RISK & HAZARD MANAGEMENT

009 - Raw Materials

Saffil Ltd (also known as Unifrax/Alkegen)
Line 4 Permit Variation

Safety Risk

Business Risk

Environment Risk

Document History

Version	Issue	Date	Notes	Author	Reviewer
1	-	23/03/22	Working draft with client	J. Carroll R. Nibbs	C. Nicholls
2	-	01/07/22	Final draft.	J. Carroll R. Nibbs	C. Nicholls R. Ritchie R. Nibbs
3	1	11/07/22	Issue as part of permit application.	J. Carroll R. Nibbs	C. Nicholls R. Ritchie R. Nibbs

Contents

1 Introduction

This document is submitted as part of Form C3 of the environmental permit variation.

Please note that this document refers to the site as Unifrax Widnes and to the owning company as Unifrax. Unifrax was the name of the American company that owns Widnes site. A further complexity is added because due to a recent merger, Unifrax has changed its name to Alkegen. So, it is possible in correspondence or discussions that the site may be referred to as Alkegen.

The legal entity that owns the site at Widnes is however called Saffil Ltd and remains so despite the name changes to Unifrax and now Alkegen – and it is in this name that the EPR application is made on the accompanying forms.

2 Raw materials selection for Saffil manufacture

The basic raw materials for Saffil, M-Fil and Silica Fibre are well established. Tight quality control of the incoming raw materials for fibre is essential for ensuring fibre quality and hence minimising waste.

2.1 Process raw materials and chemicals

The tables below identify the process raw materials and chemicals used in the manufacture of Saffil, M-Fil and Silica fibre.

Estimated maximum usage figures are based on a total site production capacity of approximately 3500 te/year. The maximum usages depend on the split of production between fibre types.

The growth rate of the silica fibre demand will determine how much silica fibre is made on Line 4 compared with the other fibre types.

Table 1 Process Raw Materials Used in Saffil/M-Fil Fibre and Steam Production

Raw material	Specification	Principal Impurities	Anticipated Maximum Usage Lines 2, 3 and 4 (Te/Yr)
Aluminium chlorohydrate solution (max 58% w/w)	Alumina 23-27% w/w Chlorine 8.1-9% w/w pH 4 SG 1.33	Iron < 75ppm w/w Sodium <200ppm w/w	10,000
Aluminium chlorohydrate solid (flake/powder)	Alumina 47% w/w Chlorine 16.3%	Iron <150 ppm w/w Sodium <400 ppm w/w	2,000
Spinning aid Polyethylene oxide (PEO)	Organic polymer >99.8% w/w	Silica <0.1% w/w 2,6-Di-tert-butyl-cresol <0.1% w/w	180
Siloxane (organic silicon material)	SG 1.05 – 1.10 Silicon as SiO_2 25%w/w	N/A	570
Silica solution (max 40% w/w)	Max 40% Colloidal Silica dioxide, amorphous. Up to 5-6% aluminium chlorohydrate	Acetic acid <2%	5,500
Silcolapse (foam inhibitor)	30% Non ionic aqueous emulsion of polydimethyl - siloxanes 1,2-benzisothiazole-	N/A	20

Raw material	Specification	Principal Impurities	Anticipated Maximum Usage Lines 2, 3 and 4 (Te/Yr)
	3-one, sodium salt 0.15%		
Caustic soda (sodium hydroxide, employed in scrubber liquor treatment)	NaOH 25% w/w		5,000
Diesel Oil	Standard low sulphur grade	N/A	Emergency back up fuel only <10 te/yr
Natural Gas	Standard mains natural gas	N/A	110,000 MWhr/yr

Table 2 Chemicals used in utilities

Chemical	Location	Specification	Anticipated Usage (litres/Yr)
Biocide Aquaserv activator 150	Cooling Tower Dosing Cabinet	SG 1.16-1.19 pH 13 14% Sodium Hypochlorite	750
Corrosion inhibitor Aquaserv NB501 molybdate based	Cooling Tower Dosing Cabinet	SG 1-1.1 pH 9-10 Maleic acid copolymer 1-5% Phosphonobutanetricarboxylic Acid (PBTC) 1-5% Sodium hydroxide 1-5% Sodium molybdate 1-5% Sodium tolyltriazole 1-5%	360
Huwa-San TR20	Cooling Tower and Water tank disinfection	Hydrogen peroxide solution 10-30%	500
Oxygen scavenger Aquaserv BW340	Boiler Feed Water Dosing Equipment	SG 1.35 – 1.45 pH 9.5-10.5 Potassium sulphite (aq)	12,000
Scale inhibitor Aquaserv BW140	Boiler Feed Water Dosing Equipment	SG 1.1-1.3 pH 7-7.5 Aqueous solution containing phosphates	900
Alkalinity adjuster Aquaserv BW380	Boiler Feed Water Dosing Equipment	SG 1.35 pH >14 25% sodium hydroxide solution	500

Table 3 Detailed chemical information

Substance	Function	CAS Number	Fate % to product	% to water	% to sewer	% to waste/ land	% to air	Hazard Statements	Bioaccumulation	Biodegradability	Maximum amount on site (tonnes)
Aluminium chlorohydrate	Main product feedstock. Al content to product; chlorine content to scrubber. Used in 50% w/w aqueous and 100% w/w solid form.	12042-91-0	Al= approx. 95 Cl=0	Al=0 Cl=0	Al=0 Cl=99.	Al = approx. 5 (waste fibre) Cl=0	Al=0 Cl=1	None	N/A	N/A	Liquid – 300 Solid - 30
Siloxane	Main product feedstock Si content to Product; Organic content to abatement	N/A	Si= approx. 95 Organics=0	0	Si=<1 Organics<0.1 %	Si=<10 waste fibre Organics=0	Si=0 Organics largely as CO_2/CO/VOCs=99.9	None	N/A	N/A	30
Silica Solution	Main product feedstock. Si content to product. Minor organic component <2% acetic acid to abatement	7631-88-9 amorphous silica 64-19-7 acetic acid impurity	Si = 30%	0	0	0	70%	None	N/A	N/A	105
Polyethylene oxide (PEO, Polyox)	Spinning aid Main product feedstock Decomposed organic content to abatement	N/A	Organics=0		Organics<<1 %	Organics=0	Organics largely as CO_2/CO/VOCs =99.9	None	N/A	N/A	15
Silcolapse	Anti foaming agent	NA	Si=>90 Organics=0		Si=<1 Organics<0.1 %	Si=<10 Organics=0	Si=0 Organics largely as CO_2/CO=99.9	None	N/A	N/A	5
Sodium hydroxide (caustic soda)	Neutralisation of scrubber liquor HCl	1310-73-2	0	0	100 as NaCl	0	0	H290, H314	N/A	N/A	200
Diesel	Back up emergency fuel to boilers	68334-30-5	0	0	0	0	100% as combustion products from boiler stack	H226, H304, H315, H332, H351, H373, H411	N/A	N/A	10
Natural Gas	Fuel for boilers	74-82-8	0	0	0	0	100% as combustion products from boiler stack	H220, H280	N/A	Fast	<0.1 (contained in pipeline)
Aquaserv activator 150	Biocide for the cooling tower	NA	0	Approximately 100	0	0	0	EUH031, H314	N/A	Fast	1
Aquaserv NB510 molybdate based	Corrosion inhibitor for the cooling tower	NA	0	Approximately 100	0	0	0	H302, H314, H315, H319, H335	N/A	Weeks to months	1
Aquaserv BW340	Oxygen scavenger – in boiler water treatment	NA	0	Approximately 100	0	0	0	EUH031	N/A	Weeks	2
Aquaserv BW140	Scale inhibitor in boiler water treatment	NA	0	Approximately 100	0	0	0	None	N/A	Fast	2
Aquaserv BW380	Alkalinity adjustment in boiler water treatment	As sodium hydroxide above									

2.2 Quality control of raw materials

Quality control of raw materials is controlled by agreeing specifications with suppliers, in line with site quality procedures. Supplier documentation is checked prior to offload of the material.

2.3 Waste minimisation audit (minimising the use of raw materials)

Waste minimisation in the fibre production process is critically dependent on process control and elimination, as far as practicable, of the production of off-specification fibre.

Prevention of waste at source is the main focus. This is actioned by careful attention to process settings and in-process quality control. The control of process settings to ensure fibre quality is key and described in quality procedure QSETUP as covered in 002 – Management System.

Process settings are reviewed at the daily production meeting and corrective action is taken where possible to restore process settings to the correct values for the product in question.

In-process losses are the largest sources of waste fibre. QC failures of finished fibre are the second largest source of waste. Sometimes this fibre can be redesignated to a different grade to allow sale, but scrap fibre can also be generated from this route. Trimmings and other in-quality fibre which is not in the correct product form is fed back into the packing process as 'top-up' or reprocessed through the off-line facility for sale.

Items in this area of operation regularly monitored by the operational management include:

- Production yield
- Production variable cost
- Equipment availability
- Product quality performance
- Site housekeeping and waste management

Actions are identified and prioritised to improve performance in all these areas, on a short and longer term basis, and reviewed at regular management meetings.

Every month the amounts of saleable fibre and waste are calculated for production reporting and accountancy purposes. There is stock reconciliation every month with a cross check against daily production reporting and a stock check every quarter.

3 Water consumption information

3.1 Mains water

The predicted average mains water consumption for the site following installation of Line 4 and removal of Line 1 is shown in the table below:

Table 4 Predicted mains water consumption

Stream No.	Description	Existing Flow (2 Line Operation) (m^3/hr)	Estimated Flow (3 Line Operation) (m^3/hr)
Continuous flows			
Fed from rising main			
1	Boiler feed water	8	12
2	Cooling tower make up	0.5	1
3	Amenities	0.5	0.5
Fed from water booster/break tanks			
4	Line 2 array dump tanks	1	1
5	Line 2 scrubber	2	2
6	Line 3 array dump tanks	1	1
7	Line 3 scrubber	2	2
8	Line 4 array dump tanks	0	1
9	Line 4 scrubber	0	2
10	Array cleaning	1	1.5
	Total	**16**	**24**

Water usage capacity for a three line operation has been checked against the predicted requirement and it is considered that no upgrade to mains capacity is needed. Improvements in water usage, as detailed in document 011 – Energy and Resource Efficiency are taken into account in these figures. The project with the most significant impact at reducing water usage in recent history has been the recycling of condensate to the boiler hotwell.

The table below lists the intermittent flows expected during site operation with three production lines. These flows cannot be added together because they will not all occur together. Intermittent water usage combined with the base load water usage is not anticipated to exceed the available water supply to site.

Table 5 Expected intermittent – instantaneous short term flows

Stream No.	Description	Estimated Flow (3 Line Operation) (m^3/hr)
1	Process hoses	2
2	Cooling tower	1
3	Amenities/showers	2
4	Humidifier top up	2
5	Emergency quench water - scrubbers	5
6	Refrigeration make up (all lines)	1

3.2 Cooling water

A new upgraded closed loop cooling tower will also be installed as part of the project in order to increase cooling water capacity, particularly to service the cooling load associated with additional silica solution reflux capacity needed to serve Line 4.

Predicted cooling water usage is detailed in the table below:

Table 6 Predicted cooling water usage

Stream No.	Description	Cooling water flow (m3/hr)
Existing (2 line operation)		
1	Line 2 LT cooling	11
2	High shear mixer	6
3	Air compressors	31
4	Line 3 LT cooling	11
5	Silica solution reflux Line 2/3	14
6	Solution Preparation – coolers	8
	Total	81
Additional (to serve Line 4)		
7	Silica solution reflux Line 4	14
8	Solution preparation - cooler	4
9	Air compressor (depending on design chosen)	15
10	Line 4 LT cooling (removed from scope)	0
	Total	33

4 Waste Handling

4.1 Characterise waste streams and waste handling

A summary of the estimated waste stream quantities for Lines 2, 3 and 4 in operation is provided in the table below, along with the disposal or recovery option selected for each.

Compliance with the Packaging Waste Regulations (which applies to streams 1-4 inclusive) is managed through VALPAK, a national compliance scheme.

Table 7 Waste streams

Waste Stream	Description of Waste Stream	Amount Produced tonne/year	Nature of waste	Disposal or recovery option
1a	Packaging waste – paper and cardboard drums	4	Biodegradable non-hazardous waste	Recycle
1b	Packaging waste – paper and cardboard drums	9	Biodegradable non-hazardous waste	Landfill
2	Pallets	75	Biodegradable non-hazardous waste	Recycled or reused
3a	Steel drums	15	Stable non-reactive hazardous waste	Other Recycling
3b	Steel drums	16	Stable non-reactive hazardous waste	Landfill
4a	Plastics	13	Stable non-reactive hazardous waste	Other Recycling
4b	Plastics	10	Stable non-reactive hazardous waste	Landfill
5	Fibre scrap - process	180	Hazardous waste	Landfill
6	Intermediate Bulk Container (IBC) Waste	350	Non-hazardous waste	Off-site treatment

4.1.1 Description of waste treatment and disposal

Waste Stream 1

This stream is made up of packaging waste from the raw materials and processing. The stream is collected in a compactor at the site and transported to a recycling site where possible.

Waste Stream 2

This stream is made up of discarded or broken pallets from the raw materials and processing. The stream is either re-used or collected and recycled through an agent.

Waste Stream 3

This stream is made up of discarded raw material steel drums. The stream is stored on hard standing at the site and recycled where possible through a recycling plant.

Waste Stream 4

This stream is made up of waste plastics from the raw materials and processing. The stream is collected in a skip at the site and recycled where possible.

Waste Stream 5

This stream is made up of scrap fibre product from processing. The stream is bagged and collected in a compactor at the site and carried to hazardous landfill sites registered for the waste. This stream is made up of fibre that is lost due to process upsets or difficulties and also material that is out of specification and cannot be re-classified for re-use. The principal new waste stream in this area is likely to be milled fibre from the fibre processing area on Line 4.

Waste Stream 6

This stream is partially made up of liquid effluent from processing and is sent to sewer at controlled rate within pH control and is consented. Otherwise the stream is transported by tanker to a licensed waste disposal site where it undergoes treatment and disposal.