

International Process Plants

Stock #600494

Esters Plant

24,000 MTPY



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Brief Overview

- Production: 24,000 metric tons/year Esters
- Units Included:
 - (1) Batch Ester Unit (vacuum to 3 bar): 20 metric tons, batch capacity
 - (1) Batch Ester unit (atmospheric): 9 metric tons, batch capacity
- Year Built/Shutdown: 1996 / 2009
- Technology: Free and Clear to Practice Worldwide
- Utilities: Electricity, Steam, Water and Fuel Gas
- Raw Materials: Fatty Acids, Alcohols
- Documentation: Available and Primarily Electronic
- Some spare parts for critical equipment are available with the sale.
- Process control systems and programming are completely up-to-date and are available for sale with the facility. They are Siemens PCS7 and Fisher-Provox systems.

Process Overview

- The ester plant is a highly automated and flexible batch plant located indoors. The plant was commissioned in 1996 and is capable of processing a wide range of ester products. Alcohols and fatty acids are initially prepared in a weigh-vessel before being transferred to the reactor vessel. Reacted ester is then cooled while transferring to the bleacher vessel. The ester is further refined in the bleacher vessel before being filtered through a pressurized 5,000 liter Dr. “M” Fundabac candle filter into dedicated storage tanks. The filter is used to remove the carbon which was added for color control.
- The main process operation steps for the manufacture of all products are: pre-weighing of fatty acid and alcohol in the pre-weigh vessel, followed by esterification in the reactor to produce the crude ester, and finally neutralization, bleaching, filtration, and deodorization of the product in the bleacher vessel to meet the finished product specifications (normally acid value, color, and odor).

Process Overview

- The rectification of the low boiling alcohols, methanol and isopropanol, is carried out using the reactor column when sufficient alcohol has accumulated in the wet alcohol storage tanks.
- The pre-weigh vessel is a stainless steel tank with 33 m³ capacity. It is mounted on load cells with internally fitted hot water heating coils, agitator, and nitrogen blanket. The reactor charge recipe of fatty acid, alcohol, carbon, and catalyst are weighed into the pre-weigh and warmed to a maximum of 80°C while the reactor is occupied. Alcohols used in this process are glycerol, propylene glycol, butyl alcohol, octyl alcohol, and tri-methylol propane (TMP).



Main Esters Building



Process Overview

- The fractionating column is packed in two sections (1.7 m at the bottom and 2.8 m at the top), with the vapor from the reactor entering below the bottom bed. This allows for future modification to give the option of middle vapor entry for in-situ alcohol (methanol or isopropanol) rectification during reaction. This would also make middle liquid feed possible as an alternative to batch rectification of the wet alcohol. For column cleaning and cooling of hot spots, 40 psig steam can be injected into the vapor space below the bottom bed. All of the charge injection valves with the exception of nitrogen and the low-pressure steam to the column base are interlocked so that only one can be opened at once. Liquid can be collected independently from the base of the column and the condensers to either of two 5.6 m³ receivers. The receivers are discharged to the appropriate alcohol storage tank or to effluent. The vessel high pressure safety relief from the rupture disc and relief valve is directed to atmosphere via a cyclone separator, allowing the liquid component to be collected into an enclosed 4 m³ accumulation tank.

Process Overview

- The bleacher capacity is 30 m³, which will give an actual product yield of 22-23 metric tons per batch (same as the reactor). The unit operations of neutralization, drying, bleaching, filtration, and deodorization are carried out on the crude product in the bleacher. These are the processes of refining to remove residual reaction components and catalyst and improve the color and odor of the ester as necessary to meet the product specification.
- Catalyst and residual fatty acid impurities are reduced to an acceptable level by neutralization, addition of bleaching earth, drying, and filtration carried out in the bleacher. The refining of crude reaction products manufactured using acid catalyst (low or medium temperature injection) is performed by neutralization with 28% sodium hydroxide solution, addition of a minimum quantity of bleaching earth to adsorb the catalyst salt, followed by drying and filtration. Additional earth and carbon is used in the process of bleaching to improve color during refining. Crude high temperature esterification products are treated with 50% phosphoric acid solution to aid in catalyst removal with bleaching earth adsorption and filtration.

Process Overview

- Neutralization is performed with either sodium hydroxide or phosphoric acid. Bleaching is performed with bleaching earth and carbon black. Filtration is done with a Dr. “M” candle filter. Deodorization is done with carbon black and steam heat.



Dr. M Filter



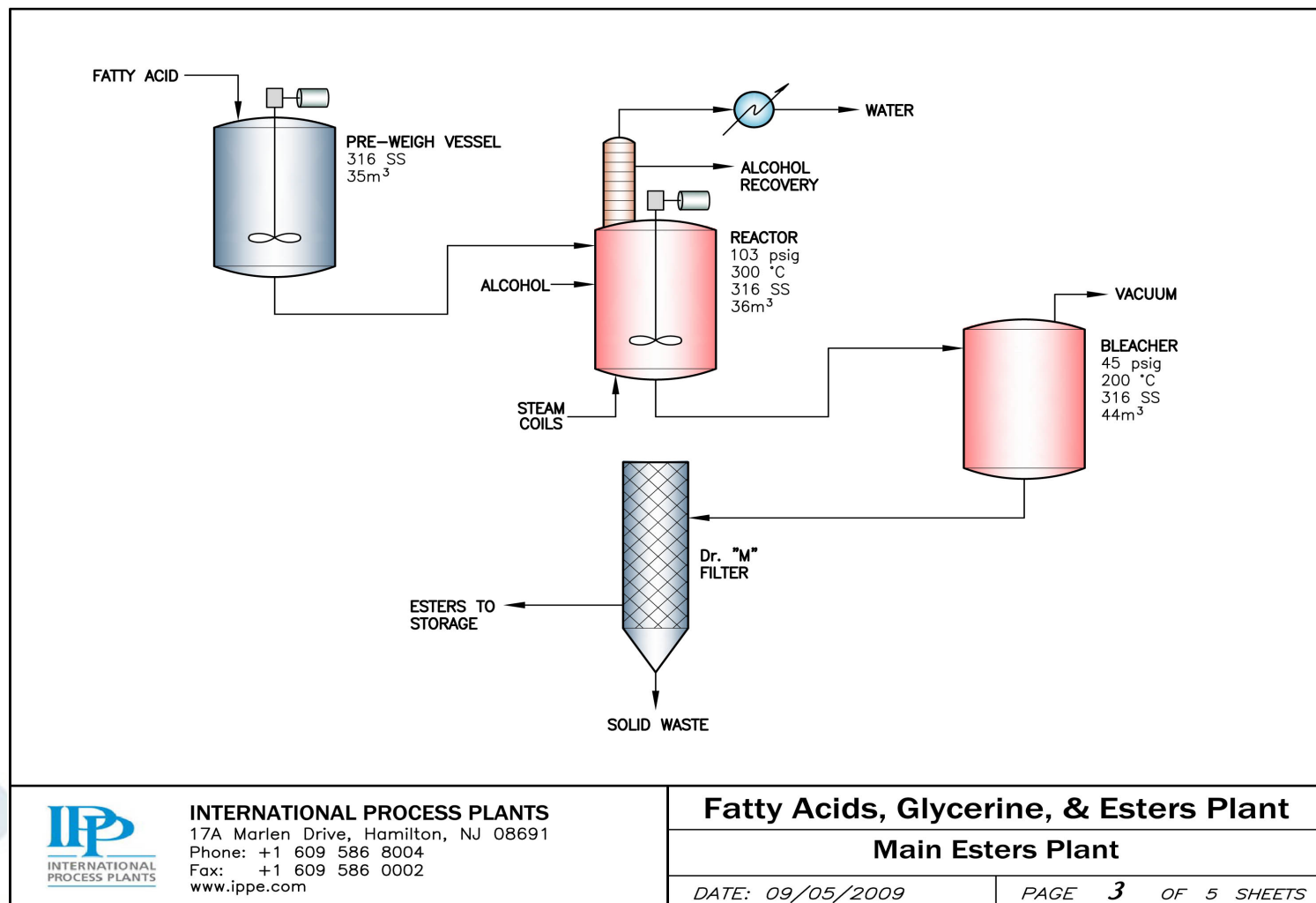
Major Equipment

- Pre-weigh Vessel (item 721-V8100):
36.4 m³, 316 SS vertical agitated pressure vessel with internal 316LSS coil, weld dished top and bottom. 3 m (dia) x 4.15 m (straight side), manufactured by Jacobs Engineering Ltd., design pressure internal 2 barg @ 120°C, coils 4.5 barg @ 120°C, seven sets of 316LSS vertical coils, Chemineer agitator drive, two 3-blade pitched paddles with mechanical seal.
- Reactor (item 721-V8200):
35.9 m³, 316 SS vertical agitated pressure vessel with internal coils, weld dished top and bottom, 3 m (dia) x 4.1 m (straight side), manufactured by Ardeth Engineering Ltd, design pressure internal 7 barg/FV @ 20/300°C, coils 82.8 barg/FV @ 20/300°C, internal vertical coils, Chemineer agitator drive, two 3-blade pitched paddles with mechanical seal.

Major Equipment

- Bleacher Vessel (item 721-V8300):
39 m³ 316LSS vertical agitated pressure vessel with internal duplex stainless steel coils, weld dished top and bottom, 3.2 m (dia) x 4.4 m (straight side), manufactured by Jacobs Engineering Ltd, design pressure internal 3 bar/FV @ 200°C, coils 3.5 bar @ 200°C, eight sets of vertical duplex stainless steel coils with 41 m² surface area, Chemineer agitator drive with approx 37 kw motor, two 4-blade pitched paddles with mechanical seal.
- Fundabac Filter
4.8 m³ 316Ti stainless steel vertical Fundabac pressure filter, manufactured by DR. M, working pressure -1/7 barg @ 200°C, density medium 1,000 kg/m³, 1,284 mm (dia) x 2,940 mm (straight side) x 974 mm (bottom cone), bolt dished top, welded coned bottom.
- There are 54 stainless steel storage tanks with a total capacity of 2,200 metric tons associated with this plant.

Main Esters Flow Diagram



Contact IPP Today!

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