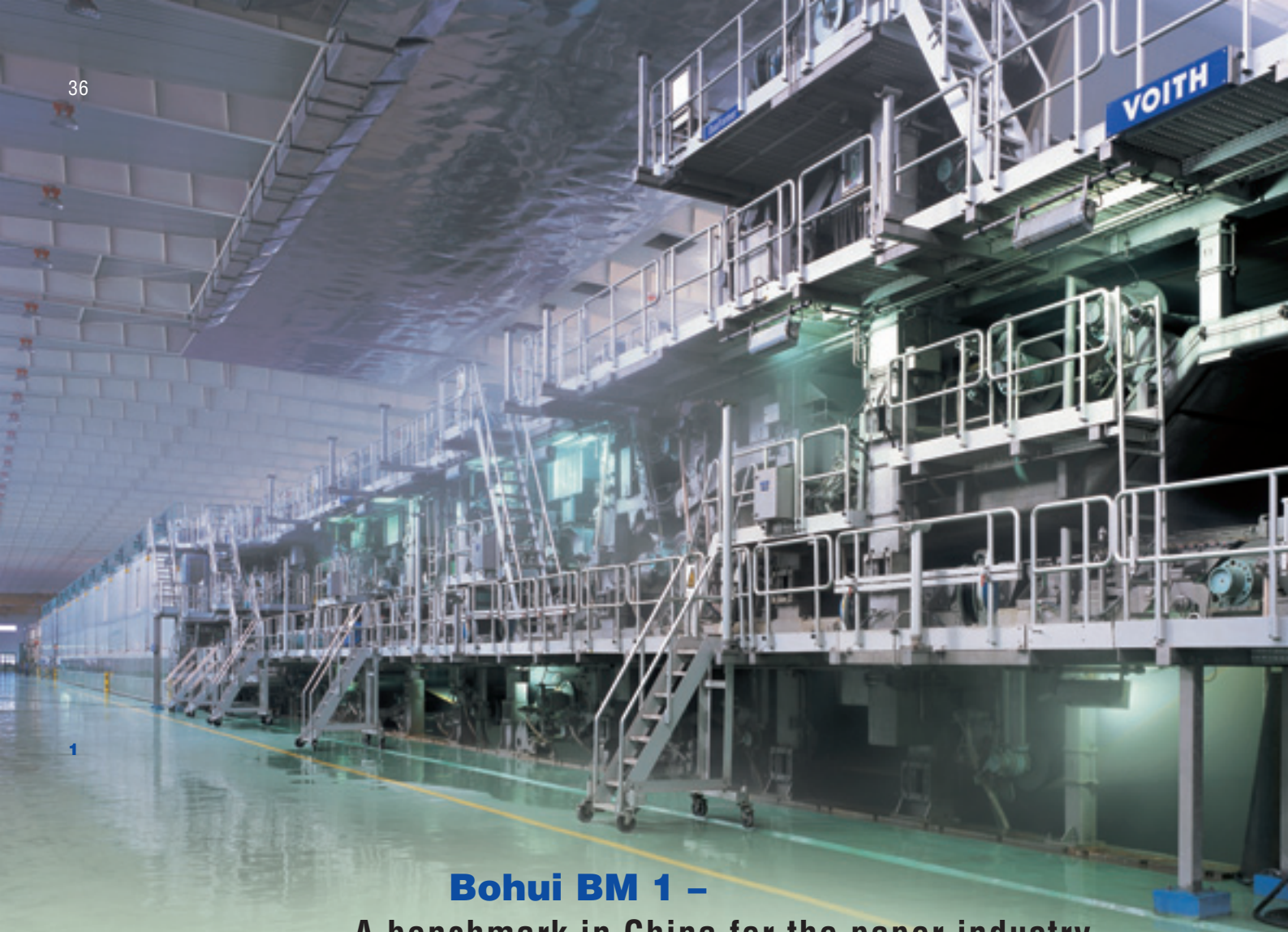
Project Manager SAICA 4

"We chose Voith as the main supplier of the PM 10 production line, because we think its technology is more adapted and proven for our grades and furnish. The PM 10 configuration comes very close to our existing PM 9, which was also delivered by Voith four years ago.

Besides, since the PM 9 project, we have established a very high cooperation level between Saica and Voith, with a high and open commitment of the two technical teams. This makes us trust that for the next steps taken both on PM 9 and PM 10, we will have a solid basis to achieve our goals."

- Profilmatic M on the ModuleJet M2 headbox
- Profilmatic S for the ModuleSteam blow box in the press section
- Profilmatic MP for the ModulePro P-50 nozzle humidifier in the after-dryer section.

At the end of the paper production line, the paper web is wound up on a Sirius reel, which allows maximum roll diameters of 4,000 mm with optimum winding quality. A Rollmaster will be used at the Sirius reel for optimisation and analysis of the wind-up process.



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Bohui BM 1 –
A benchmark in China for the paper industry worldwide

Helmut Riesenberger

Paper Machines
Board and Packaging
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This new board machine for the Bohui Paper Group in China was smoothly commissioned on July 18, 2003, some weeks earlier than planned. With a capacity of 300,000 t.p.a. it is one of the world's biggest production lines for white coated carton. This was of course the focus of great expectations in the paper industry – which after more than one and a half years of outstandingly successful operation have been fully justified.

Bohui Paper Group

Bohui is about one hour's flight south of Beijing, right in the center of Shandong Province with its rapidly expanding industries. The Bohui Paper Group production portfolio includes linerboard, folding boxboard and graphic grades as main products. Apart from paper and board, Bohui also makes various chemical products such as PVC and common salt (NaCl, sodium chloride). The group's very considerable energy requirements are covered by its own thermal power plant, soon to be joined by a second one to keep pace with demand.

With about 4000 employees and an output of around 450,000 t.p.a. of board and 120,000 t.p.a. of graphic paper grades, the Bohui Paper Group is already one of China's ten largest paper producers. And

2

it plans to expand overall paper and board production to about 1 million t.p.a. by the year 2008.

At the end of March 2002 the Bohui Paper Group entrusted Voith Paper with the delivery, erection and commissioning of a complete new board machine.

One of the most decisive reasons for booking this order was our excellent references in this area – over the last few years Voith Paper has successfully delivered and commissioned no fewer than eleven board production lines in China.

State-of-the-art technology

The new machine produces high-grade carton, coated on both sides, from 100% chemical pulp, and folding boxboard with white coated cover layer from recovered paper furnish. Voith Paper delivered the entire process technology on a single-source basis.

In the stock preparation system, apart from cleaning, hole and slot screening as well as fractionation, the mill has also installed EcoCell deinking and two complete disperger systems, each with preceding disc filter. A further disc filter is used to recover fibers.

The new paper machine comprises the following components:

- 4 fourdriniers and a DuoFormer D
- 4 MasterJet F/B headboxes, with the liner headbox being equipped with a ModuleJet dilution water control system

Technical data of the new board machine

Product	Folding boxboard (coated white board grey/white back) Cardboard (coated white cardboard)
Basis weight	150-450 g/m^2
Wire width	6,230 mm
Untrimmed width at reel	5,630 mm
Operating speed	233-500 m/min
Design speed	600 m/min
Production capacity	932 t/24 h

Fig. 1: *Bohui board machine 1.*

Fig. 2: *Bohui Paper Group in Bohui, Shandong Province, China.*

Fig. 3: *SpeedFlow.*

Fig. 4: *Overall layout of the paper machine and coating line.*

Fig. 5: *Bohui coating machine.*

Fig. 6: *Reel.*

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- NipcoFlex shoe press
- Suction press
- Offset press
- 2-tier dryer section with a predryer section, afterdryer section and a correction group
- On-line coating machine with 4 GL coaters for double coating on both sides
- Krieger InfraElectric infrared dryer, with integral InfraMatic moisture cross-profiling for the coat
- SpeedFlow coating unit
- 1 hardnip calender and 2 softnip calenders
- TR 125 reel
- VariFlex two-drum winder.

The entire machine control, operation and visualization systems were installed by Voith Paper Automation. The automation system also includes Profilmatic M cross-profile control, Aquapac moisturizing spray nozzle system and IR coating dryer. Voith also took responsibility for the erection and commissioning of this board machine. All machine clothing was supplied and installed by Voith Fabrics. Major components such as the dryer section and coating machine frames, the dryer cylinders and rolls were made in China by Voith Paper Liaoyang Ltd.

The new coating line

The on-line coating machine with four GL coaters was built according to the Voith "One Platform Concept" and fitted with a Krieger IR-drying system.

The special features of this coating machine include modular arrangement of the coater stations, and the Airturn dryers. These innovative dryers ensure contactless turning of the board web during the simultaneous drying process.

This modern coating line is particularly distinguished by its short and uniform web runs before and after the coaters, each with its own web tensioning group, as well as fast web transfer and the low overall machine height.

The coaters are suitable both for rod and blade operation modes.

Extremely operator-friendly, this coating line with its compact dimensions ensures the highest coating quality and excellent runnability.

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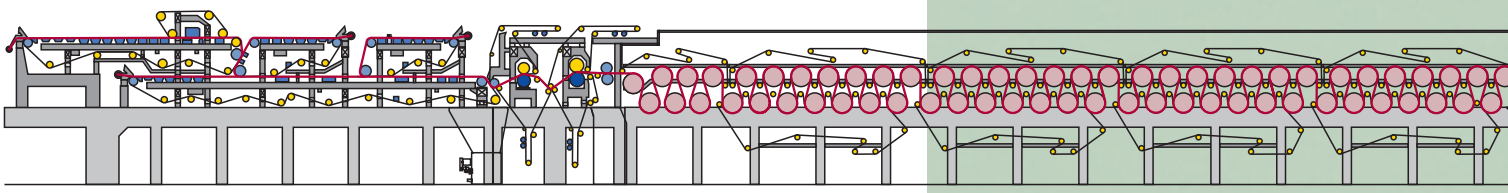

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Erection, commissioning and optimization

The notably short erection and commissioning time of only six months in total was only possible thanks to first class coordination and cooperation between the Bohui Paper Group and Voith Paper. One month after commissioning, the new board machine was already producing saleable board at full production capacity. A decisive reason for the uncommonly short completion time of only 16 months for a project of this size – from contract signing to commissioning – was that Voith effectively took over responsibility for the entire machine and thus reduced interfaces to a minimum.

Hardly a year after commissioning this new board machine, all the specified requirements for folding boxboard as well as for cardboard production were complied with at full production capacity.

The highly successful commissioning took place in July 2003.

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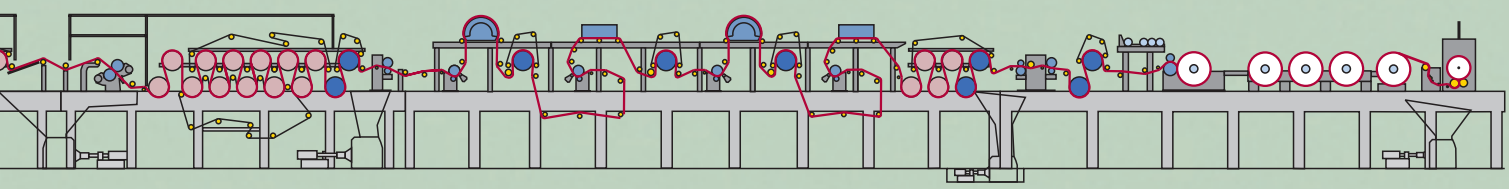

Amcor Cartonboard –
Australasia Petrie Mill invests in the future

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Amcor Cartonboard Australasia invested US$ 40 million to replace the Wet End of their board machine at Petrie Mill with a state-of-the-art Multifourdrinier forming section. The objective of this upgrade was to improve quality and to offer their customers the best board they can possibly make.

Rebuilding for the Future

Amcor Cartonboard's Petrie Mill is a member of a major international packaging company and is the only coated cartonboard producer in Australia. Its primary market is Australasia and Asia. Although Amcor is the major supplier to the Australasian greyback market, the intention of the upgrade is to increase the market share of the whiteback market and open new avenues for the premium end of the market such as pharmaceuticals, cosmetics, confectionery and high quality printing.

Improving quality and keeping pace with market demands and progress have always been major motivating factors in the Amcor Cartonboard philosophy. The firm go-ahead for the wet end project was given by the Amcor Board in October 2002 and Voith Paper São Paulo was chosen as the major supplier.

The Wet End Components

The Multifourdrinier forming section supplied by Voith Paper is the concept used by majority of the leading Cartonboard

Technical Data

Paper grades	4-ply white lined chipboard
Basis weight	240-467 g/m^2
Wire width	4,060 mm
Untrimmed width	3,550 mm
Max. operating speed	500 m/min
Design speed	600 m/min

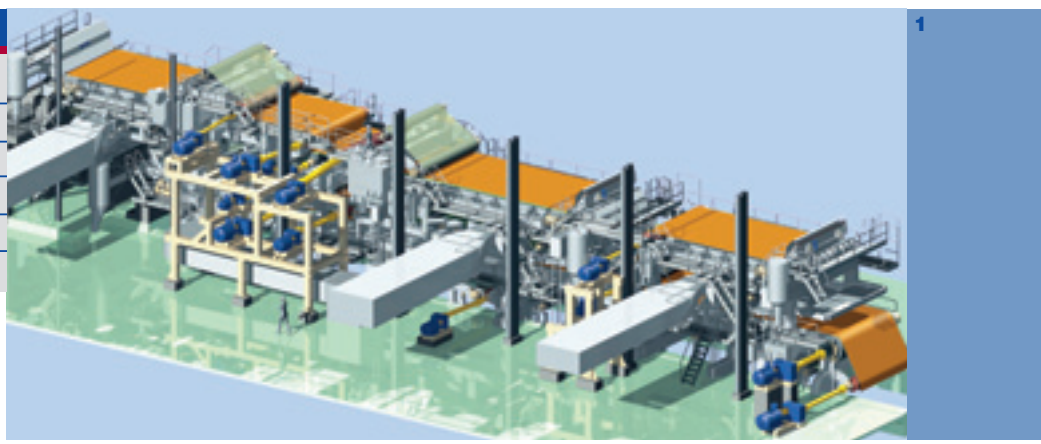

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Fig. 1: *Wet End components.*

Fig. 2: *Petrie Mill: Wet end of the BM.*

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manufactures around the world. It comprises a fourdrinier for each of the four plies resulting in a top product quality. Each fourdrinier has a headbox type MasterJet F/B. The Middle Ply headbox features the dilution control through a ModuleJet system that permits excellent basis weight control. The Middle Ply and Under Top Ply forming section each have a DuoFormer DC installed enabling optimum formation with a higher basis weight split. With a length of more than 40 meters, it is one of the longest wet ends ever manufactured by Voith Paper.

Because of the upgrade, the approach flow system was also slight modified to be compatible with the new Wet End. It was necessary to rebuild the screening systems. The upgrade mainly involved the installation of MultiScreen pressure screens, fine slotted screens on all four plies that remove impurities, a MiniSorter for handling the rejects from the middle ply and twin impeller fan pumps.

The Project

Project results on each individual project phase really exceeded expectations. The perfect planning and interaction between Amcor and Voith started during the sales phase and contract phase with the discussion of an optimization plan that also included machine sections beyond Voith Paper's scope of supply.

Voith Paper provided an extensive training program to the Petrie Mill. The training included an interactive 3D module, class room and on site training sections.

The perfect interaction between Amcor, Voith Paper and the contractor during the erection and commissioning led to a very smooth and safe start-up on April 12, 2004 and the results were nothing but outstanding.

Due to the common goal of all parties involved, excellent results were achieved very shortly after start-up and the preliminary machine acceptance document was issued less than 4 weeks later, on May 07, 2004.

In order to achieve the project's premium Cartonboard quality goal, machine sections like press, dryer, calender, coater etc were analyzed. A team of specialists from Voith Paper and Voith Fabrics visited Petrie to check the machine and make suggestions for improvements.

A consultant for coater chemistry joined the team for the optimization of the exiting coater.

Voith Paper would like to thank all persons that contributed to the outstanding results of this project and looks forward to a long and strong partnership with Amcor group.

Bob Scard
Project Manager Amcor Cartonboard

Dick Lock
Production Manager Amcor Cartonboard

"Dealing with Voith Brazil has been nothing but a positive experience. Their expertise and professionalism is second to none", Bob Scard, Petrie Project Manager, stated. According to the Petrie team, the Voith engineers listened to Petrie's problems and suggestions. *"Voith has a flexible and open-minded team of experts and they tailor each machine to the specific requirements of their customers. Also, being an international company, most of the Voith people speak fluent English and the language posed no problems",* Dick Lock explained.
Every stage, from design to construction, pre-assembly, packing for shipment and start-up of the wet end has gone smoothly so far and there are no obvious reasons why this project should not conclude without any major problems. Amcor Cartonboard has nothing but praise for Voith Brazil. *"It was a pleasure dealing with them",* Bob Scard added.

Voith Silent Technologies – SeaLencer

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Harald Freytag

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The increasing industrialization makes noise a key issue. The industry, in particular the paper industry, often faces the problem that the operation of technical equipment is not, or only to a limited extent, possible if the legal limit values are exceeded. The pioneering solution of the SeaLencer sealing strip system developed by Voith for suction rolls fully satisfies today's demands on noise abatement.

The starting position

The sound pressure level usual in the vicinity of paper machines confronts the design engineers with the task of taking noise abatement measures. In particular, the legal provisions for employee protection and neighborhood protection require noise reduction measures. The targets set by Voith Silent Technologies are to pave the way for systematic noise reduction in paper machines: By the end of 2005, the suction roll noise is to be reduced by 5 dB, A-weighted, which corresponds to a sound energy reduction of 68%. The noise level reduction to less than 90 dB, A-weighted, to be achieved at operator level on a long-term basis is to significantly improve the workplace quality in the vicinity of paper machines. The suction rolls in the wire and press sections are the crucial noise sources of a paper machine. Due to their "noise dominance", the acoustic design process presently focuses on suction rolls.

Voith's acoustic test stand

An acoustic test stand is used to systematically analyze and optimize the acoustic characteristics of suction rolls under standardized conditions. It allows to alter various physical parameters (such as felt speed, vacuum, amount of water, etc.) within wide limits.

In addition to acoustic analyses, innovative technologies are developed in the research fields of "wear-optimized design of seals", "reduced energy consumption" and "reduced vacuum losses". Extensive studies and tests result in innovative sealing materials and new seal geometries. The Voith SeaLencer described below is the result of systematic research and development for low-noise design on the acoustic test stand.

Voith SeaLencer – Seals of Silence

A suction roll comprises, among other things, a perforated roll shell and an evacuated suction box. Sealing strips are used to seal the vacuum against the air in the rotating suction roll and are pressed against the inside of the suction roll shell. When conventional sealing strips are used, the vacuum suddenly collapses after the sealing strip is passed. Impulses of high-frequency sound are emitted due to the abrupt flow of air back into the holes of the suction roll after leaving the suction area and produce the annoying effect of suction roll whistling.

The function of the SeaLencer – patent applied for – **(Fig. 1)** is determined by its special geometry for optimizing the pressure gradient in the gap above the sealing strip. The gradual, non-abrupt flow of air into the suction holes at the bevelled surfaces results in controlled and uniform pressure reduction in the holes **(Fig. 2)**, which is clearly audible: A "softer" sound with a lower sound pressure level is created.

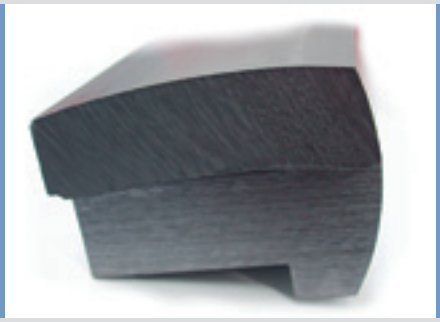
A run-up test from 1,000 m/min to 2,200 m/min on the acoustic test stand demon-

Fig. 1: *Optimized geometry of SeaLencer.*

Fig. 2: *Continuous pressure reduction due to uniform flow of air into the suction-roll holes.*

Fig. 3: *Fingerprint: Standard sealing strip.*

Fig. 4: *Fingerprint: Voith SeaLencer.*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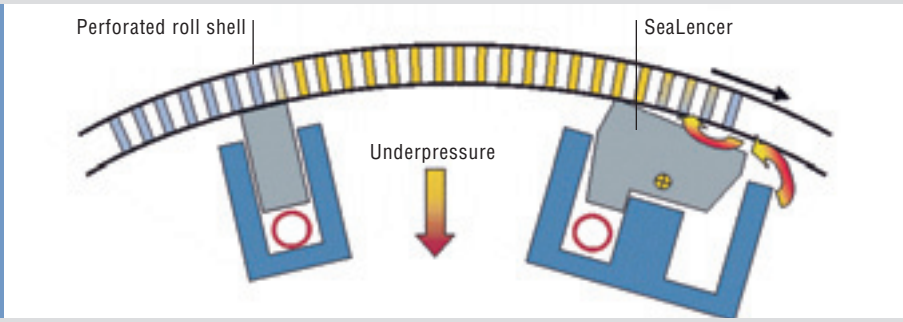

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strates the acoustic effect of the SeaLencer by using acoustic fingerprints (**Figs. 3 and 4**): The horizontal axis correlates with the frequency, the vertical axis is the speed. The colour denotes the sound pressure level in the relevant frequency band (yellow = very high level, red = high level, blue = medium and low level). The comparison of a conventional sealing strip and the SeaLencer shows a distinct reduction of the emitted sound pressure level and a strong reduction of the disturbing high frequency portions (yellow lines, red areas).

After installation of the SeaLencer, the emitted sound pressure level is usually reduced by up to 5 dB, A-weighted. In individual, psychoacoustically disturbing frequency bands, reductions of up to 15 dB, A-weighted, were often measured.

Increased lifetime and less friction energy

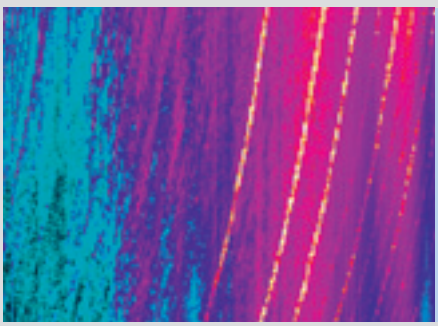
Additional advantages of the SeaLencer are less friction energy and reduced wear of the sealing strip material (increased lifetime). As the sealing surface is reduced, both the friction between sealing strip and roll shell and the thermal stress of the sealing strip material are substantially diminished. Extensive trial runs are presently made on the acoustic test stand and on running paper machines to analyze the additional advantages of longer service lives and lower drive powers.

The acoustic success of the SeaLencer

The noise reduction effect of the SeaLencer has meanwhile been confirmed on 30 paper machines in operation. Since January 2002, 91 SeaLencer units have been installed in suction rolls. Machine operators describe the noise of rebuilt suction couch rolls to be “softer”, “quieter” and “more pleasant”. Further information on the SeaLencer and sound examples can also be found on the Internet at http://www.voithpaper.com

The silent future

The development of silent technologies is a key topic of Voith Paper’s research activities. High acoustic workplace quality and increased neighborhood protection in terms of noise are core areas of our R&D activities. Noise is a topic of the future in many sectors – the consistent development of innovative noise reduction technologies helps Voith Paper to further strengthen its position as a pioneer in noise abatement.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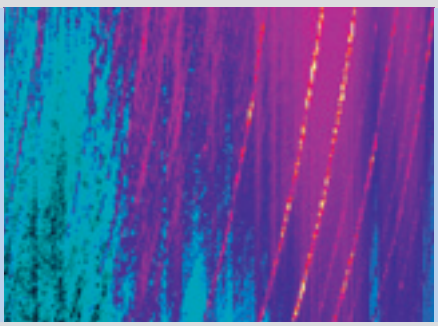
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The two Offline Janus MK 2 at Chenming/Shouguang show their strength

The two 10-roll Janus MK 2 from Voith Paper, started up in 2002, are performing to the customer's greatest satisfaction. Both, productivity and the obtained surface properties are excellent.

Fig. 1: *Mr. Geng Guang Lin, Vice President of Chenming Paper Shouguang together with Mr. Thomas Koller, Executive Vice President of Voith Paper, Finishing Division.*

Figs. 2 and 3: *Shandong Chenming Paper Holdings Ltd. in Shouguang, China.*

2

3

"No doubt that our expectations in this respect were high from the very beginning. Yet, the actual results are even better than anticipated", says **Mr. Geng Guang Lin**, Vice President. And he adds: *"The calenders equipped with automatic un- and rewind are in fact doing so well that we are able to additionally run paper from another line over these calenders."*

To better understand this statement one should know that the Janus MK 2 offline calenders, installed together with Voith's offline-coater producing woodfree-coated fine papers and coated label printing papers with a max. web width of 4,635 mm, were designed to run at an operating speed of max. 1,000 m/min, to finish papers with a basis weight of up to 210 g/m^2.

During the past months, however, the speed has been increased to 1,500 m/min and the basis weight was simultaneously raised to 250 g/m^2.

This success is certainly a token of the unique Janus MK 2 calendering technology firmly embedded in Voith's One Platform Concept. However, the achieved performance would be inconceivable without the effective assistance of Chenming's engineers. Voith Paper is proud of the optimum result obtained by the combined efforts and wishes his Chinese partners all the best with the new equipment.

Highest Coating Quality with Cast Coating Technology

1

2

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Cast coating is applied for board and graphical paper grades which require extremely high brightness, gloss, durability and appeal of the printed colors.

These are products such as:
Paper: High-grade printing paper (calendars, posters, catalogs)
Information-related products (labels, badges, ink jet/laser printed products)
Cardboard: Gift boxes, shipping boxes.

The demand for such high quality grades will grow, i.e. with the rapid spread of digital cameras and household printers in recent years, the demand for high quality coated paper has attracted attention and is a promising field for the paper industry in the long run.

Cast-coated paper for label paper applications has already shown steady growth within the last ten years. Voith IHI does active development and continuously improves the cast coating process suitable to produce the required highest quality at max. possible speeds.

Historycally, about 30 years ago the main investment into cast coating was in America and Europe, but afterwards, Japan and other Asian countries became very active in this field and the technological progress went ahead rapidly. Voith IHI is market leader for cast coaters (new lines and rebuilds) and has more than 30 years experience in this technology. The total number of lines is close to 40 units. Especially in the recent years, the technology has been improved considerably.

Method	Operating Speed [m/min]	Appeal on Consumers
Direct Method	20 - 40	Good
Gel Method	30 - 90	Superior
Rewet I	50 - 200	Good
Rewet II	30 - 100	Superior

Fig. 1: *Examples for cast coated paper products.*

Fig. 2: *Voith IHI pilot coater machines in Japan.*

Fig. 3: *Cast coater cylinder from outside.*

Fig. 4: *Cast coater drying section.*

Fig. 5: *Moisturizing and reel section.*

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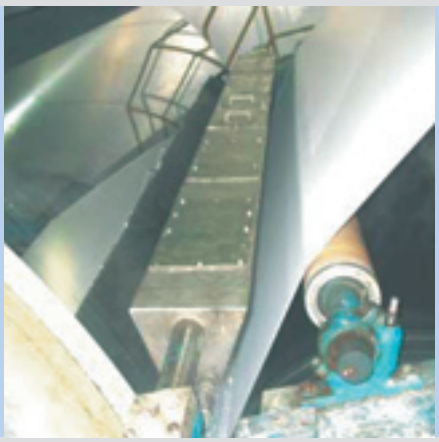

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There are three representative production methods, which can be characterized and evaluated as shown in the table above.

Key features of the cast coating technology

Key of the cast coating process is to apply the coating color onto paper to achieve a hard, mirror-like surface while the coating color is still wet. After the application on the base paper the coating color is pressed against the cast coater cylinder in moist condition, which results in such extreme surface quality. Since gloss of cast coated grades tends to decrease with increased production speed and pin hole defects of the coat appear, it is extremely important to achieve higher speeds without such quality defects.

It is essential to mainly discharge water vapor from the uncoated paper side, because if water vapor is discharged from the coating surface, pin holes can occur, influencing the printability and appearance of the surface. A further key point is to control moisture (omit excessive drying) and curling after the coated paper left the cast coater cylinder.

There are various adjustment measures, such as application of a curling prevention agent onto the backside, application of steam to both sides or passing the paper through a hood with moisturized air. Voith IHI's longterm experience and accumulated know is a solid foundation for serving the industry with whatever is required to improve the cast coating process.

Required base paper properties

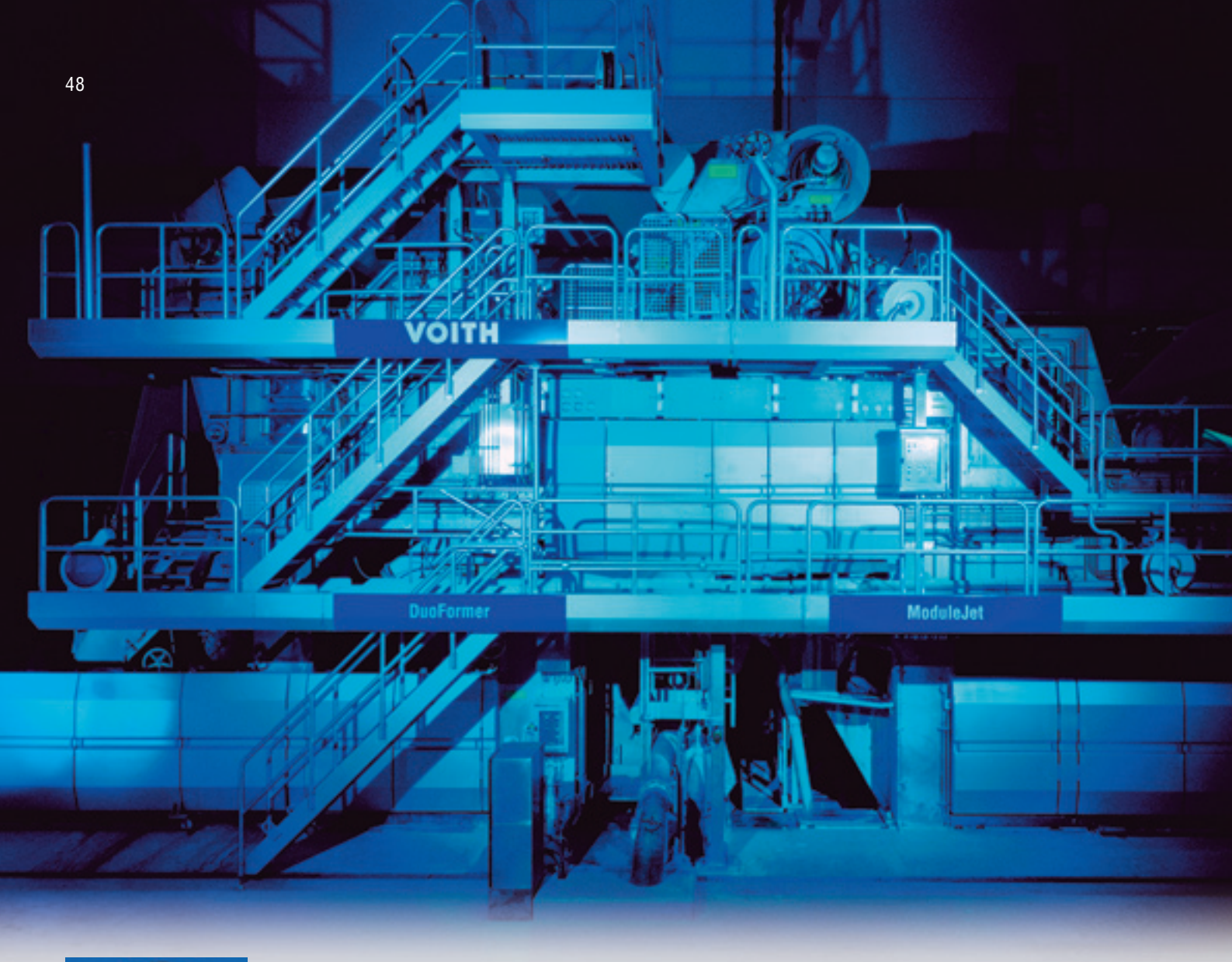
For the base paper there are two main requirements: Porosity of the base paper is important to allow the paper to transfer the moisture/vapor during the drying on the cast dryer drum. In addition, the base paper's smoothness has a significant influence on the smoothness of the coated layer.

Required coating color properties

The properties of the coating color differ slightly according to the production process. However, the main common point is that the size of the pigment particles, the pigment mixing ratio, and the binder type and mixing ratio are important elements.

Considering the market trends, this special coating technology will become even more important in the near future. Within the Voith Paper Group, Voith IHI will assume the role to continue the development of the cast coating technology together with the industry.

We trust that even with the improvement of other coating technologies, the challenge of cast coating remains important to the industry and we would like to invite interested customer to develop together with us business chances in this specific coating field.



Voith Process Solutions –

Wet End Process Analysis as the foundation of an optimization of paper quality and process stability

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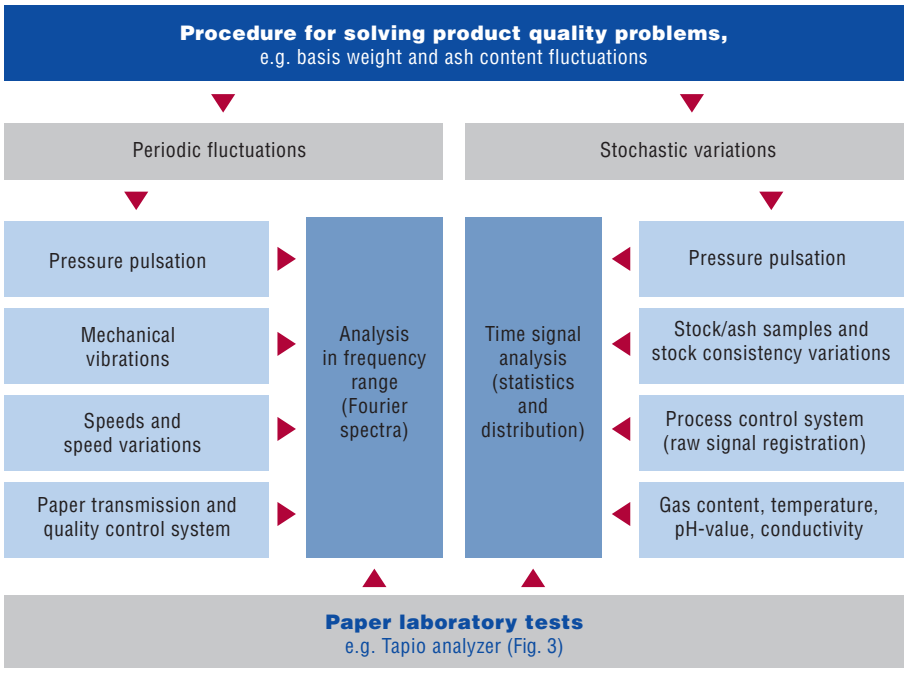
Where is paper actually made? That question is often asked rhetorically to emphasize the complexity of the papermaking process. Fact is that the "wet end", between the machine chest and the first dryer cylinder, forms the basis for good paper profiles. Disturbances and errors made here could hardly be changed further downstream. They often cause extensive quality and efficiency limitations of the whole line.

Fig. 1: *Procedure for a WEP Analysis.*



The approach and evaluation method of the Wet End Process Analysis explained here shows that it is a largely standardized service product developed by Voith in close partnership with the paper industry.

Goals of Wet End Process Analysis

Since the Wet End Process Analysis is largely standardized, it serves as a tool for various purposes:

It can be used for troubleshooting problems such as bad sheet profile or wrinkles.

This tool can also be used as a condition analysis prior to rebuilds or for assessing optimization potential and investment, e.g. to increase runnability or operating speed or better profile quality.

The results from a Wet End Process Analysis by Voith Process Solutions are the basis for answers to various questions.

The analysis in the paper mill consists of on-site measurements of all parameters affecting the papermaking process, production output and quality. Thanks to sophisticated evaluation techniques, conclusions can then be drawn on widely varying aspects.

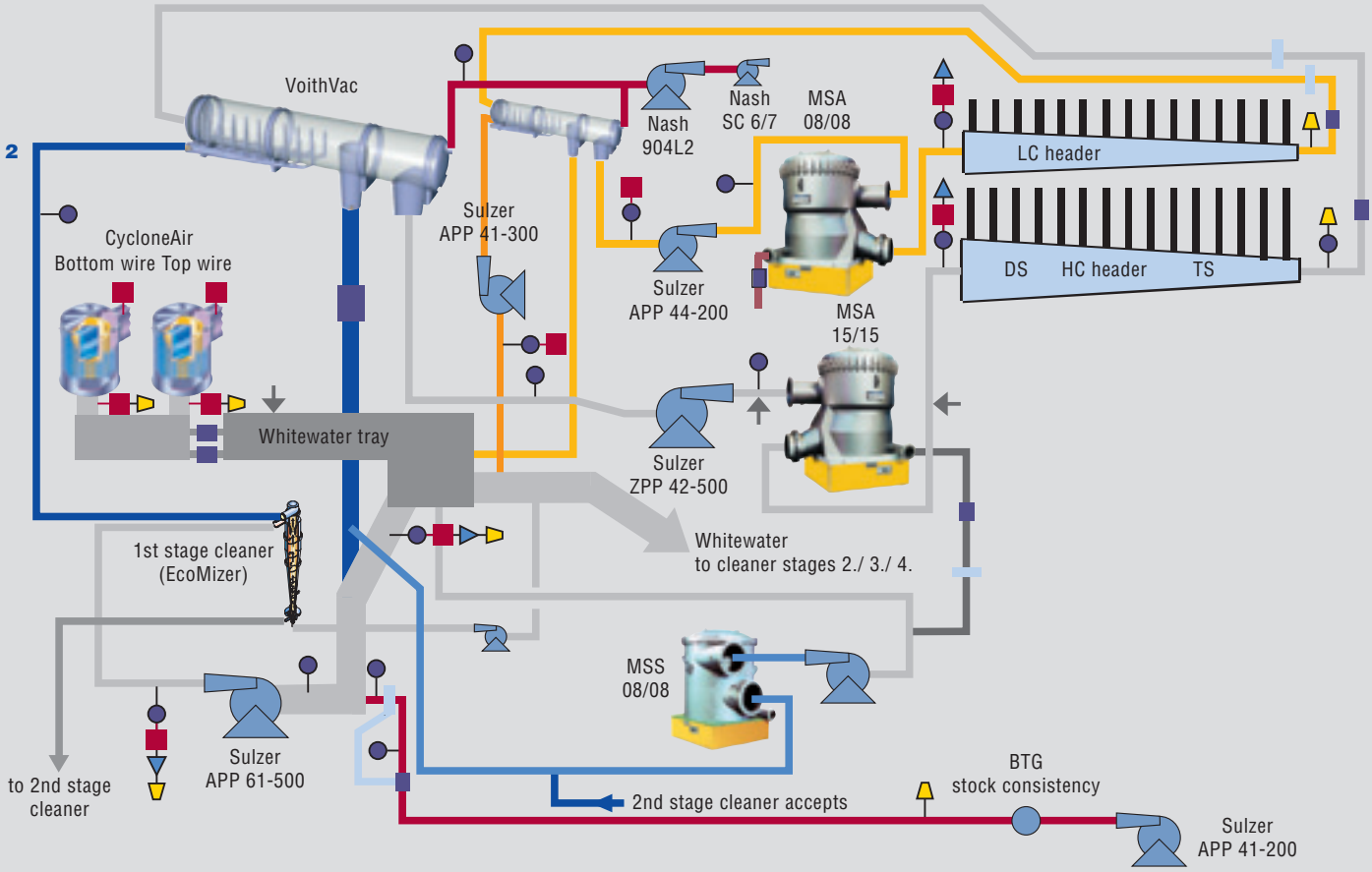
Fig. 1 shows the basic procedure for a Wet End Process Analysis evaluation.

Starting with the paper characteristics, such as basis weight or ash content stability, potential periodic or stochastic variation parameters are identified and evaluated. Interrelationships for example between pulsation and rotational frequencies, gas content and defoamers and sheet breaks are investigated thereby using all available information from the process.

Typical aspects related to the papermaking process

- Hydraulic stability (freedom from pulsation) of the stock and water loops
- Inflow and outflow conditions as well as headbox pressure stability
- Stock mixing efficiency among the various flows in the approach flow section
- Efficiency-optimized operating ranges of the cleaner and screen sections
- Optimized positioning of pipe elbows and fittings
- Necessity and efficiency of mechanical degassing systems in relation to chemical defoamers
- Additive quality in relation to gas content and retention of fiber and ash
- Stability of the jet impingement line after the headbox; web pick-up deviations on the central press roll
- Drainage element and vacuum settings for optimal quality and water removal

Fig. 2: *Wet end data collection:*
- *Pressure pulsation sensors*
- *Gas content sensors*
- *Stock consistency variation sensors*
- *Stock consistency measurement*
- *IDM*
- *Additives dosing point*



- Web profile control loop stability in machine and cross-machine directions.

Typical product-related aspects

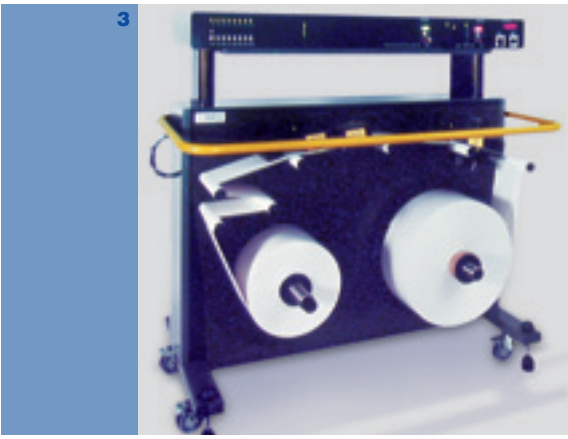
- Basis weight and ash distribution stability in the machine and cross-machine directions and residual profiles as a function of:
  – long-wave fluctuation with periods of several minutes and their effect on process control loops
  – short-wave fluctuations (e.g. visible striping)
- Formation improvement
- Stabilization of fiber orientation and tear factor
- Pinhole troubleshooting
- Production limitation by shrinkage wrinkles
- High sheet break rates.

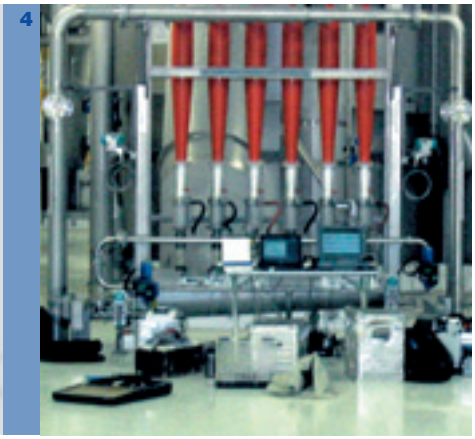
Scope of Wet End Process Analysis

The complexity of a Wet End Process Analysis covering all aspects is basically irrespective of the end product, paper quality or operating speed. This is confirmed by experience with the procedure on more than 120 lines so far.

Fig. 3: *Tapio analyzer.*

Fig. 4: *Measuring location.*





Our reference list includes high and low speed lines for graphical grades such as newsprint, SC and LWC as well as numerous machines for specialty grades like decorative papers, photographic papers and also board and packaging paper machines.

As shown in **Fig. 2**, various process conditions are analyzed at the same time, using a common procedure with comparable instrumentation:

- Hydraulic stability from machine chest to headbox; simultaneous recording of up to 32 pressure signals in the 0-1000 Hz range
- Stock consistency variations; simultaneous recording of up to 3 flow streams in the 0-10 Hz range
- Vibration measurements in all relevant points to establish interference potential; simultaneous recording on up to 48 channels
- Speeds and speed variations of mixers, pumps, screens and fans
- Free and dissolved gas content in stock suspension
- pH and conductivity values for all stock and water loops
- Mixing conditions based on stock consistency and ash content measurements in each flow stream.

Apart from data delivered by the Voith measuring systems specially developed for Wet End Process Analysis, settings and readings are also taken over from the process control system and directly from the wet end machines. These include operating speed, chest levels, flow rates, valve and headbox settings, vacuum settings, etc. Also included in the documentation and evaluation are process-relevant data such as furnish characteristics and additives, as well as production-related data like shift reports and sheet break records.

Wet End Process Analysis evaluation and assessment methods

An intensive Wet End Process Analysis, generally completed in 2 to 3 days by a experienced Voith team of experts, delivers an enormous amount of data and readings. Generally, the analysis covers settings for more than one grade or production rate.

A well-structured analysis and evaluation methodology is imperative for efficient goal attainment.

The paper quality characteristics on-site are determined by direct transmission sensors and complemented with data from the other measurement parameters. This procedure enables targeted measures to be taken already at the measurement stage, particularly for troubleshooting, so that the causes of paper defects or markings can be pinpointed and eliminated.

Another benefit is that it reveals the curious effect that the negative influence on paper quality can be caused by vacuum pumps, refiners, chemical dosing equipment, shakers or fans well away from the stock and water loops.

A Wet End Process Analysis is therefore a universal tool in the decision making process for optimization measures in the Wet End.

Process analysis for stock and water loops – a well-proven process optimization and development tool

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The experienced specialist teams at Voith Process Solutions cover the entire spectrum of technical, technological and engineering services for the paper industry.

Paper production problems often arise at many levels. The only way to solve them satisfactorily is by thorough process analysis in order to diagnose and eliminate the causes. The following objectives can be involved:

- Product quality enhancement
- Higher production
- Better runnability
- Reduced operating consumables.

Cost saving goals can also be met by process analysis and optimization to reduce the expensive emission of for example effluent, residues, polluted air, heat and additives.

As with analyses of the wet end, process analysis for stock and water loops is largely standardized and independent of the end product and system configuration. Experience from more than fifty process analyses clearly shows that this systematic procedure can also handle problem areas not originally identified as such. The amount of analysis work involved on site and in the laboratory depends on the specific problems and objectives involved.

To work out a detailed problem-solving strategy for process analysis, various tools are required:

- Operating data records
- Stock sample data
- Laboratory examination of stock and paper samples
- Inspection of all key machines and components
- Balancing and process modelling (simulation)
- Checking of machine sizes
- Trials in Voith's Technical Centre.

Voith process analysis incorporates all the latest know-how from our R&D programmes together with new multi-platform machine and process developments as well as control and automation expertise.

The WEP analysis described in the previous article should provide back-up interest when analyzing the approach flow system and paper machine loops and their effects on paper quality.

The following practical examples from mill operation illustrate the systematic procedure used for process analysis.

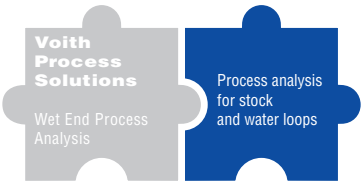
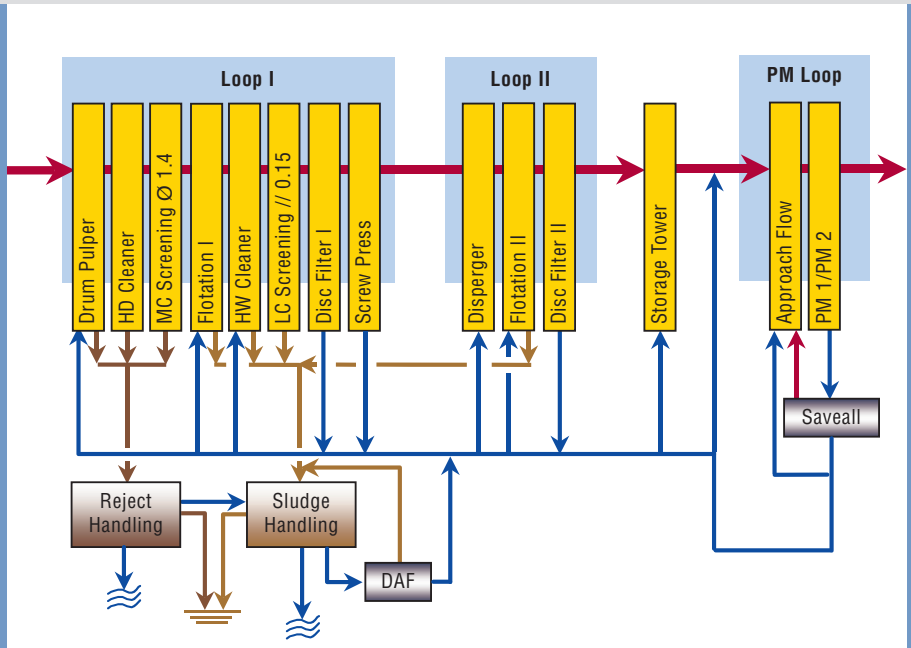


Fig. 1: *System configuration of a newsprint production plant.*

Fig. 2: *COD values as an indication of how far the counterflow principle is followed.*



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Sample point for clear filtrate	Before optimization (measurement)	Before optimization (balancing)	After optimization (balancing)
	COD Chemical oxygen demand [mg/l]		
1st water loop	> 4000	4682	**1678**
2nd water loop	941	1104	**231**
PM water loop	235	288	**60**

2

Case study

After seven years of production and growing competition on the Asian market, a newsprint mill using 100% recovered paper needed to take fundamental steps to strengthen its market position. The entire paper production process was analyzed to show the best ways of enhancing product quality and increasing productivity.

Results from analyzing the stock preparation and approach flow

The stock preparation line is a classical system with two water loops (Fig. 1) and intermittently operating final stages in hole and fine slot screening and in the cleaning system.

The stock sample analysis results showed an extremely high stickies content in the final stages of these subsystems. Due to badly adjusted intermittent operation of each final stage, large quantities of stickies were washed into the accepts and re-entered the previous stage. This led to stickies concentration in each of these final stages. A large proportion of these stickies was broken down by this recirculation and they then found their way into the downstream subsystems. Some of them reached the paper machine as microstickies, clearly causing problems such as deposits on the felts as well as dust and flocks on the drying cylinders.

Since intermittently operating final stages demand exceptionally sensitive adjustment of the operating and wash cycles, simple rebuild measures were recommended in both cases. The result was user-friendly continuously operating final stages with a high removal efficiency.

During the WEP analysis a higher than normal gas content was detected in the headbox, causing unstable operation of the paper machine. To reduce this gas content, the mill added increasing amounts of defoamer despite the adequately dimensioned deaeration system.

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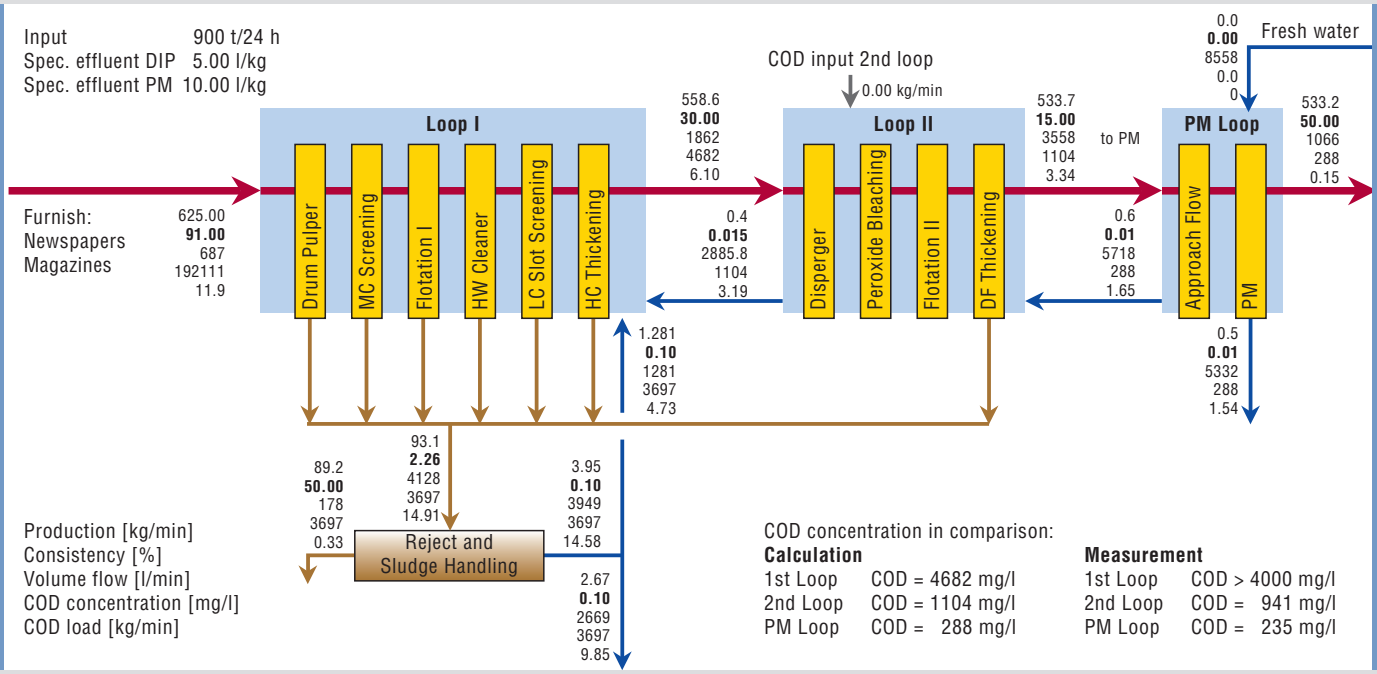

Inspection of the vacuum system revealed a defect in the vacuum pump plant, which restricted the deaeration capacity. This was then repaired.

Analysis of chemical interactions in the stock and water loops

While inspecting all the main machines and components, excessive foaming in the flotation cells with extremely stable foam and poor removal efficiency was found. Due to the low content of magazine papers in the furnish and the resultant low ash content, only tensides were used to aid flotation.

Apart from optimizing the spray nozzles to break down the foam more efficiently, a combination of tensides and soap was recommended to aid flotation.

By using less tensides, foam formation has been reduced and the use of soap has improved the removal efficiency of the cells.

Heavy deposits were found ahead of the machine chest and in the headbox. Chemical-physical analysis in the laboratory revealed aluminium sulphate as the main component of deposits at the machine chest as well as a silicate mixture in the headbox. Analysis of the additives and quantities identified the following situation:

- The aluminium sulphate dosing method was inadequate, resulting in excessive local dosages and formation of deposits just after the dosing point.
- The Composil (PAC and anionic silicate) dual retention system was correctly operated. Interaction with the relatively high concentration of aluminium sulphate led however to deposits in the headbox and these were very difficult to remove.

Balancing results and process model analysis with the focus on water management

While the analysis work was being undertaken, about twice as much process wa-

4

Stock buffer		Water buffer	Before optimization	After optimization
Dump chest	1000 m^3	Buffer DIP	–	1000 m^3 (new)
Total stock buffer DIP	1000 m^3	Total water buffer DIP	–	1000 m^3
Storage tower 1 DIP	800 m^3	Clear filtrate buffer 1	1500 m^3	1500 m^3
Storage tower 2 DIP	1000 m^3	Clear filtrate buffer 2	–	2000 m^3 (existing)
Dry broke	800 m^3			
Wet broke	800 m^3			
Total stock buffer PM	3600 m^3	Total water buffer PM	1500 m^3	3500 m^3

Fig. 3: *Simulated COD balance for conditions before optimization. The simulated balance indicated significant COD and disturbing substance improvements following implementation of the counterflow principle (see also Fig. 2).*

Fig. 4: *Lack of dynamic water buffer capacities leads to uncontrolled overflows.*

ter was flowing from the paper machine loop into the biological effluent treatment plant compared with process water from the first stock preparation water loop. This indicated that the counterflow principle had not been properly implemented in the mill's water management programme.

With the counterflow principle, process water flows in the opposite direction to the stock flow. In other words, overflow from the paper machine water loop with a relatively low dissolved solids content is re-utilized in the stock preparation water loops before passing with a high dissolved solids content to effluent treatment.

The COD value (chemical oxygen demand) serves as a measure of colloidal and dissolved solids content (disturbing substances) in the various process water flows. In this mill case the COD test results clearly confirmed the balancing results (**Fig. 3**).

In particular, the first water loop in the stock preparation line showed an unnecessarily high level of colloidal and dissolved solids due to the restricted operating mode (**Fig. 2**).

Using a simulation model of the entire papermaking process, a proposal was worked out for a systematically optimized water management based on the counterflow principle. The relationship of dynamic stock and water buffer levels was also checked out and optimized (**Fig. 4**).

Process analysis conclusions

About one year after presenting the process analysis results, the success of all optimization measures taken so far has been confirmed. Some smaller, less spectacular measures still have to be taken. The process analysis has led to close teamwork between the mill and Voith Process Solutions, so that all objectives are being reached in an economically sensible way.

Innovative Trends in Automation

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Quality control systems of the future will put significantly higher emphasis on analytical tools. This will improve process control and disturbance analysis can be carried out sooner. The papermaker can use the analysis results to identify complex technological interrelations. Nowadays, – analytical tools are already essential, given the complexity of a paper production plant. The high quality targets cannot be economically achieved any longer in any other manner.

Powerful quality control systems play an increasingly important part in this process, although important process data are also gathered from other systems and measuring devices. The origin of data is of no significance for the machine operator. It is only important that these data flows are channeled, archived and processed in a uniform manner. These analytical tools will determine the great development steps of the near future.

This trend in automation technology is primarily based on:

- machine-integrated sensors,
- information systems for data integration,
- quality and process controls which are increasingly linked and realized by DCS tools.

Machine-integrated Sensors

Conventional quality control systems require places with open draw, where the paper web is accessible from top and bottom, for installation in the paper machine. In modern paper machines with largely closed web runs, such places are becoming increasingly hard to find.

New measuring methods focus on single-sided quality measurement, increasingly even in places hard to access to date. The attempt becomes even harder, because this is often a great challenge due to the ambient conditions. And then there are the sensors of similar design, which do not monitor the paper, but the production process.

As examples, we mention the traversing moisture measurement after the press section by the EnviroScan **(Fig. 1)** and the traversing felt condition measurement by a permeability sensor and a moisture sensor **(Fig. 2)**, all done under difficult ambient conditions in the wet end of the paper machine. There, potential trouble is detected early, which allows faster control, as the disturbance is detected close to the place of origin.

The EnviroScan can detect characteristic features in the moisture profile of the web after the press very quickly. This allows an assessment of the mechanical dewatering behavior of the press. The operator can recognize the influence of the wet end and the press on the moisture profile.

The felt condition measurement can be used to assess the felt or, in conjunction with an automatic felt cleaning device, for specific felt cleaning action at the same time. The latter guarantees longer felt life and with it fewer machine downtimes for felt change.

Future quality control technology will be more concerned with the process itself not only with the final product. With smooth processes, quality is speaking up for itself.

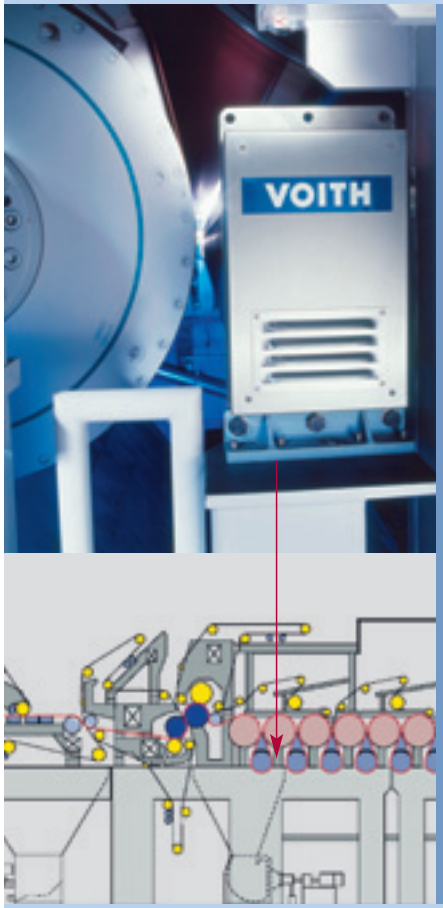
Process Analysis

Traditional analytical technology was based on the assessment of process data in graphic representation (trends). This can be refined further if a screen page can display both quality and process variables in the same diagram at the same time.

The present example **(Fig. 3)** shows the development of a felt over a period of more than 3 weeks. Specific cleaning allows one to extend the life of the felt. The data, however, show that the impact of cleaning does not have lasting effects. Twelve hours after washing, the felt reaches the same condition as before the cleaning process.

Fig. 1: *EnviroScan installation location.*

Fig. 2: *Felt condition measurement.*



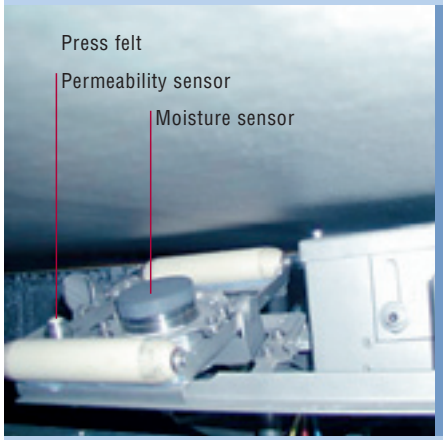


Fig. 3: *Development of felt condition over several weeks – permeability of the press felt.*

Fig. 4: *: Integrated information display of quality data and paper defects.*

Fig. 5: *OnQ traversing quality scanner at LEIPA-Schwedt.*

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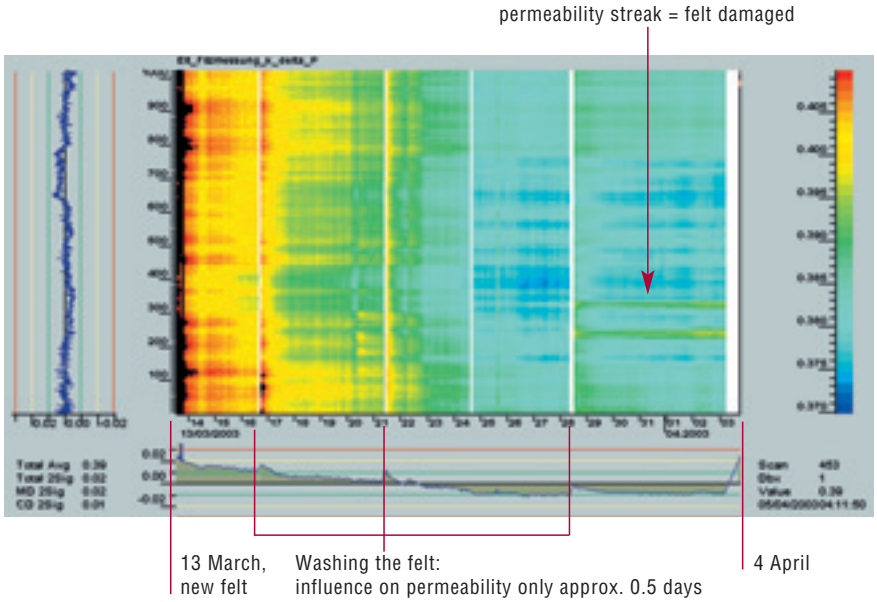

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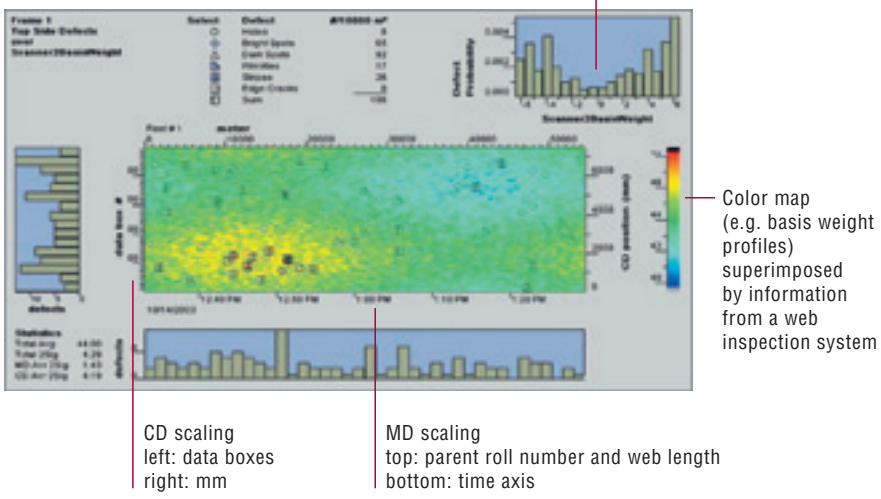

Although cleaning initially increases the uniformity over the entire web width and the permeability is briefly increased at the same time, it quickly and continuously decreases again. In the last phase, permeability streaks increasingly appear, which requires the felt to be replaced soon. The picture in particular shows two streaks of higher permeability after a shut-down. The increased permeability of the felt in these places was the result of damage to the felt during startup of the paper machine. The nap of the felt was partly rubbed off in two places.

The example shows: Sequential analysis of the moisture profiles in different places of the process and carefully excluding influences allow successful performance of problem analysis.

Integrated Information Systems

Process information is obtained in a variety of places in the paper production process. It is important, however, that all this information should be seen in context. This is particularly true for the assessment of paper defects, for which a connection to other quality parameters can be assumed.

When such connections are found, measures to eliminate them can be found in most cases. But even without correcting actions, problem areas like that can be

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taken into account later during finishing or optimized cutting.

An integrated representation of quality deviations and paper defects in connection with cutting optimization is, therefore, desirable. A so-called color map can show color-coded quality data and paper defects together (Fig. 4).

PaperMiner

In the above example of a color map, a relatively small amount of specific information is sufficient to allow a meaningful analysis. In paper production, however, – this is rather the exception. As a rule, the interrelations are complex and difficult to identify, although or because a huge amount of data is available. For example, the question under which process conditions good printability is achieved cannot be answered by simple means.

These and similar questions are typical tasks for the PaperMiner. But first, the data must be collected and prepared for the PaperMiner. The PaperMiner can pick up its information from this data pool.

The PaperMiner provides a number of methods for analysis. The most important ones of these are the so-called **S**elf-**O**rganizing **M**aps and **D**ecision **T**rees, which originate from the area of "machine learning methods".

These techniques allow both model-based forecasts and a deeper insight into the process interrelationships.

In the case of "Self-Organizing Maps (SOMs)", the system starts with a continuous data set, which may comprise hundreds of data for one parent roll and reproduces the data on a two-dimensional display. Each data set is assigned to one spot on the display.

The SOM method can be used for forecasts with good success. Once a SOM has been generated, the place of a modified machine setting can be determined on the two-dimensional map, and it can be used to determine the expected values for the desired target parameters (porosity, formation etc.). Of course, the quality of such forecasts is greatly dependent on the number of data sets used to generate the map, and whether or not all major influences were included.

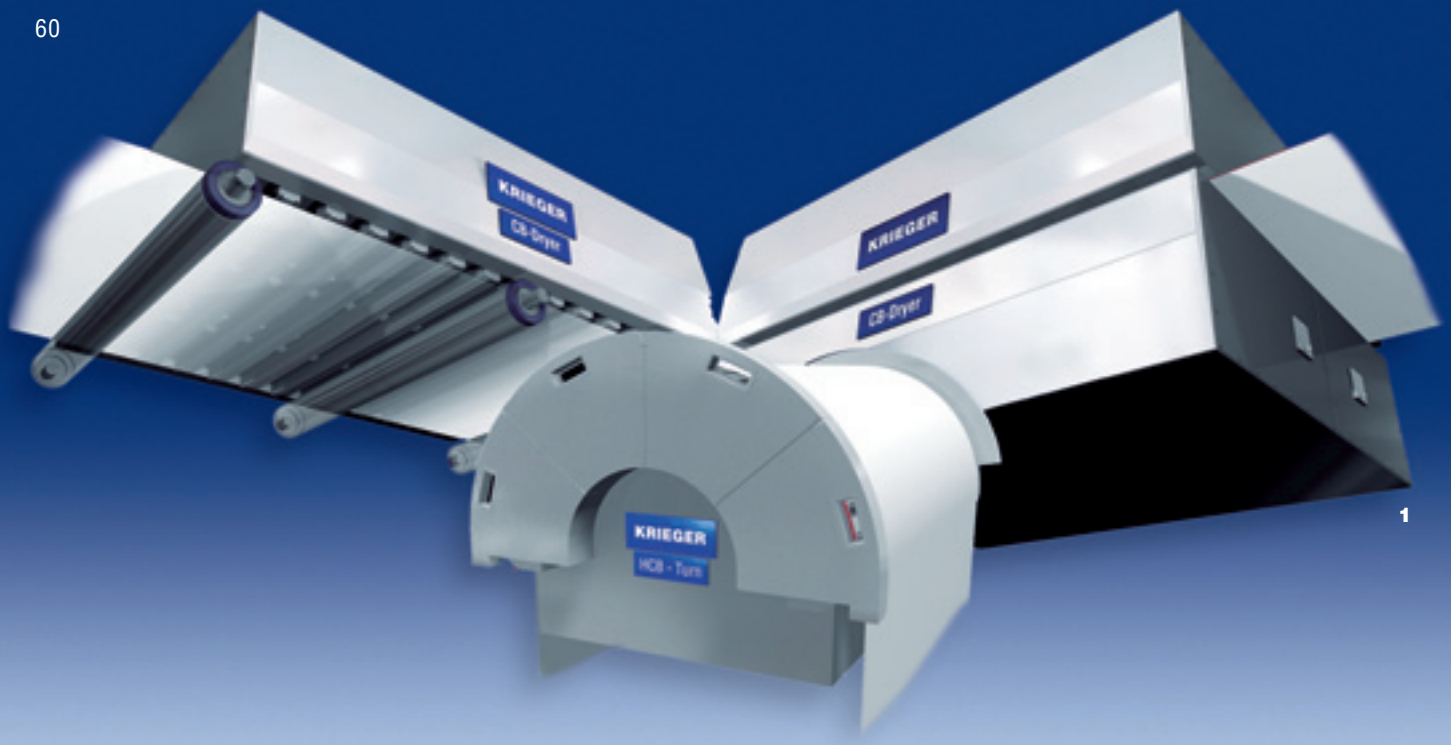
Decision Trees are another method of analysis. In order to use Decision Trees, a target value to be analyzed is first selected. The decision tree can then be used to find out which process adjustments must be made.
Generally, it can be said that the PaperMiner is a very efficient tool for data analysis. It is capable of handling large volumes of numerical and non-numerical data (such as grades, felt type, ...). It provides a high quality of results even for complex physical relationships and facilitates the understanding of the process. This allows forecasts of process behavior, for example. However, the methods require good data quality from a large amount of data available, and they cannot be mastered without basic technological knowledge.

System-integrated Process Analysis

Due to networking via Ethernet and the communication standard OPC, it is today possible to exchange and link data, regardless of the place of their acquisition within a system's network. This now provides a uniform user interface that allows functional data integration between QCS, DCS and other systems.
This is particularly important for all systems that provide process information. These include:

- Reporting of the quality control system,
- Web inspection,
- Web break analysis,
- The bearing monitoring system,
- The technology monitoring system,
- The traditional distributed control system and more.

All data acquired by means of these systems will be available in a central database in the future and can be linked to each other. This makes physical relationships visible and allows them to be processed in a total plant visualization for the operator.



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Development trends in non-contact web drying systems

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Due to rising production speeds and quality requirements, drying systems and concepts for non-contact drying of paper and coating color are increasingly being customized depending on their application. At the same time, high energy efficiency, trouble-free web guiding and low life-cycle costs must be ensured.

For many years, Krieger has been the only system supplier worldwide to provide a complete range of products for non-contact drying. Thanks to our own intensive development work and constant exchange of ideas and experience within the Voith Divisions, optimally matched system configurations are guaranteed. In an effort to increase energy efficiency, Krieger's range of products includes gas-fired and electric infrared systems, as well as different types and combinations of hot-air dryers for both drying methods.

While the development of gas-fired infrared dryers is geared toward the utilization of new materials and the simplification of maintenance work, Krieger's activities in convection drying are focused on increasing the performance and efficiency of the systems – as well as optimizing the web run (Fig. 1).

With the modular system designed by Krieger, the following features can easily be adapted to individual applications:

- Fuel (gas, steam)
- Maximum operating temperature (up to 450 °C)
- Nozzle supply air velocity (up to 70 m/sec)

Fig. 1: *One-sided CB-Dryer, HCB-Turn and double-sided CB-Dryer.*

Fig. 2: *Comparison of heat transfer coefficients in hole-type and slotted nozzles.*

- Number of nozzles
- Nozzle spacing/nozzle width
- One-sided dryer or double-sided floating dryer
- Non-contact drying with simultaneous web turning (HCB-Turn).

Consequently, any quality requirements relevant to the user can easily be incorporated during the project engineering phase. In this regard, the following aspects should be given special attention:

- Level of heat transfer and drying rate
- Avoidance of web overheating
- Stability of the web run
- Minimization of the open draws
- Energy efficiency.

Krieger CB-Dryers as components in coating color drying

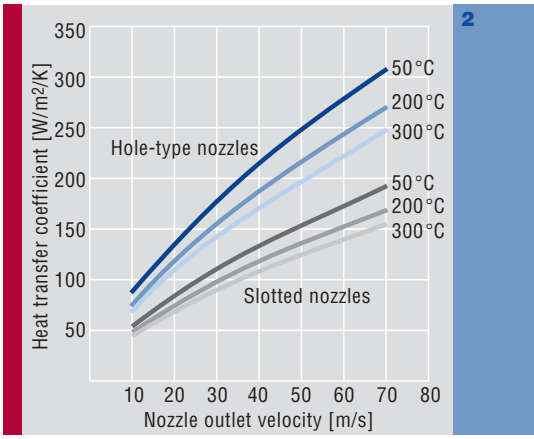
In many cases, a combination of infrared dryers, air dryers and drying cylinders is suitable for coating drying. The function of IR dryers is to heat the web to a high temperature as quickly as possible and simultaneously cause the evaporation of as much of the water contained in the coating as possible. Depending on the coating formulation, by incorporating a large percentage of IR drying, web temperatures can reach over 100 °C in the course of coating drying. For this reason, Krieger prefers to use air dryers from our series of CB-Dryers at this point in the installation, because they allow for comparatively high drying rates at lower web temperatures.

Next, the drying cylinders finish the remainder of the drying with the simultaneous possibility of correcting the curl of the paper or board web.

With our different types of CB-Dryers, Krieger offers a modern air-drying system which, in addition to a uniform, non-contact web run, features highly efficient heat and mass transfer and maximum thermal stability. One of the main features of the Krieger CB-Dryers is the CB2 hole-type nozzle, which permits the highest possible heat transfer rates. The development of this highly effective nozzle type is based both on fundamental insights into flow mechanics and on many years of experience in dealing with the special requirements of the paper industry.

The development of the CB2 nozzle, therefore, aims not only at ensuring maximum heat transfer to the web, but also at obtaining optimized load capacity. In addition, it achieves the highest possible insensitivity to thermal deformation and contamination by coating color during sheet breaks.

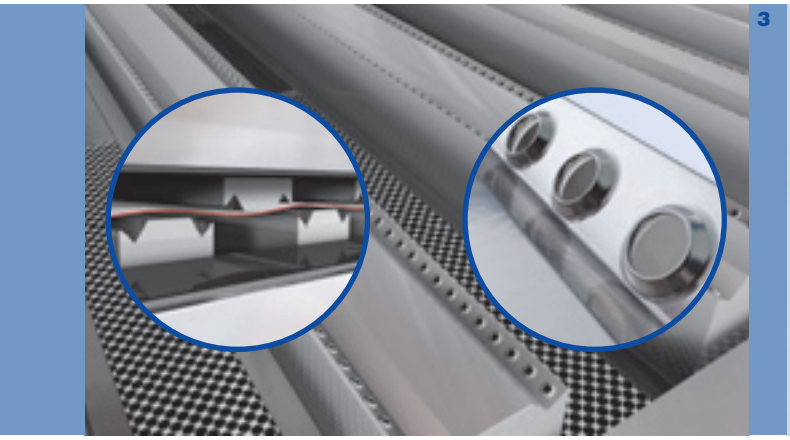
If air is blown onto the paper surface at a suitable angle at high velocity, vortices form in the air, thoroughly blending the drying air. This causes an increased heat exchange between core flow and paper surface. A measure of the number and intensity of these vortices, and thus also of the intensity of the heat transfer, is the so-called degree of turbulence. In addition to the air velocity and the direction of the approaching air flow, the nozzle shape is of major importance for the level of the degree of turbulence. Scientific studies have shown that hole-type nozzles have a distinct advantage over the simple, slotted nozzles. With the same air-flow rate (and the same required heating and fan capacity!), hole-type nozzles achieve up to 50 % higher heat transfer rates than slotted nozzles (**Fig. 2**).

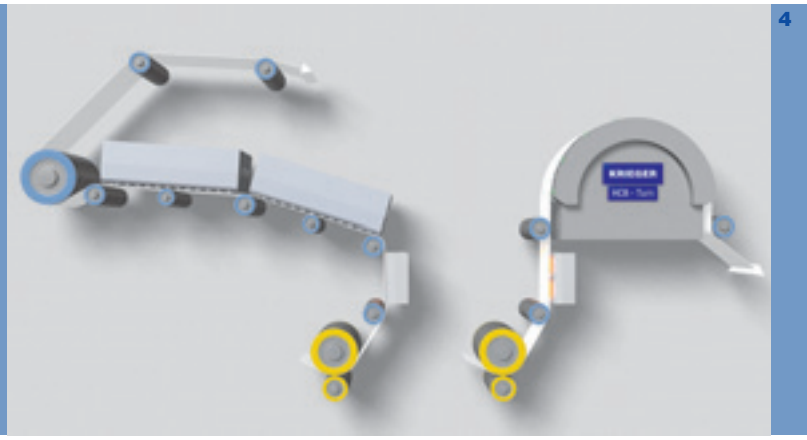


Furthermore, the CB2 nozzle ensures homogeneous heat transfer since, unlike slotted nozzles, a thermal change in the nozzle geometry is impossible. Through the use of materials with relatively low thermal expansion coefficients, a high

Fig. 3: *Schematic of air flow of the CB2 nozzles.*

Fig. 4: *Web run concepts for drying the bottom side of the web.*
Left without HCB-Turn
– long web run
– motor driven rolls
– risk of contamination.
Right with HCB-Turn
– short web run and simplified tail threading
– fewer rolls
– low risk of contamination.





thermal stability of all CB-Dryers used is guaranteed.

Another feature of the CB2 nozzle is the special geometry of the air nozzle. The nozzle outlet openings, placed opposite to each other, generate an extremely stable cushion pressure and, due to the recessed arrangement of the holes, contamination is nearly impossible. As a result, downtime is greatly reduced (**Fig. 3**).

In the CB-Dryer, the largest portion of the drying air is recirculated, whereby the drying air repeatedly makes contact with the web. This results in the transfer of more energy (energy efficiency). A certain portion of the air must, however, be continuously withdrawn from circulation in order to remove the steam that is being created. In the combination of CB-Dryers and infrared systems, the energy balance of the entire system can be optimized through the partial recovery of the energy that is present in the combustion exhaust gases of the gas-fired IR emitters.

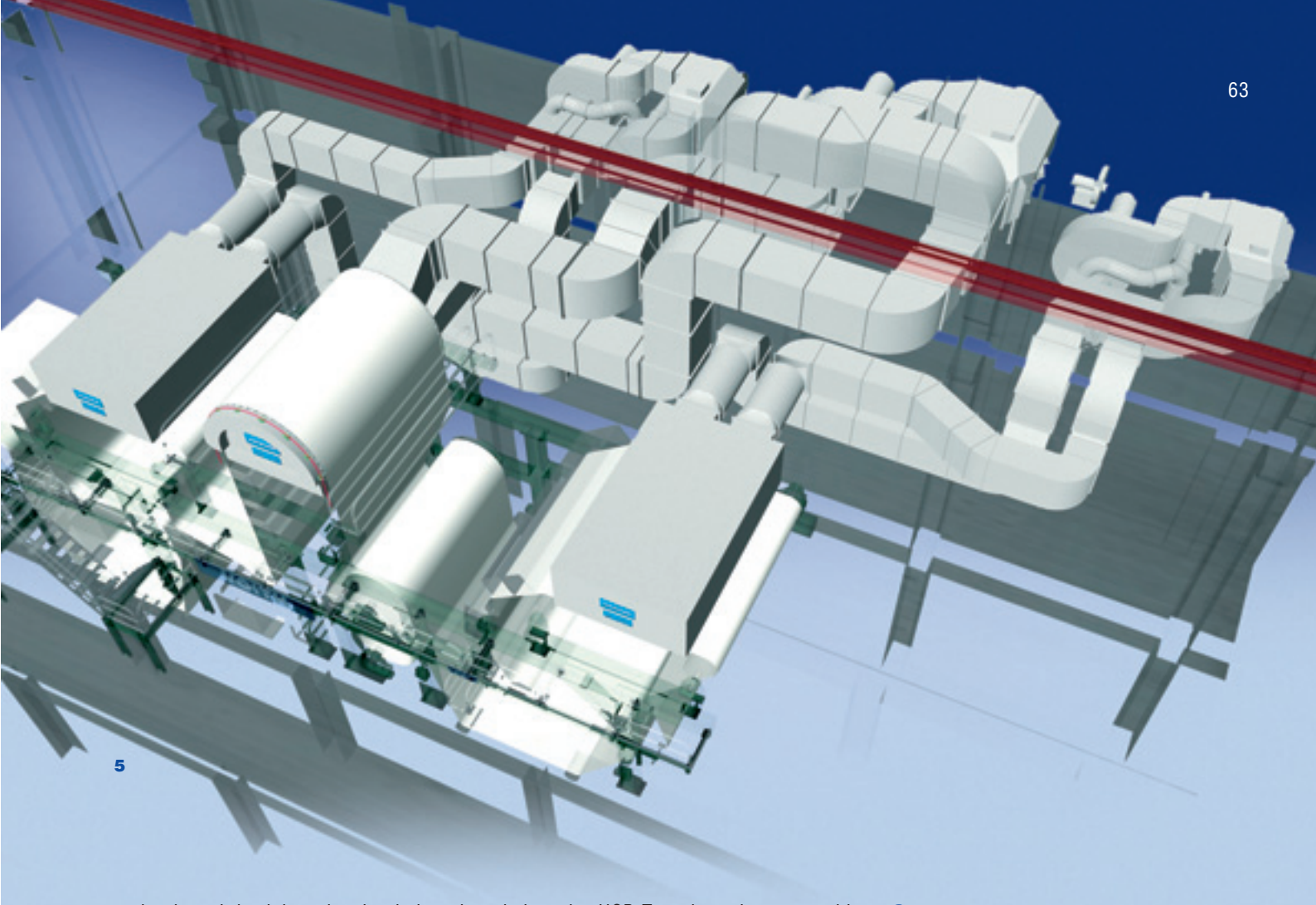
The Krieger HCB-Turn for simultaneous turning and drying of a paper web

The Krieger HCB-Turn has been developed in response to persistent market demand concerning space requirements and web run, – both in the case of rebuilds and new installations, and recently went into operation.

The construction of the HCB-Turn is based on our experience with the above-mentioned excellent characteristics of the CB2 nozzle – which, for many years, has been used successfully in the Krieger CB-Dryer – and the optimized load-carrying capacity of the Krieger CB-Turn. Our challenge was to combine the high load-carrying capacity (turning of a paper or board web by 180° with high web draws) and high drying rates with simultaneous space-saving web guidance (**Fig. 4**).

In extensive trials, the ratio of the width of the supply-air nozzle beam to the width of the exhaust gap in particular, was optimized and a patent is pending for this design. This feature ensures a high exhaust capacity even at high web draws, as is frequently the case in board production. It also results in uniform drying across the entire web width (**Figs. 5-7**).

In non-contact web-turning systems, a certain amount of the air invariably escapes from the area of the cushion pressure into the atmosphere. In order to achieve the required high drying output, the air has to have a high temperature. Krieger has developed a suction system that recaptures a portion of this heated air on both drive and tending sides and



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recirculates it back into the circulation-air system. A patent for this system is pending. The operation of gas-fired systems generates temperatures of approximately 350 °C. In order to avoid overheating of the rope-pulley bearings, an additional cool-air duct has been integrated into the tending-side exhaust system.

In web widths greater than 6 meters, it is often necessary to plan for more space below the HCB-Turn in order to provide room for additional drying components (e.g. infrared dryers). For this reason, Krieger developed an additional model that splits the HCB-Turn with a wrap angle of 180° into two separate parts each having a wrap angle of 90°. In order to stabilize the straight section of the web between the two 90° HCB-Turns, it is equipped with heated CB2-nozzles as well.

Summary

When it comes to the optimization of application-related performance in coating drying, Krieger CB-Dryers and HCB-Turns are important components, especially in combination with other non-contact drying systems (infrared). As a rule, only the suitable combination of systems leads to the desired level of performance and quality. Each application, therefore, requires an individual solution.

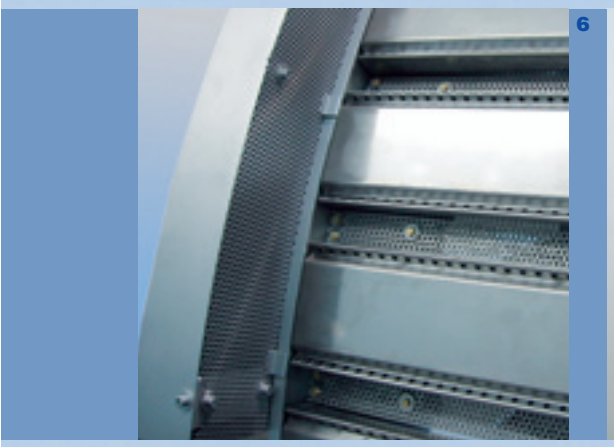

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Fig. 5: *Online coating system with two CB-Dryers and HCB-Turn.*

Fig. 6: *Additional tending-side air return.*

Fig. 7: *Support-nozzle geometry and air-cooled rope pulleys.*

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Field Service Specialist PikoTeknik Oy in Finland – one year with Voith Paper now

Happy Birthday – PikoTeknik! The Finnish Field Service Company PikoTeknik Oy is a member of the Voith Paper for one year now!

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By acquiring PikoTeknik with its wide competence in field service mainly for the paper industry, Voith Paper Service has strengthened its position for Mill Services in the Nordic Countries and especially in Finland. Being closer to the customers in this important market area was the driving force for Voith Paper. Expanding with such activities on a more global basis is the next target.

"Joining Voith Paper was a natural continuation of our deep co-operation with Voith", says Ingmar Vesterlund, the Managing Director of PikoTeknik. *"Thanks to Voith we have access to new valuable know-how for our product development and power to continue our rapid growth in the paper industry."*

PikoTeknik Oy was founded in 1989 by Ingmar Vesterlund and Göran Antila in Pyhäjoki near Oulu in central Finland and has meanwhile become the biggest company in Finland specialising in on-site maintenance and coating of pulp and paper machine rolls and cylinders.

After being an established player for more than 15 years mainly on the Finnish and Scandinavian markets, PikoTeknik now intends, together with Voith Paper, to focus on other markets in the world, too.

PikoTeknik has know-how, wide experience, flexibility and innovative product development concerning work that has to be performed at the customer's facilities during short downtimes.

The main expertise of PikoTeknik Oy lies in:

- coatings: wear-resistant, frictional, non-sticky and repair coating
- on-site machining: grinding, grooving, drilling of drying cylinders
- repair of machine parts
- inspecting rolls and drying cylinders at the customer's facilities
- balancing rolls and drying cylinders at the customer's facilities and even in the machine.

"In the production process of a modern paper mill it is of essential importance that all potential bottlenecks are foreseen in time. On-site solutions help to decrease machine downtime and improve runability. Working directly in the mill takes less than half the time required for traditional off-machine cylinder maintenance, grinding or coating in combination with time consuming cylinder replacements", says Ingmar Vesterlund.

Optimal cylinder performance for years

PikoTeknik has developed its methods, a wide assortment of equipment and special tools in co-operation with Finnish paper mills and the Technical Research Center of Finland.

As an important solution to the sticking, dust and corrosion problems which might even lead to frequent paper breaks, PikoTeknik has developed a comprehensive selection of coatings. For example **PikoClean**, which is a non-stick composition coating with high ability for doctoring. It combines the unique qualities both of hard carbides and repellent PTFE (Teflon). This prevents effectively stickies and fibers from picking, linting and dusting even at high temperatures. Applications on-site have successfully been made on drying cylinders after presses, size presses or coating stations.

Also **PikoFric**, which is a roughening and frictional coating, has been developed for on-site applications on drums in reels and winders. Using the HVOF (High Velocity Oxygen Fuelled) spraying method ensures more effective adhesion with up to 50 % improvement in comparison to plasma spraying methods.

A complete on-site machining to specified dimensional and surface tolerances ensures optimum roll/cylinder performance for several years, that offers the possibility to increase speed and to produce a higher-quality end product.

Fast execution, where needed

There are many examples of fast on-site work:
When Neusiedler SCP a.s. in Ruzomberok, Slovakia, carried out a major machine rebuild project together with Voith Paper in August 2003, to raise the production capacity from 800 m/min to 1,400 m/min, PikoTeknik was responsible for on-site balancing of 65 rolls, 53 drying cylinders and one suction roll and, besides that, the drilling of several drying cylinders. The work was completed within 11 days.

In October-November 2003 a major rebuild project was carried out at Stora-Enso in Kemi, Finland, together with Voith Paper. PikoTeknik's part included the changing of drives and bearings of 56 drying cylinders, as well as grinding and balancing of the 56 drying cylinders for a speed of 1,400 m/min, drilling of 6 drying cylinders and coating of 5 cylinders with PikoClean, that improves sheet release on dryers.

Together with Voith Paper Service teams, PikoTeknik was involved in several major projects in Germany, Austria and even in India, Indonesia and New Zealand.

This first birthday can be considered as an important milestone towards a long lasting relationship – all the best for further development!

Fig. 1: *Main building of PikoTeknik Oy in Finland.*

Fig. 2: *On-site grinding of a drying cylinder.*

Fig. 3: *On-site coating of a drying cylinder with PikoClean.*

Fig. 4: *Application of the Teflon layer.*

Deep-frozen, dried – and saved

In the night of September 2nd, 2004, a major fire destroyed large sections of the historic building housing the Duchess Anna Amalia Library in the German town of Weimar. Local residents, library employees and several hundred volunteers formed a human chain and rescued more than half of the irreplaceable original manuscripts and incunabula from the burning building, which is on the UNESCO World Cultural Heritage list. Some 30,000 of the library's volumes were passed from hand to hand in this way, and a further 30,000 also escaped the flames, though damaged to a greater or lesser degree.

Most of the books that were rescued, were already singed or soaked in water as a result of the fire-fighting operations. They were taken temporarily to the Book Preservation Center (ZFB) in Leipzig, an institute possessing expertise unparalleled anywhere in the world in the saving of old books, periodicals and musical scores for posterity, and the restoration of old maps and plans, certificates and official records.

Months after the catastrophe in Weimar, visitors to the ZFB can still detect a slight smell of smoke and burning in the air. It emanates from the 'patients' brought there from the Anna Amalia Library. These are stacked everywhere in the workrooms and corridors. Some have already been given initial treatment, which involves sorting and classifying them into groups according to the degree of damage they have suffered. Group One consists of largely undamaged items, whereas Group Six contains those that have been almost completely destroyed.

The first treatment stage for the books is to be stored temporarily in large cold storage chambers at 20 degrees Celsius below freezing point. Wrapped individually in muslin or fleece, each soaking wet book is transformed within a very short time into a frozen-through block of ice. This technique avoids further loss of shape or disintegration, but more importantly prevents the spread of mold spores and is a means of gaining valuable time. Although the Institute is working round the clock in three shifts, its skilled methods of limiting damage are unavoidably time-consuming. Nobody expected to be confronted with tens of thousands of books, all needing urgent attention to protect them against irrevocable damage.

The second stage in the treatment process is freeze drying – using a method that the ZFB itself developed to extract moisture from the books. If they were to be allowed to dry in a normal atmosphere, the inks, color pigments and glues would run, the pages would tend to stick together and the paper would become wavy and brittle. In other words, even worse damage would be caused. Freeze drying, on the other hand, prevents the moisture in the book, once it has been turned into ice, from thawing again in the conventional sense of the term. It trans-

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forms the ice into vapor that can then escape and leave the book dry.

A load of books weighing up to a ton is sealed into a pressure chamber, the temperature inside lowered to 192 degrees Celsius below zero and the air pressure, which is normally in the region of 1,000 millibars, reduced to below 7 millibars. Instead of melting, the ice begins to 'vaporize' in these conditions, and in this state can easily be extracted from the chamber. The normal atmospheric pressure is then restored and the temperature allowed to rise gradually to 20 degrees Celsius.

Depending on the number of books being processed and their formats, the treatment process may be over within a few hours, but can also take two to three days. Afterwards, the books are absolutely dry.

The last stage in their treatment involves the removal of residual dirt by hand. Rows of work booths have been installed beneath an air extraction system, and ZFB staff armed with fine brushes turn the pages of each book with great care and remove the mixture of ash and limewash dust that the fire extinguishing water removed from the shelves, ceilings and walls.

This treatment of the books completes the task that the ZFB has been commissioned to carry out.

Many of the 'patients' have already been returned to Weimar, and now confront the experts and restoration staff of the Anna Amalia Library with some difficult decisions: what further restoration measures should be applied to them, and in what order of priority. One thing is certain: many years will elapse and extensive financial support will be needed before this unique historic heritage can re-open for academic study or for the general public. It is doubtful whether the final traces of the fire will ever be eliminated. Following this spectacular rescue operation, the ZFB will return to its normal day-to-day book preservation activities, and we can indeed be grateful if rectifying fire damage remains one of its more exceptional activities.

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Fig. 1: *Damaged books from the Duchess Anna Amalia Library in Weimar, Germany.*

Fig. 2: *Freeze drying damaged documents.*

Fig. 3: *Removing ash and lime.*

Fig. 4: *Paper destroyed by acids.*

Fig. 5: *Mold damage.*

Fig. 6: *Damage caused by aggressive inks.*

Fig. 7: *An extensively damaged map.*

ZFB document restoration techniques:

Fig. 8: *Bulk deacidification, in which the books are soaked in a non-aqueous solution. A treatment capacity of more than 100 tons a year.*

Fig. 9: *Aqueous fungicide treatment to eliminate mold spores.*

Fig. 10: *Manual paper splitting. Gelatin is used to hold the damaged document between two supporting sheets of paper; it is then split apart so that it can be stabilized by inserting an interleaved core sheet between the two halves of the original document.*

Fig. 11: *Mechanical paper splitting if the document is less severely fragmented. In this case, a thin but highly tear-resistant core sheet is inserted between the two halves.*

Fig. 12: *Closing holes and gaps by mechanical fiber reconstruction. As in papermaking, a fiber suspension is applied to a screen in such a way that the fibers take up the desired position and are linked together.*

Fig. 13: *Restoring damaged book covers and spines.*


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Acid damage to paper – the biggest problem and challenge

Books are part of our cultural heritage, but are exposed to many different dangers. The worst of these are not bookworms, bark beetles or other destructive insects, nor even mold or similar problems caused by incorrect handling of valuable volumes. If asked about the main priorities in the preservation of old books, Dr. Manfred Anders, the ZFB's General Manager, is sure that the main challenge for the future will be to stop acid decay, which according to current knowledge threatens at least two-thirds of the world's most significant libraries, archives and document collections.

The acids that cause this damage often enter the paper in the fillers or as a result of incorrect dosage of strengthening agents during the papermaking process, but environmental influences both past and present are also to blame. The acids break down the cellulose that provides the paper with its mechanical strength, whereupon it becomes brittle and breaks up easily. This is an auto-catalytic ageing process, in other words one that speeds up automatically and can only be countered by effective deacidification.

The ZFB, had its origin in the restoration departments of two German libraries, the 'Deutsche Bücherei' and the 'Deutsche Bibliothek', which were combined in Leipzig following the German reunification. For some time now it has confronted this specific acid-damage problem and developed equipment suitable for the bulk deacidification of books. Such large-scale methods are clearly essential if the loss of possibly millions of important books is to be avoided. In 1998 the ZFB ceased to be part of the Deutsche Bibliothek and became an autonomous institute. With its know-how, its experience and the methods at its disposal, it is today in a position to assist all international state-run and private bodies that have the task of maintaining important collections of books.

The ZFB's 'Papersave' process

The books are pre-dried to reduce their natural moisture content temporarily from the usual 5-7% to below 1%. This is followed by the actual deacidification process, in which the books are soaked in an alkaline, non-aqueous solution. For


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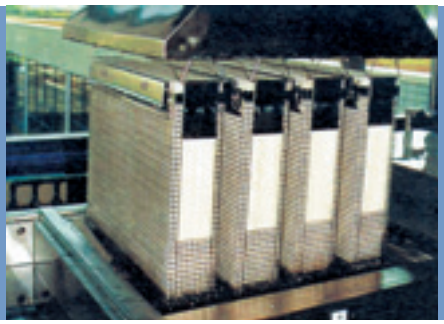
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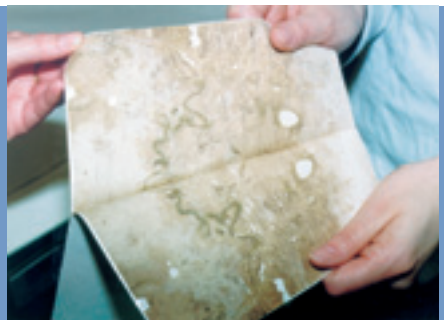
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this purpose, the treatment chamber containing the books is completely flooded. The solution is then pumped out and the books removed after subsequent drying. Next comes a reconditioning phase in which they recover their normal moisture content from the surrounding air. The full deacidification process takes three to four weeks to complete.

Following neutralization of the paper, it retains about 0.5-2% magnesium carbonate as a kind of 'alkaline reserve', to protect it against acids that develop later or reach it from external sources. Experimental work and the results so far obtained confirm that the life of paper deacidified in this way is extended by a factor of 4 to 5. The earlier the deacidification process is undertaken, the longer the paper's potential life.

The 'Papersave' process and bulk deacidification are capable of stopping damage, but clearly can not reverse any deterioration that has already taken place. The ZFB, therefore, concerns itself with all forms of restoration work as well: repairs to paper eaten away by inks, paper stabilization, prevention of mold and all related forms of damage reduction, from identification to remedial treatment, subject to the limitations imposed by research, know-how and the available techniques. Astonishing results have been achieved in many cases, for instance a scarcely decipherable Beethoven music manuscript, the almost completely decayed first printed edition of a Luther Bible and plans drawn out by the great German architect Schinkel have all been restored to (almost) their original condition.

One could ask why such efforts should be made in view of the fact that all such material could be recorded on microfilm or digitized, and indeed these tasks are normally carried out in parallel with the restoration work.

There's a fundamental difference, however, between studying text, illustrations and drawings on the screen and actually holding a valuable document in one's hands and seeing the work of scribes and printers dating from many centuries ago, and representing the basis for our own history and culture. The passage of time and various unwelcome events have already destroyed so many of these artifacts. What still remains must never be regarded as a burden imposed by our ancestors, but as a legacy that – for our own sake – it is our duty to preserve.
Manfred Schindler

What the ZFB offers:

- Bulk deacidification
- Paper stabilization with wet treatment, fiber reconstruction and paper splitting
- All forms of wet treatment (aqueous deacidification, bleaching, re-gluing
- Book cover restoration
- Treatment of specific forms of damage such as mold or aggressive inks
- Recovery work after water damage – freeze drying including protective action, cleaning and logistics, post-treatment
- Decontamination and chemical cleaning
- Processing of plans and maps
- Production of protective patterns
- Microfilming, reprinting and digitizing
- Elimination of complex forms of damage
- Consultation and advanced training

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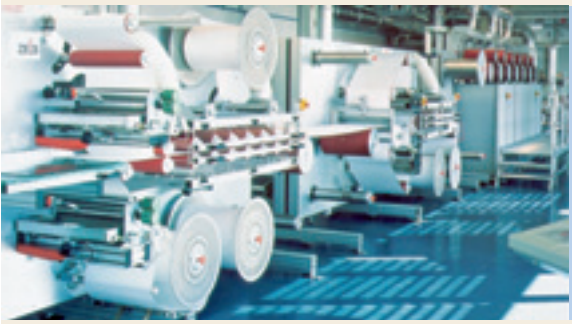

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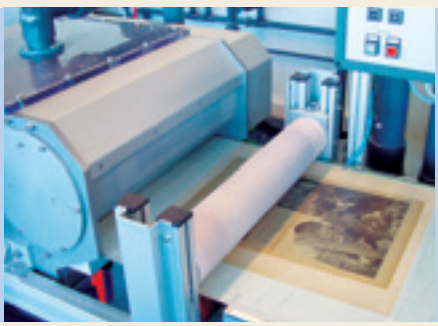

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Startup highlights in 2003/2004

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
Stora Enso North America, Port Hawkesbury, Canada.
Daishowa Paper, Port Angeles, USA.
Abitibi-Consolidated, Alma, Canada.
International Paper, Augusta, USA.
Bowater Newsprint, Calhoun, USA.
International Paper, Norway, USA.
Atlantic Newsprint, Whitby, USA.
UPM-Kymmene, Miramichi, Canada.
Great Lakes Pulp, Menominee, (pulp), USA.
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau, Germany.

Stock preparation systems and sub-systems for board and packaging papers
PCA, Tomahawk, USA.
Longview Fibre, Longview, USA.
Inland Paperboard, Orange, USA.
United States Gypsum, South Gate, USA.
Weyerhaeuser, Valliant, USA.
APP, Ningbo, China.
SCA Packaging Containerboard, Aschaffenburg, Germany.
Shanghai Chung Loong, Shanghai, China.

Stock preparation systems and sub-systems for tissue papers
SCA Tissue North America, Barton, USA.
Georgia-Pacific, Green Bay, USA.
Georgia-Pacific, Clatsklanie, USA.
J.D. Irving, Saint John, Canada.

Paper machines

Graphic papers
Stora Enso Magazine Paper, Maxau, Germany.
LEIPA Georg Leinfelder, Schwedt, Germany.
Calik Group, Yaslik, Turkmenistan.
Khanna Paper Mills Private, Khanna, India.

Board and packaging papers
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
Shanghai Cheng Loong, Shanghai, China.

Installation and rebuilds
UPM, Shotton, Great Britain.
Stora Enso Veitsiluoto, Veitsiluoto, Finland.
Suzano Papel e Celulose, Suzano, Brazil.
Abitibi Consolidated, Alma, Canada.
Stora Enso, Kotka, Finland.
Papresa, Renteria, Spain.
Papelera del Besaya, Besaya, Spain.
International Paper, Quinnesec, USA.
Ledesma, Ledesma, Argentina.
Krkonosske Papirny, Hostinne, Czech Republic.
Holmen Paper, Braviken, Sweden.
August Koehler, Oberkirch, Germany.
Crown van Gelder, Velsen, Netherlands.
Ahlstrom, Osnabrück, Germany.
OP papirna, Olsany, Tschechien.
PCE – Papel, Caixas e Embalagens, Manaus, Brazil.
Klabin Fabricadora de Papel e Celulose, Telêmaco Borba, Brazil.
Visy Pulp and Paper, Tumut, Australia.
CMPC Celulosa– Planta Laja, Laja, Chile.
Orsa Celulose, Papel e Embalagens, Paulínia, Brazil.
Amcor Cartonboard, Petrie, Australia.
Inpa – Indústria de Embalagens Santana, Pirapetinga, Brazil.
Cocelpa Cia de Celulose e Papel do Paraná, Araucaria, Brazil.
Shin Daeyang Paper, Shiwa, Korea.
Hwa Seung Paper, Korea.
Oji Paper, Matsumoto, Japan.
Oji Paper, Saga, Japan.
Oji Paper, Sofue, Japan.
Oji Paper, Oita, Japan.
Mead Westvaco Corporation, Chillicothe, USA.
Cartitalia, Mesola/Ferrara, Italy.
Tolentino, Tolentino/Macerata, Italy.

Coating technology
LEIPA Georg Leinfelder, Schwedt, Germany.
August Koehler, Oberkirch, Germany.
Krkonosske Papirny, Hostinne, Czech Republic.

Winding technology
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau, Germany.
M-real Zanders, Germany.
Norske Skog Follum, Follum, Norway.
W. Hamburger, Pitten, Austria.
Stora Enso Veitsiluoto, Veitsiluoto, Finland.
Mondi Business Paper SCP, Ruzomberok, Slovakia.
Stora Enso Baienfurt, Baienfurt, Germany.

Finishing

Janus Concept
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau, Germany.
Midwest, USA.

Ecosoft calender
LEIPA Georg Leinfelder, Schwedt, Germany.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Papresa, Renteria, Spain.
Zhejiang Tianting Yalun Paper Group, Longyou, Zhejiang, China.
Minfeng Special Paper, China.
Shenzhen Wander Color Printing & Packaging, China.

NipcoFlex calender
Stora Enso Baienfurt, Baienfurt, Germany.

Calenders
Minfeng Special Paper, China.
Zhejiang Yongtai Paper, Fuyang, Zhejiang, China.
Shanghai Chung Loong Paper, Shanghai, China.

Twister/Roll Handling
LEIPA Georg Leinfelder, Schwedt, Germany.
Papresa, Renteria, Spain.
Dresden Papier, Heidenau, Germany.

Roll cutting machines
LEIPA Georg Leinfelder, Schwedt, Germany (3).
Stora Enso Magazine Paper, Maxau, Germany.
Stora Enso Baienfurt, Baienfurt, Germany.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
AO Kondopoga, Kondopoga, Karelien, Russia.
Ningbo Zhonghua Paper, Ningbo, China (2).
International Paper, Jay, USA.
SCA Tissue North America, Barton, USA.
Calik Group, Yaslik, Turkmenistan.
Shanghai Chung Loong Paper, Shanghai, China.

Parent reel cart
LEIPA Georg Leinfelder, Schwedt, Germany.
Papresa, Renteria, Spain.

Automation

Norske Skog Albury, Albury, Australia.
Holmen Paper, Braviken, Sweden.
Gold East Paper, Dagang, China.
Fabrica Nacional de Papel, Fanapel, Uruguay.
Changde Heng An Paper Products, Hengan, China.
CNTIC Trading, Huatai, China.
Shandong Huatai Paper Group, Huatai, China.
Stora Enso Kabel, Kabel, Germany.
Norske Skog Tasman, Kawerau, New Zealand.
Oji Paper, Matsumoto, Japan.
Mondi Paper, Merebank, South Africa.
Oji Paper, Nakajima, Japan.
Papeteries Emin-Leydier, Nogent-sur-Seine, France.
Holmen Paper Papelera Peninsular, Peninsular, Spain.
MD Papier, Plattling, Germany.
Oji Paper, Saga, Japan.
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
W. Hamburger Pitten, Spremberg, Germany.
Appleton Papers, Spring, USA.
Papier- und Kartonfabrik Varel, Varel, Germany.
Veracel Celulose, Veracel, Brazil.
Nippon Paper Industries, Yatsushiro, Japan.
Pan Asia Stonebridge, Stonebridge, China.
Steinbeis Temming Papier, Glückstadt, Germany.
Thai Kraft Paper Industry, Thailand.
Weyerhaeuser Pulp & Paperboard Division, Longview, USA.
Kaysersberg Packaging, Kaysersberg, France.
Korsnäs, Korsnäs, Sweden.

Voith Fabrics

Graphic papers
LEIPA Georg Leinfelder, Schwedt, Germany.
Lee & Man, Jiangsu, China.

Board and packaging papers
Papier- u. Kartonfabrik Varel, Varel, Germany.
Chung Loong Shanghai Paper, Shanghai, China.
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
W. Hamburger Pitten, Spremberg, Germany.
Bohui Paper Group, Shandong, China.

Installation and rebuilds
Stora Enso Baienfurt, Baienfurt, Germany.
Abitibi-Consolidated Alma, Canada.
Stora Enso North America, Kimberly, WI, USA.
Stora Enso North America, Biron, WI, USA.
Georgia-Pacific, Wauna, USA.
Georgia-Pacific Green Bay, USA.
Marcal Paper Mill, Elmwood Park, New Jersey, USA.

Recent large orders

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
Stora Enso North America, Biron, WI, USA.
International Paper, Augusta, USA.
Bowater Newsprint, Calhoun, USA.
International Paper, Norway, USA.
Atlantic Newsprint, Whitby, USA.
MeadWestvaco,Wickcliffe, USA.
Jiangsu, China.
Huatai Paper, Dongying, China.
Mondi Paper, Merebank, South Africa.
Holmen Paper Papelera Peninsular, Madrid, Spain.
UPM-Kymmene Austria, Steyrermühl, Austria.
UPM-Kymmene, Kaipola, Finland.
Cartiere Miliani, Italy.

Stock preparation systems and sub-systems for board and packaging papers
Longview Fibre, Longview, USA.
Inland Paperboard, Orange, USA.
United States Gypsum, South Gate, USA.
Weyerhaeuser, Valliant, USA.
Thai Kraft Paper, Bangkok, Thailand.
SAICA – Sociedad Anónima Industrias Celulosa Aragonesa, Zaragoza, Spain.

Stock preparation systems and sub-systems for tissue papers
Georgia-Pacific, Green Bay, USA.

Paper machines

Graphic papers
Gold East Paper, Dagang, China.
Shandong Huatai Paper Group, Huatai, China.
Holmen Paper Papelera Peninsular, Peninsular, Spain.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
Mudanjiang Hengfeng Paper, Hengfeng, China.
Binzhou Huanghe Paper Group, Binzhou, China.
Zhejiang Purico Minfeng Paper, Purico, China.

Board and packaging papers
SAICA – Sociedad Anónima Industrias Celulosa Aragonesa, Zaragoza, Spain.

Installation and rebuilds
Norske Skog, Kawarau, New Zealand.
Norske Skog, Albury, Australia.
Holmen Paper, Braviken, Sweden.
August Koehler, Kehl, Germany.
Sappi, Cloquet, USA.
Mead Westvaco Cooperation, Chillicothe, USA.
Banque de France, Vic le Comte, France.
Kunshan Banknote Paper, Kunshan, China.
CBPC Banknote Paper, Chengdu, China.
Baoding Banknote Paper, Baoding, China.
Ziegler Papier, Grellingen, Switzerland.
Golg Huasheng Paper, Suzhou, China.
Yue Yang Paper Group, Yue Yang, China.
Radece papir. d.d, Radece, Slovenia.
Mondi Paper, Merebank, South Africa.
Kaysersberg Packaging, Kaysersberg, France.
Korsnäs, Korsnäs, Sweden.
SCA Packaging Containerboard, Aschaffenburg, Germany.
Siam Kraft Industry, Banpong, Thailand.

Coating technology
Papier- und Kartonfabrik Varel, Varel, Germany.
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
Zheijang Purico Minfeng Paper, Purico, China.
Papeteries Emin-Leydier, Nogent-sur-Seine, France.
August Koehler, Kehl, Germany.
SCA Packaging Containerboard, Aschaffenburg, Germany.
Korsnäs Aktiebolag, Gävle, Sweden.
Khanna Paper Mills Private, Khanna, India.
Union Industrial Papelera, Uipsa, Spain.
Mundanjiang Hengfeng Paper, Hengfeng, China.
Mondi Paper, Merebank, South Africa.
SAICA – Sociedad Anónima Industrias Celulosa Aragonesa, Zaragoza, Spain.

Winding technology
Holmen Paper Papelera Peninsular, Peninsular, Spain.
Shandong Huatai Paper, Huatai, China.

Mondi Paper, Merebank, South Africa.
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
SAICA – Sociedad Anónima Industrias Celulosa Aragonesa, Zaragoza, Spain.
SCA Packaging Containerboard, Aschaffenburg, Germany.

Finishing

Janus Concept
Gold East Paper (Jiangsu), Dagang, China (2).

Ecosoft calender
Zhejiang Xianhe Special Paper, Quzhou, Zhejiang, China.
Zhangqiu Huashi Paper, Zhangqiu, China.
Zhejiang Rongfeng Paper, Rongfeng, China.
Holmen Paper, Fuenlabrada, Madrid, Spain.
Shandong Huatai Paper, Dongying, Shandong, China.
Henan New Century Hengxing Paper, Suixian, China.
Weyerhaeuser Pulp & Paperboard Division, Longview, USA.
Cartiere di Guarcino, Guarcino, Italy.

NipcoFlex calender
Weyerhaeuser Pulp & Paperboard Division, Longview, USA.

Calenders
Mondi Paper, Merebank, South Africa.
Gold East Paper, Dagang, China.
Norske Skog, Albury, Australia.
St. Regis Paper, Darwen, Great Britain.
Tullis Russell, Glenrothes, Great Britain.
Henan New Century Hengxing Paper, Suixian, China.
Shandong Huazhong Paper Industry, Zaozhuang, China.
Changde Heng An Paper Products, Changde City, Hunan, China (2).

Twister/Roll Handling
Holmen Paper, Fuenlabrada, Madrid, Spain.
MD Papier, Plattling, Germany.
Ahlstrom, Osnabrück, Germany.
Torraspapel, Motril, Spain.
Sappi Lanaken, Lanaken, Belgium.

Roll cutting machines
Gold East Paper, Dagang, China (2).
Holmen Paper, Fuenlabrada, Madrid, Spain (2).
MD Papier, Plattling, Germany.
Stora Enso North America, Kimberly, USA.
Norske Skog, Albury, Australia.
Papresa, Renteria, Spain (2).
Emin Leydier, Nogent-sur-Seine, France.
Papierfabrik Adolf Jass, Rudolstadt/Schwarza, Germany.
Papier- u. Kartonfabrik Varel, Varel, Germany.

Parent reel cart
Gold East Paper, Dagang, China (3).
Norske Skog, Albury, Australia.

Automation

Archangelsk Pulp and Paper Mill (APPM), Archangelsk, Russia.
First Quality Tissue, Boston, USA.
Nippon Paper Industries, Fuji, Japan.
Nippon Paper Industries, Iwanuma, Japan.
CMPC Celulosa, Laja, Chile.
LEIPA Georg Leinfelder, Schwedt, Germany.
Stora Enso Magazine Paper, Maxau, Germany.
Cartitalia, Mesola, Italy.
Procter & Gamble, Neuss, Germany.
Radece Papir, Radece, Slovenia.
Nippon Paper Industries, Shiraoi, Japan.
Stora Enso Suzhou Paper, Suzhou GHS, China.
Feinpapierfabrik Dr. Franz Feurstein, Traun, Austria.
UIPSA, Unión Industrial Papelera, Uipsa, Spain.
Yueyang Paper, Yueyang, China.
Vipap Videm Krsko, Krsko, Slovenia.
Shanghai Chung Win Recycle Technology, Shanghai, China.
SCA Packaging Containerboard, Aschaffenburg, Germany.
SAICA – Sociedad Anónima Industrias Celulosa Aragonesa, Zaragoza, Spain.

Voith Fabrics

Graphic papers
Gold East, Zhenjiang, Jiangsu, China.
Nine Dragons, Taicang City, Jiangsu, China.

twogether

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