Document SPS–2B

Sterling

STERLING PHARMA SOLUTIONS

Biological Treatment Plant

Operating Techniques

Table of Contents

1 Introduction

The proposed activities defined for the purposes of this application are “Disposal of Hazardous Waste” and “Disposal of Non-hazardous Waste” with a Directly Associated Activity – “Waste Storage”.

This document describes the Biological Treatment Process, as per the below sequence written in chronological order.

2 Biological Treatment Plant (BTP) Upgrade Works Technical Description

The overall process description can be seen below and follow the chronological treatment of wastewater within the system. Overall, the upgrade works are designed to process 2200m^3 of effluent per day and a maximum of 45 tonnes of soluble Chemical Oxygen Demand (COD).

2.1 Feedstock

The BTP upgrade works have been designed as a pre-treatment step to the existing BTP. The purpose of the BTP upgrade works is to ensure that the majority of waste generated by SPS’ manufacturing operations, that are currently transferred offsite, can instead be processed onsite. These waste streams are generally high strength solvents that had to be incinerated offsite by a third party. Instead, they will be accepted as feedstock to be processed within the BTP upgrade works to produce environmentally low carbon biogas.

A variety of third-party effluent will also be processed by the BTP upgrade works. As per the existing PPC, the maximum number of tankers sent to site will remain at 30 per day, representing an incremental volume of approximately 600m^3. However, it is likely that the content of these tankers will vary to include a higher volume of high strength solvents. It is intended that high strength third party solvents are containerised in tank T104 and blended into the feedstock to the ICX bioreactors as a pre-treatment step to the existing BTP.

2.2 Tanker offloading & IBC

The BTP upgrade works will include the addition of 2 tanker offloading skids to exclusively handle high strength solvent waste. These 2 new offloading skids will feed waste into reception tanks T101, T102, T103 or T104. The two existing skids will require modifications to transfer lower strength wastes to

existing BioPlant tanks T300 (originally B3065), T190 (originally B3066) and T110 (originally B3067).

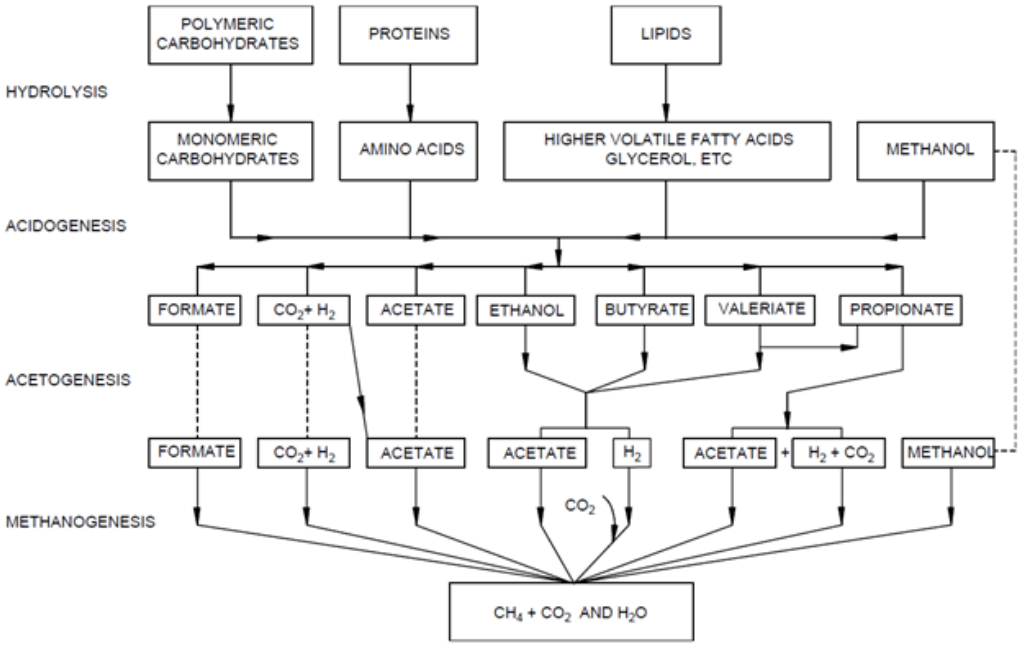
2.3 Blending & Balancing

Tanks T101, T102, T103 and T104 will use variable speed pumps to deliver independently controlled flow streams to T110. These streams will be homogenised with the hard-piped waste streams Dudley 1 & Dudley 2 from SPS' manufacturing process within tank T110 using mixers. These independent streams are monitored and changed within the process control philosophy to ensure a uniform product within tank T110. A divert tank T190 is present to allow the bypassing of T101, T102 and T103 effluent streams into the existing BTP. The homogenised feed from T110 is then bled (via a heat exchanger, heating the feed to around 33-40°C) into the existing mix held within recirculation tanks T120/T130 to begin the anaerobic digestion reaction process. To ensure sufficient control of any emissions to air, an odour abatement system is being installed as part of the BTP upgrade works. This system transfers vapour from the headspace of the effluent reception tanks T101, T102, T103 & T104, recirculation tanks T110, T120 & T130, and balance and divert tanks T300 & T190 into the odour abatement filtration system via a duty / standby blower configuration.

2.4 Anaerobic Digestion Reaction

The anaerobic digestion reaction process occurs within the ICX reactors R220 & R230 which are directly linked in a recirculation loop with recirculation tanks T120 & T130 respectively. The reaction uses live biological agents to digest the incoming, homogenised feed in an atmosphere lacking oxygen to produce methane, carbon dioxide and some trace elements. The effluent feed is mixed in the appropriate recirculation tank and fed into the expanded granular sludge bed (EGSB) reactors from the bottom. The recirculation tanks are dosed with various nutrients (phosphoric acid, urea solution and sodium hydroxide) to balance pH and encourage biomass growth within the reactors. The biogas created as part of the reaction is transferred to the biodome to be stored before being upgraded, whilst the liquid effluent, now with a significantly lower COD is transferred to T300 (B3065) to be processed via the existing BTP. Solid biomass is produced as the biological agent grows within the reactor chamber. This biomass is removed from the reactors, intermittently, based on the growth rate. This step marks the end of the upgrade works for the solid and liquid components.

The following diagram demonstrates the various bio-chemical reaction steps involved in an anaerobic digestion facility, clarified by the designers as part of this submission.



This surplus biomass is discharged, via the existing BTP sludge process, to the sludge consolidation tank which is used as a holding tank to feed the dewatering belt press. The sludge is pumped at a controlled rate to the belt press and polymer is added at a predetermined rate to promote the dewatering characteristics of the sludge and produce the optimum dewatering characteristics. The conditioned sludge is fed onto the belt press that achieves dewatering in three distinct stages, being dewatered sequentially by gravity drainage, pressure and then pressure and shear, on a continuous belt press. Supernatant from the belt press is collected in a sump and returned for processing through the BTP. Dewatered sludge is discharged to a skip via a shaftless screw and belt conveyor system and is removed for offsite disposal to a second, third party anaerobic treatment site to be processed.

2.5 Biogas Upgrading facility

Before entering the biodome, the biogas is checked for its hydrogen sulphide and oxygen content. Based on these levels of these components, the gas will either be bypassed to the flaring system or continue to progress to the biogas upgrading unit (BUU). The flare is set to be used intermittently and is a primary safeguard against the build-up of toxic components within the biogas. The primary processing route distributes biogas to the BUU, which uses a blower to transport the biogas from the biodome through the pre-treatment system and to the subsequent upgrading compressor. The pre-treatment system consists of a cooler, dryer and two sets of carbon filters. The cooler and dryer ensure the moisture content of the biogas is reduced, whilst the carbon filters

remove both hydrogen sulphide and volatile organic compounds (VOCs). These filters are removed from an approved third-party company who either regenerate or safely dispose of the filtration mediums based on its saturation levels / content. This compressor pressurises the biogas to circa 12-16barg which is fed through three sets of filtration membranes, separating the biomethane from the carbon dioxide. The carbon dioxide is vented as a point source emission, whilst the biomethane is transported to the Grid Entry Unit (GEU), where the methane is upgraded with trace amounts of propane and odorised to ensure compliance with National Grid standards. The GEU injects the gas into the gas network main through an additional compressors and export pipeline. The BTP upgrade works for the gas medium terminates at this point.

3 Material Balance

A material balance has been developed for the BTP upgrade works. This can be seen in the supporting document labelled “Material Balance”.

3.1 Process Flow Sheet Diagram

A process flow diagram of the BTP upgrade works can be seen in the following documents attached within this application:

Tanker offloading & IBC to Anaerobic Digestion Reaction: Document ID "PEU-2115138-PFD-001-H-Released"

Biogas Upgrading Facility: Document ID “783-01-BMDR-009_A”

3.2 Site Plans

Site plans of the BTP upgrade works can be seen in the following documents attached within this application:

3.2.1 Site Plans

Tanker offloading & IBC to Anaerobic Digestion Reaction: Document ID “2115138_014_980_01b_Colour”

Biogas Upgrading Facility: Document ID “783-01-BMDR-001_F”

3.2.2 Emissions Plans

Tanker offloading & IBC to Anaerobic Digestion Reaction: Document ID “2115138_017_900_01.dwg”

Biogas Upgrading Facility: Document IDs “783-01-BMDR-002_Sht1_B” & “783-01-BMDR-002_Sht2_A”

4 Activities

There are two activities referenced within the existing Pollution Prevention Control permit that will be affected as a result of these BTP upgrade works: S5.3 A1 (a) Disposal of hazardous waste and S5.3 A1 (c) (ii) Disposal of non-hazardous waste. The following section will reference the Best Available Techniques and associated techniques stipulated within the Technical Guidance sourced from the Environment Agency that this installation will use.

4.1 Benchmark Comparison - Emissions

The following section with review and compare the various relevant Technical Guidance Notes, additional guidance (via "Speciality organic chemicals sector (EPR 4.02)") and BREFs relevant to the chemical sector and this application. A list of the relevant chemicals present as part of the BTP upgrade works and their appropriate benchmarks limits can be seen in Section 5.

4.2 Venting and Emergency Relief Provisions

The mixing/balancing tank B3065 and the emergency holding tank B3066 are covered and both vent to atmosphere. All other tanks are open to atmosphere.

The only necessary emergency relief provisions required within the plant are overflow provisions. Any overflow from any tank can be contained within the plant bund. The bund is sized to 110% of the maximum liquid capacity of the tanks within the bunded area.

4.3 Summary of Operating and Maintenance Procedures

The BTP is operated using the sequences defined for the operation of the DCS system. Maintenance routines and procedures are controlled via a computer aided maintenance system SAP. Mechanical, Electrical and Instrumentation maintenance for the BTP are provided by SPS Central Engineering function to the same systems and standards as the manufacturing plants.

4.4 Operation during Abnormal Operating Conditions

Abnormal operating conditions will produce deterioration in the overall performance of the treatment plant. In general, if performance is deteriorating both hydraulic and COD load to the bioreactor are reduced whilst the cause of the malfunction is identified and corrected. Once the treatment capacity is

regained the hydraulic and COD loads to the system can be increased to normal operational levels. Prolonged abnormal operation can lead to a priority shutdown of identified production procedures on site or isolation and off-site disposal of effluent, where possible, to reduce the pollutant load.

4.5 Emissions to Air – Monitoring

The point source emission to air (A-9, A-10 and A11) will be monitored periodically in accordance with the existing SPS operations as seen in the accompanying document "PGM022C REV 7 - Management of Stack Emissions Monitoring Programmes". All applicable point source emission monitoring locations will conform to M1 stack emission monitoring standards where appropriate.

5 BAT justification

The following section will discuss the various activities and processes undertaken and the associated Best Available Techniques (BATs) implemented to reduce the impact of this process to the environment. As stipulated in the substantial variation application form, specific BAT conclusions have been referenced when one or more techniques are available to be used.

Process associated with scheduled activities	**BAT applied**	**Source of BAT**
Design	Indicative BAT	EPR 4.02 – Section 2.1 Design of a new process
Energy Efficiency	BAT	OFC BREF – 5.1.2.6 Minimisation of energy consumption
Biological treatment	BAT	OFC BREF – 5.2.4.7 Biological waste water treatment
Environmental Management System	BAT 1	CWW, OFC & WT BREFs
Odour	BAT 33	CWW BREF

Noise	BAT 18	CWW BREF & EPR 4.02 – Section 3.4 Noise and vibration
Emissions to Air	BAT 34 BAT 6	WT BREF WGC BREF
Monitoring of odour emissions	BAT 10 & 33	CWW BREF
VOC Emissions	BAT 19(a)(e)(f)(g) BAT 23(a)(d)(g)	CWW BREF WGC BREF
Flaring	BAT 15	CWW BREF