Installation Changes For Goole Capacity Expansion Permit TP3135PX

Reference - 002

We submit the following information for your consideration.

Permit **TP3135PX** for installation at:

New Potter Grange Road
M62 Trading Estate
Goole
East Yorkshire
DN14 6BZ

1). **Changes in the process**

Additional equipment will be installed to allow for further use of the Magnetite as a raw material which runs along the side of the current copperas (Ferrous sulphate) operation. This is due to an increase in demand from the market due to the lower phosphorus discharge limits imposed on waste water treatment plants ; The extra equipment that will be required will be one additional 58 M3 dissolving tank, one new condenser, one 30m3 final product adjustment tank, one 100m3 process water tank and Magnetite storage warehouse with transportation conveyor to the plant. The existing reactors, heat exchanger, buffer tank, filter press and storage will be used.

2). **New Equipment**

New process equipment will consist of the following as a minimum:

1 x new 58m3 dissolver vessel
1 x new condenser/heat exchanger for dissolver
5 x Emission points direct to atmosphere from each dissolver condensers & adjustment tank
1 x new 30m3 adjustment tank
1 x installation of an existing refurbished filter press
1 x 100m3 blowdown tank and associated pressure relief system to serve all 5 reactors
1 x magnetite storage and transportation/distribution system

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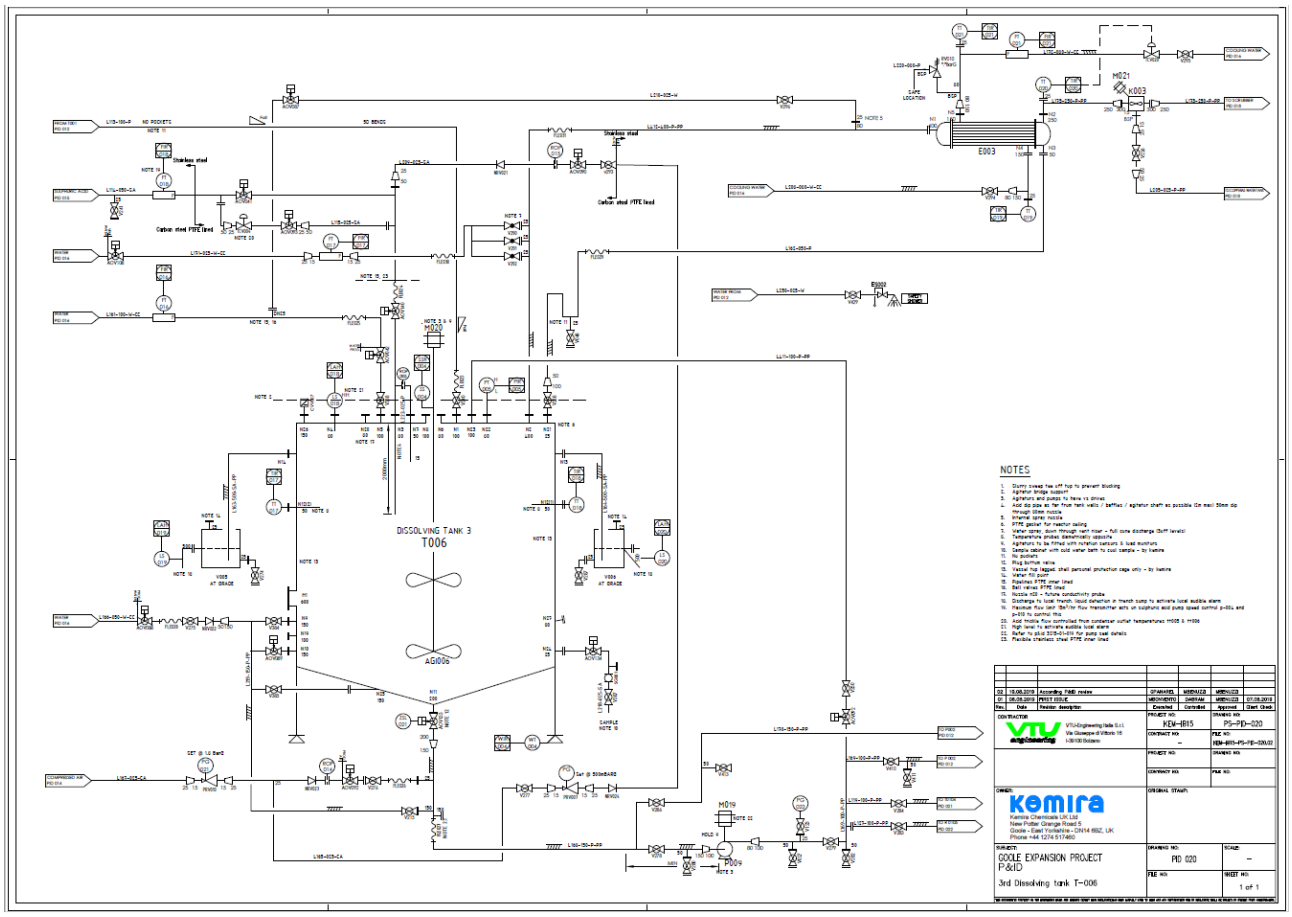

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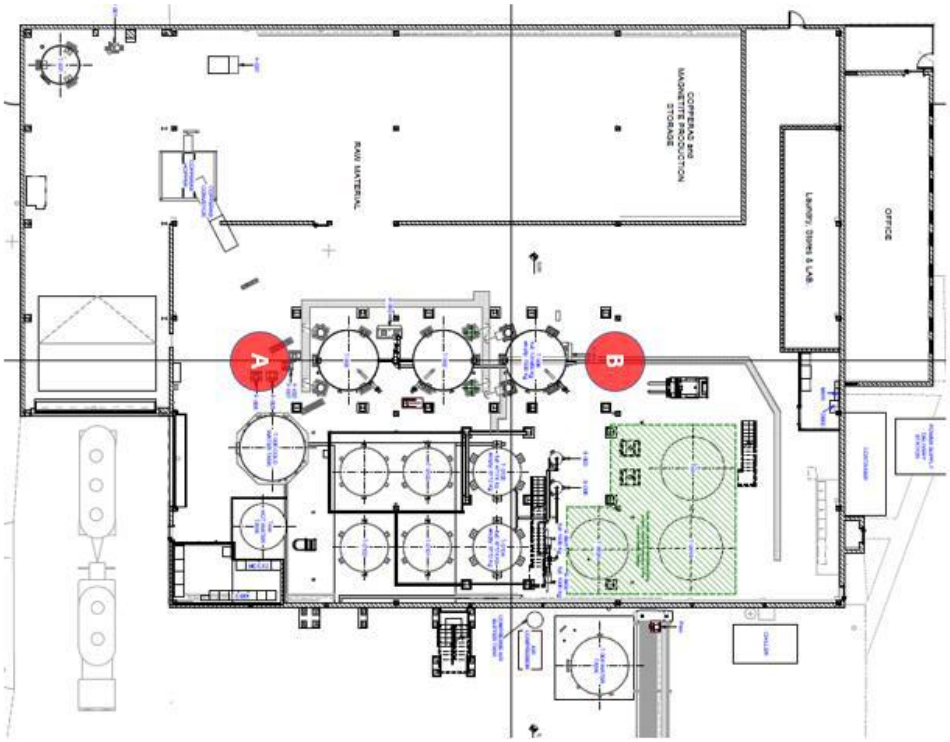
3) **Locations / Site Plan**

Two potential locations have been identified for the new dissolver vessel within the existing building shown as A and B in red on the layout below



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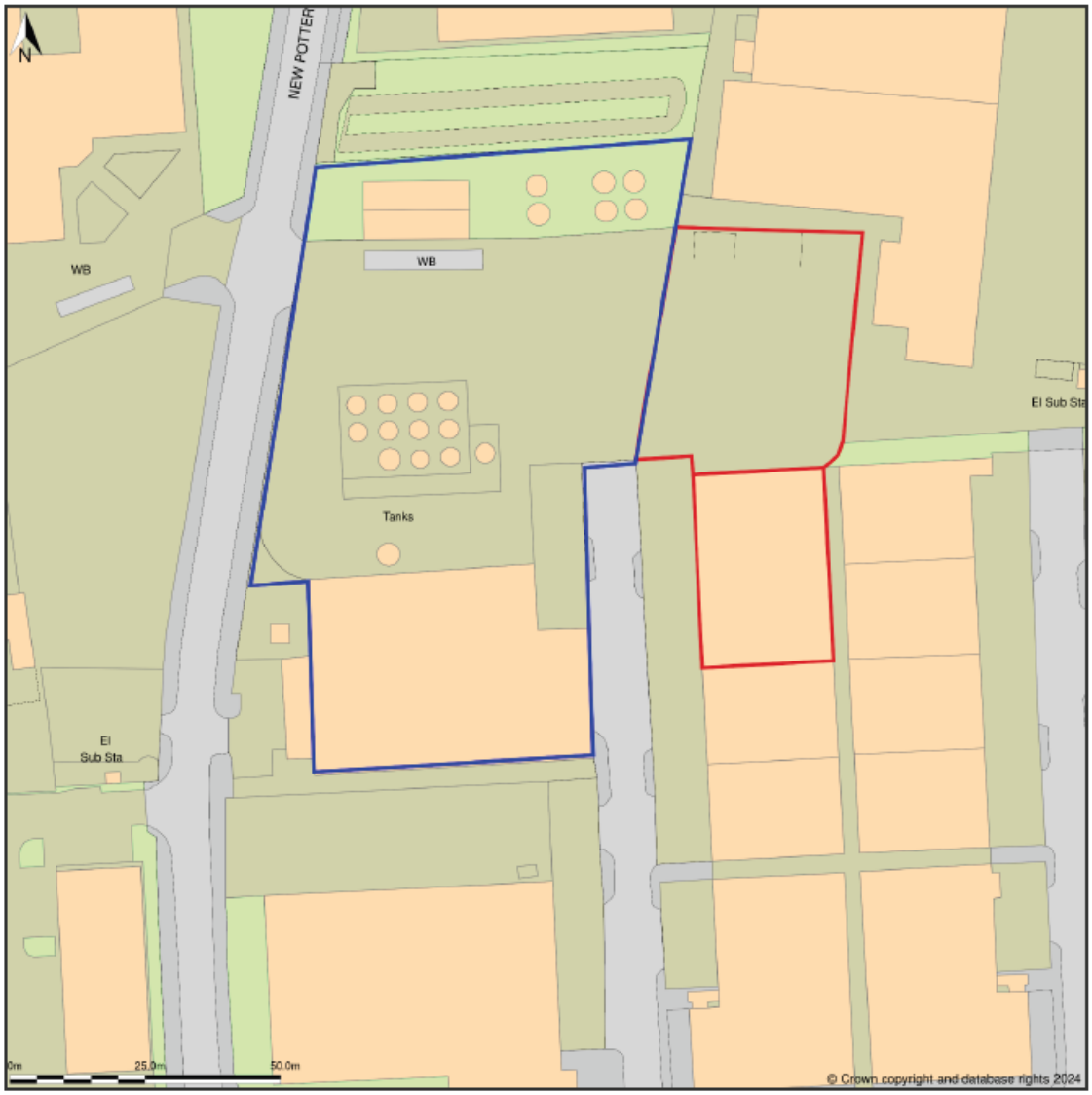
Highlighted below is the new additional magnetite storage location and as part of the application for land extension on permit – Leased by Kemira

Kemira Chemicals Uk Ltd, M62 Trading Estate, New Potter Grange Road, Goole, East Riding Of Yorkshire, DN14 6BZ



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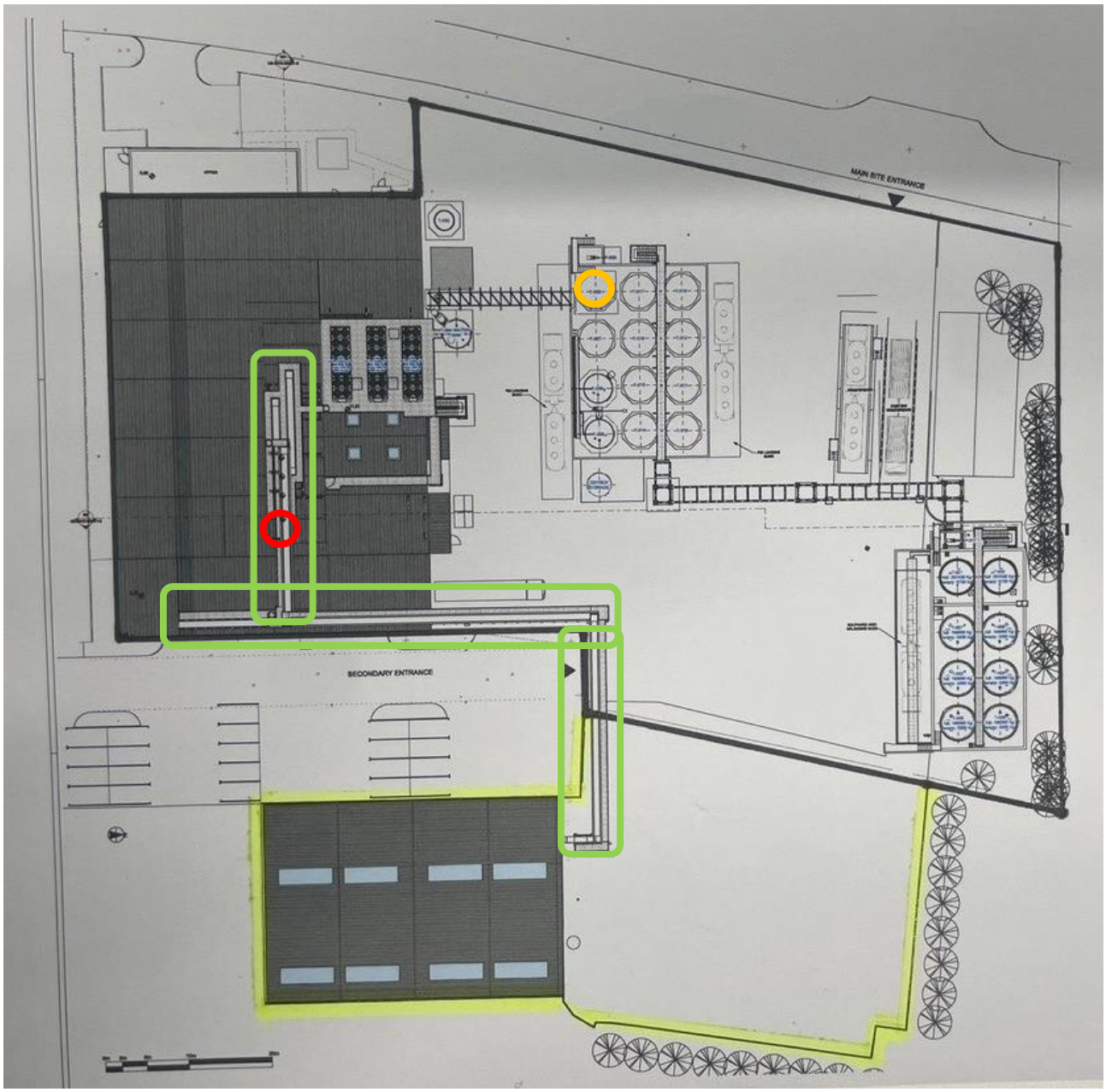

Yellow – Additional Land to permit
Green – Magnetite transportation system
Red – 4th Dissolver Location
Orange – Process water tank

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3). **Emissions.**

Addition of 5 new emmission points directly from the condensers, this is deemed necessary due to the introduction of new processing equipment required for the manufacturing of Ferric sulphate, energy & CO2 savings by none use of the large scrubber fan. The condenser will condensate back the vapours that are formed during dissolving, each emmission point will be manufactured with an emmissions sampling point so annual testing of the levels SO_2 50 mg/m^3 and 10 mg/m^3 for Particulates can continue.

All emmission points will stay within the emmission limits as per Permit requirements

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EXECUTIVE SUMMARY

EMISSIONS SUMMARY

Parameter	Units	Result	Calculated Uncertainty +/-	Emission Limit Value (ELV)	Accreditation
Total Particulate Matter Particulate Emission Rate	mg/m³ g/hr	0.75 3.9	0.77 4.1	10 -	MCERTS
Sulphur Dioxide Sulphur Dioxide Emission Rate	mg/m³ g/hr	0.06 0.37	0.04 0.26	50 -	MCERTS
Moisture	%	7.1	0.20	-	MCERTS
Stack Gas Temperature	°C	26	-	-	MCERTS
Stack Gas Velocity	m/s	9.8	0.24	-	
Gas Volumetric Flow Rate (Actual)	m³/hr	6898	356	-	
Gas Volumetric Flow Rate (STP, Wet)	m³/hr	6351	327	-	
Gas Volumetric Flow Rate (STP, Dry)	m³/hr	5898	304	-	
Gas Volumetric Flow Rate at Reference Conditions	m³/hr	6351	327	-	

ND = None Detected,
Results at or below the limit of detection are highlighted by bold italic text.
The above volumetric flow rate is calculated using data from the preliminary survey. Mass emissions for non isokinetic tests are calculated using these values. For all isokinetic testing the mass emission is calculated using test specific flow data and not the above values.
Reference conditions are 273K, 101.3kPa without correction for water vapour

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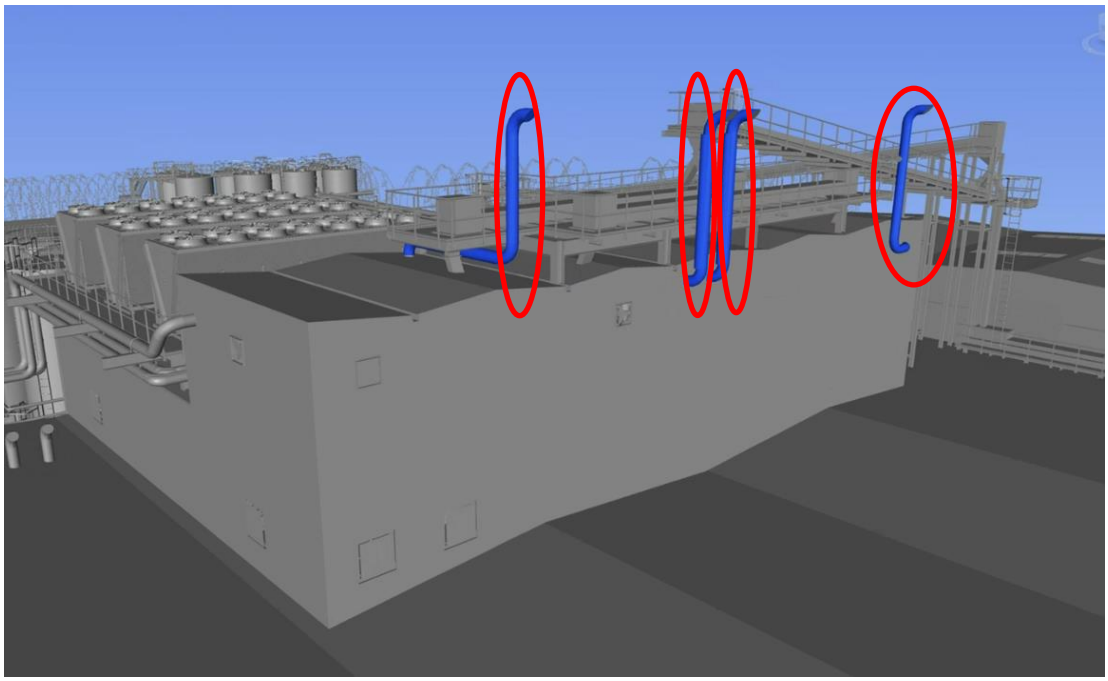
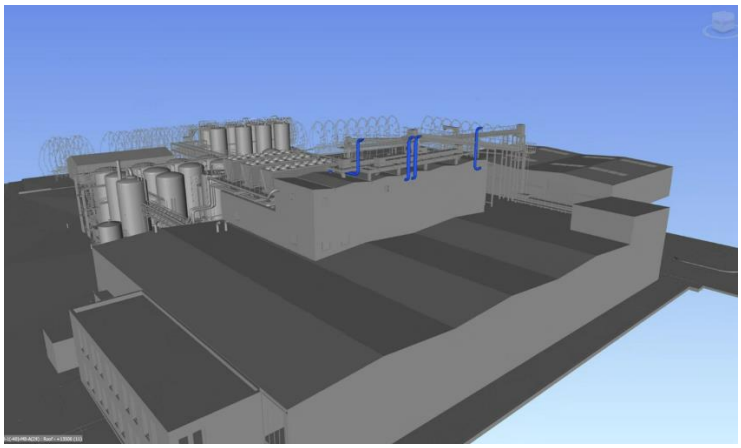
New emission points directly from the condensors to atmosphere x 4.





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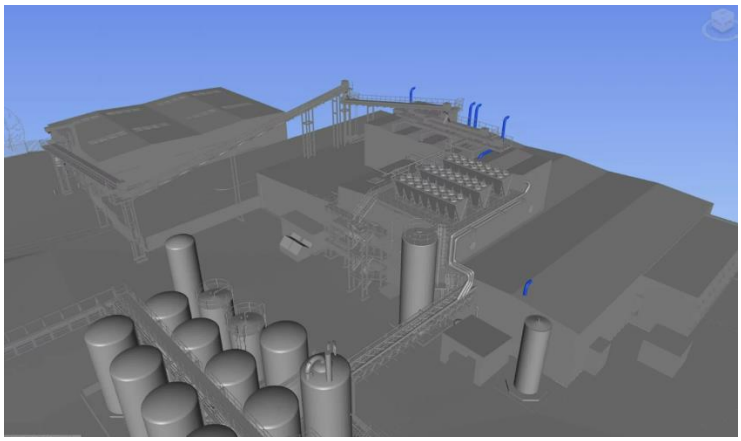
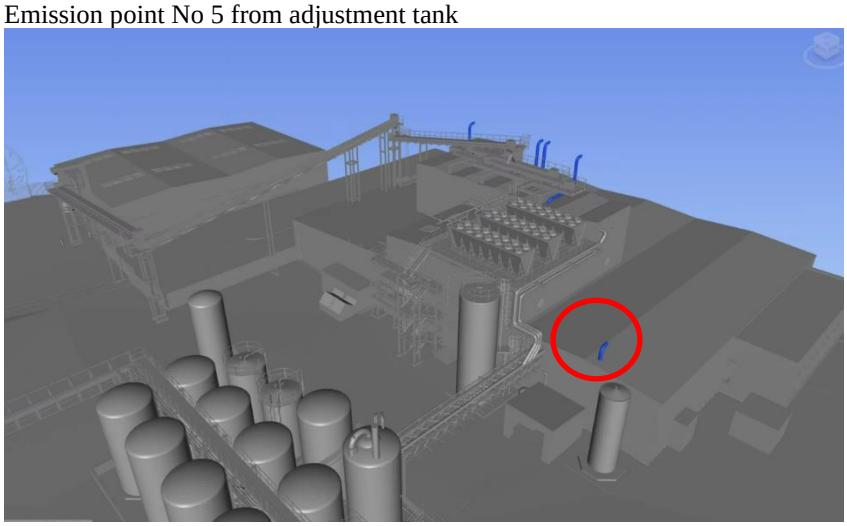
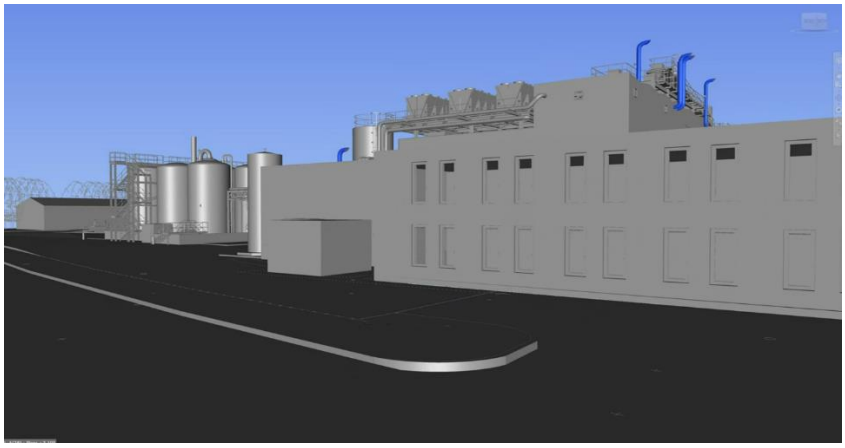


Emission point No 5 from adjustment tank





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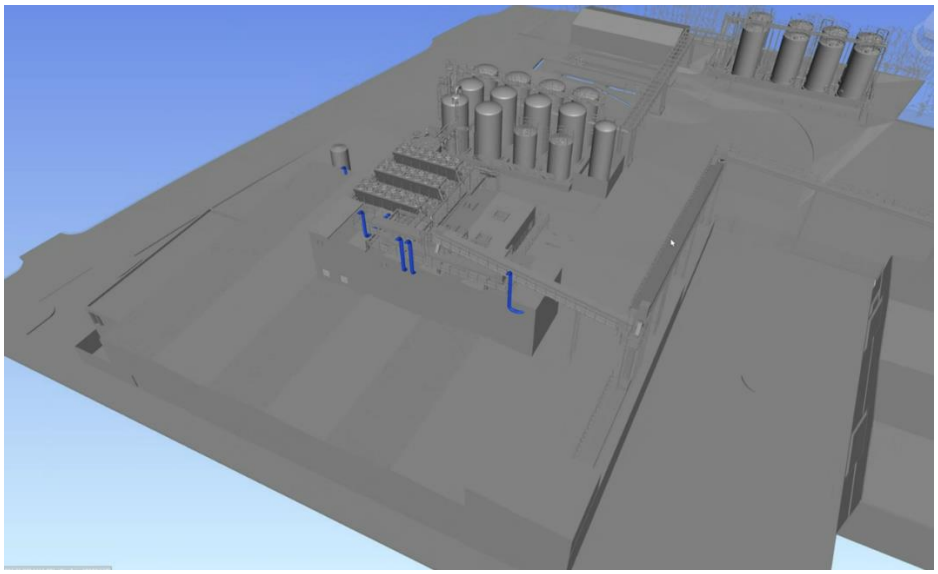

4). **Process description**

PIX-122 using Magnetite

This process description is created to describe the manufacturing of Ferric Sulphate with Magnetite as raw material.

Magnetite is added as a water slurry and pumped from the slurry tank to the dissolving tank. The Sulphuric acid and the rest of the water is added in the dissolving tank.

In the dissolving tank, there should always be an excess of magnetite therefore the outlet is from a side nozzle and the magnetite is kept as a heel in the bottom cone. Magnetite will be added as a dry bulk to the top of the dissolver via conveyor for product adjustment.

Specification in dissolving tank: Fe≥14% Free acid <3%

Recipe for two reactors á 26,5 m3 (82 tons) (Start-up batch needs to include the bottom cone)

Water 33,8 ton (The rest of the water will be added to buffer tank)

H2SO4 (96%) 30,7 ton

Magnetite 17,5 ton (15% more magnetite when empty dissolving tank)

Slurry preparation

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Water 17,5 ton (more water first batch)

Magnetite 17,5 ton (15% more magnetite when empty dissolving tank)

The slurry is made in an open tank with mixing. The tank is standing on load cells.

The water is added and measured by the load cells. The mixing is started when liquid level is 0,5xD above impeller. Then the Magnetite is added with front loader to the correct amount ± 150 kg. The pump is started with circulation over the tank. When stable flow then the valve to chosen dissolving tank is opened. After transfer, the lines are flushed with water measured by the load cells on the dissolving tank.

Dissolving tank preparation

Water 16,3 ton (more water first batch)

Magnetite + slurry 35,0 ton (15% more magnetite when empty dissolving tank)

H2SO4 30,7 ton

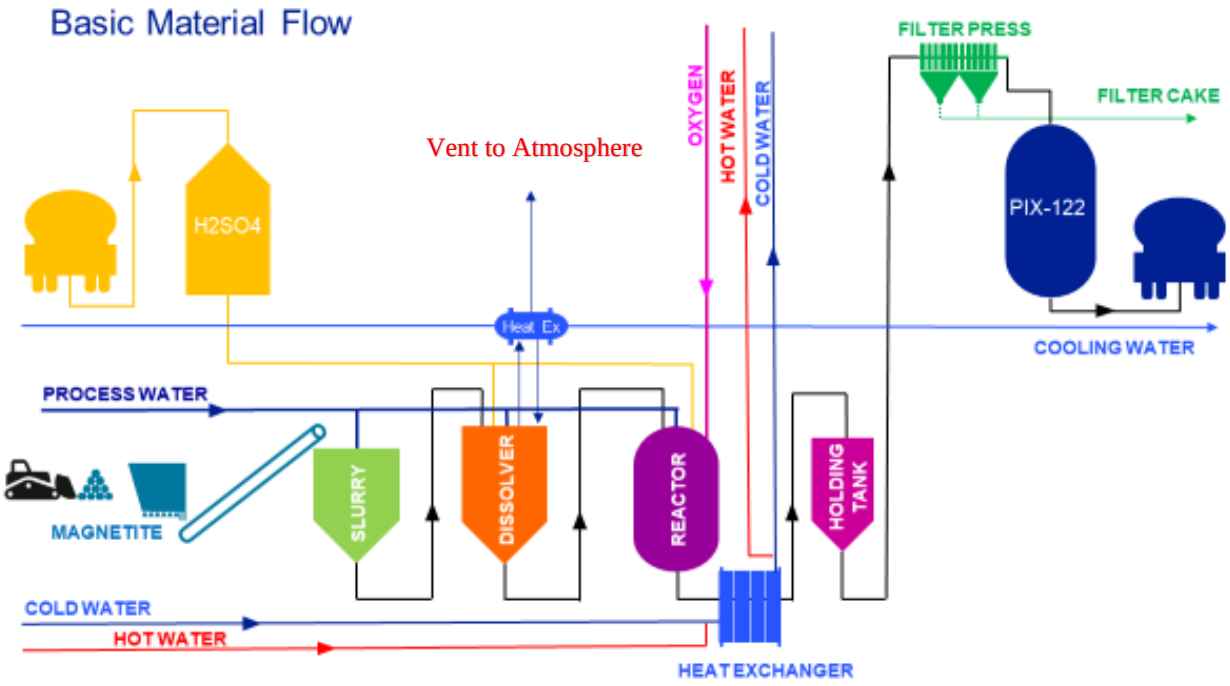
The dissolving is performed in two stainless steel tanks with mixing and standing on load cells. The tank is connected to a venting system through demister and condenser. The condenser will condensate back the vapours that are formed during dissolving.

During regular production, there is a heel left in the bottom of the tank. This heel consists of previous batch + access of magnetite. For the first batch, some extra water and magnetite are added. The batch is started by water addition through flow meter (1m3 is saved for the flushing of the pipes) and the slurry that is prepared in the slurry tank. The agitator starts automatically when the level is high enough. When all wanted water and magnetite is added and mixed then the Sulphuric acid addition is started. The acid is added by weight of the load cells. When temperature in the reactor reaches 80°C then the acid is stopped for 30 minutes. The temperature will continue to rise. After 30 minutes, the acid addition is started but with maximum 2 m3/h (~3,7 ton/h). When all acid is added then the dissolving should continue for 2h. Then dry magnetite is added to the top of the tank for reduction of free acid. Then the mixing is stopped and the access magnetite is settled for 30 min. Then a sample is taken and 26,5 m3 (~42 ton) is transferred to one of the three reactors from the side nozzle. After the transfer, a few 100 litres of water are added to flush the pipes and then the water for next batch is added to the dissolving tank to stop further reaction.

Oxidation

The oxidation is performed in the three existing reactors with vortex mixers. The reactors are equipped with venting and pressure relief valves. The first reactor is filled with 26,5 m3 measured by the load cells on the dissolving tank. During filling of the reactor, the vent is open. Check that mixer sealings are ok. When the reactor is filled and the pipe flushed with water then the oxygen is opened and all inert gases are vented out. The vent is closed and the pressure goes up. When 5 bar is reached the mixer is started. This is to protect the sealings. The pressure in the reactor during oxidation should be 6.3-10 barg. The oxidation is exothermal and the temperature goes up to 120 – 125°C. The oxidation requires approx. 260 kg oxygen (without losses or filling of reactor). When the consumption of oxygen is almost zero then the oxidation is finalized. If temperature goes above 130°C then the oxygen valve is closed. If the reactor pressure is below 5 barg then the mixer is stopped.

5) **Basic Flow**



6) **Energy Efficiency**

Energy is a key metric on the site and we can demonstrate very good energy reduction projects over the last 10 – 15 years, we currently are operating at 12 kWh per ton with a target of 15 kWh per ton, we aim to reduce this by using a more energy efficient process cooling technology, moving from a refrigerated chiller to air cooled technology.

7**) Raw Materials**

The suppler of raw materials can change due to stock restrictions and production issues at there end below is a general set of MSDS sheets that will cover the raw materials used in the process, as previously stated the process will not change, we are just increasing the production and storage capacity. The current raw materials are used as they allow us to produce coagulants that comply to drinking water standards.

LKAB magnetite-sds-12-03i

Feralco SDS UK EU English - Sulphuric Ac

2010480_oxygen_refrigerated_r1.pdf

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8) **Waste**

We are constantly looking at reducing waste generated in the process, this is influenced by the quality of the raw material as some magnetite has larger particle size which is filtered out in the final product along with increased silicate levels, copperas can contain silicates, calcium and foreign objects such as stones and gravel. The average monthly waste tonnage for H1 was 112 tons per month, with an average of 12.052 tonnes of production, H2 is down to 101 ton per month with an average 12,650 tonnes of production, we are planning in 2024 to wash the filter cake prior to disposal this will reduce the annual waste tonnage by 40% and also reduce the classification.

GARY PICKARD

PLANT MANAGER

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