HPA℠
High Pressure Absorber C_3^+ Recovery

MCDERMOTT™ TECHNOLOGY

Overview

Lummus Technology's proprietary Randall Gas HPA℠ process is a two-tower turbo-expander, high propane recovery process. The HPA process is a variation of our proprietary LPG-MAX℠ technology, providing high propane recovery at higher absorber operating pressures (>500 psia) that minimizes recompression.

The technology recovers more than 99+% propane from gas streams with essentially no ethane recovery. In this two-tower process, the absorber pressure is higher than the deethanizer pressure, which is achieved by the addition of a deethanizer overhead compressor.

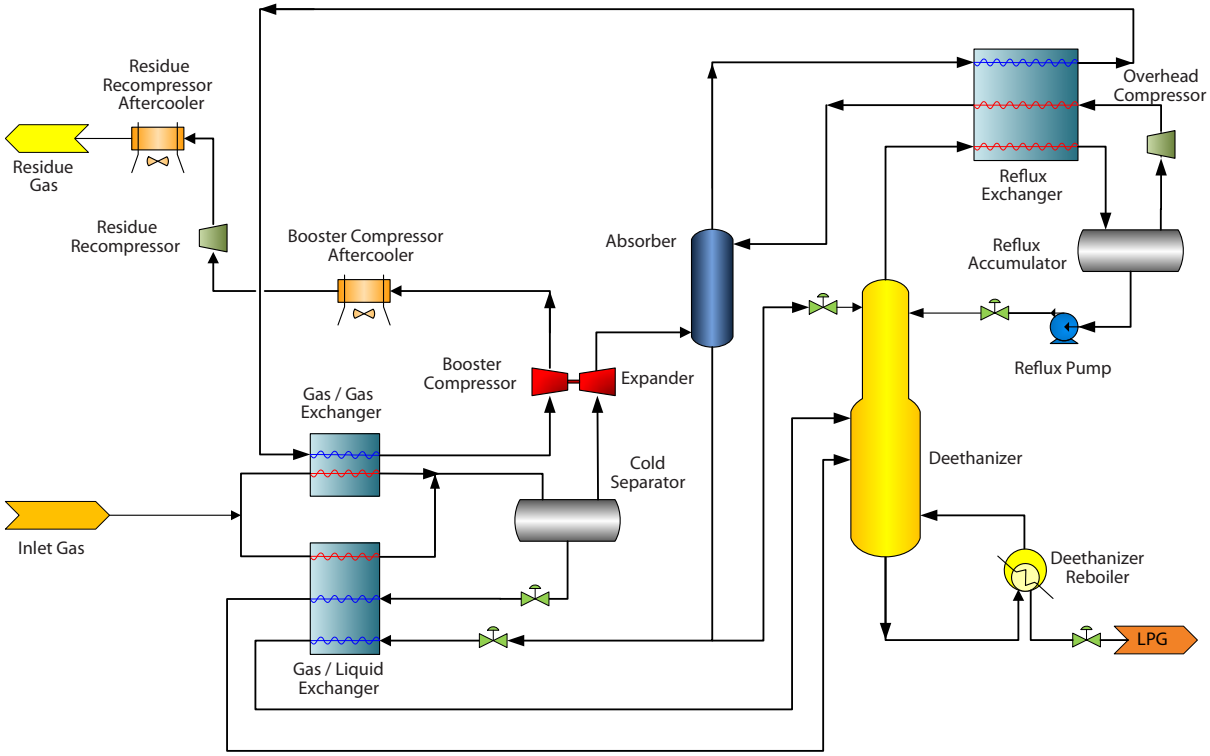
With the HPA process, the absorber pressure is decoupled from the deethanizer pressure, thus recovering LPG at the highest possible pressures while minimizing residue gas compression. The deethanizer operates at a pressure low enough to provide ethane rejection with minimal heat demand and within the practical limitations of deethanizer pressures (typically <470 psia) due to approach to critical pressure.

The HPA process is suitable for feed gases with high pressures (typically >700 psia). Operating the absorber at higher pressures results in increased tolerance to CO_2 freezing thus minimizing or eliminating the need for upstream CO_2 removal in order to achieve high LPG recoveries.

Advantages

Process Features	Process Benefits
Applicability	▪ Feed gases with high pressures (typically >700 psia) ▪ Feed gases with high CO_2 content ▪ Flexible process to maximize product recovery
Thermal Efficiency	▪ Reduced residue compression from a high pressure absorber (>500 psia) ▪ Process conditions tailored to maximize pressure at booster outlet ▪ Absorber pressure not limited by the deethanizer operating pressures
Operability	▪ Maximum efficiency turbo-expander design ▪ JT operation also available ▪ Adjustable residue reflux for optimum recovery and throughput for varying feed compositions
External Refrigeration	▪ Normally not necessary for lean gases ▪ May be needed to optimize recovery with heavier gases
CO_2 Tolerance	▪ A higher pressure absorber moves the operating point further away from the CO_2 freezing point, which results in less pre-treatment than many industry alternatives ▪ Operates further from CO_2 freeze point relative to processes with lower pressure absorbers
Constructability	▪ Easily designed for modularization

Process Flow Diagram



Process Description

This process description is of a typical HPA process.

An inlet gas stream is cooled and sent to the cold separator. In this separator, condensed hydrocarbons are knocked out, warmed and partially vaporized before going to the deethanizer column. The vapor from the top of the cold separator is expanded, and then sent to the absorber column as bottom feed.

The high pressure absorber provides the initial NGL separation. Reflux to the absorber is provided by a compressed and partially condensed deethanizer overhead stream. A second lean reflux stream (not pictured) can be taken from residue gas after compression. The absorber bottoms stream is warmed while cooling the inlet gas and then sent to the deethanizer.

The absorber overhead (residue gas) is heated in the reflux and gas/gas exchangers before entering the compressor section of the expander/booster compressor. The residue gas is then sent to the residue gas compressor, which may be needed for further compression.

The deethanizer overhead is partially condensed by exchanging heat with the absorber overhead. The two phase stream is then sent to the reflux accumulator. The liquid is pumped back into the deethanizer as reflux. The vapor stream is compressed, partially condensed by heat exchanging with absorber overhead stream, and then sent as top reflux to the absorber.

The deethanizer reboiler uses heat medium to partially vaporize the deethanizer liquid from the bottom of the deethanizer tower. The column has a temperature controller at the tower bottom to control the amount of ethane and lighter components in the column bottom product by changing the flow of heat medium to the reboiler.

The deethanizer reboiler liquid stream contains the LPG product.

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