Shell Deep Thermal Conversion and Shell Deep Thermal Gasoil

Overview

The Shell Deep Thermal Conversion process, jointly licensed by Shell and CB&I Lummus, fills the gap between visbreaking and coking. It was developed based on many years of experience with the Shell Soaker Visbreaking process. The process yields a maximum of distillates by applying deep thermal conversion to the vacuum residue feed, and vacuum flashing the cracked residue. High distillate yields are obtained while still producing a stable liquid residual product, referred to as liquid coke. The liquid coke, which is not suitable for blending to commercial fuel, is used for specialty products, gasification and/or combustion (e.g., to generate power) or hydrogen.

The Shell Deep Thermal Gasoil process is a combination of the Shell Deep Thermal Conversion and the Shell Thermal Gasoil processes. In this alternative high conversion scheme, the heavy gasoil (HGO) from the atmospheric fractionator and the vacuum gasoil (VGO) from the vacuum flasher are cracked in a distillate thermal cracking heater into lower-boiling-point gasoil.

For more than 25 years CB&I Lummus has been an authorized licensor for Shell Thermal Conversion technologies, which include Shell Deep Thermal Conversion (SDTC), Shell Deep Thermal Gasoil (SDTG), Shell Thermal Gasoil Process (STGP), Shell Soaker Visbreaking (SSVB) and Shell Vacuum Flashing (SVF). These technologies have been successfully applied worldwide. CB&I Lummus and Shell's extensive experience includes almost 100 projects and even more studies, and covers both new units and conversions of existing crude, vacuum and soaker visbreaking units into SDTC, SDTG, STGP and SSVB.

Advantages

Process Features	Process Benefits
Lower cracking temperatures and longer residence time	Selective cracking to distillate product • Less sensitive to operational and feedstock fluctuations • Better process control • Longer run-lengths and less down time
Use of soaker drum with special internals minimizes backmixing	Higher conversion for the same fuel oil stability • More distillate production • Less cutter stock usage
Smaller visbreaker heater	Lower investment cost • Less waste heat recovery equipment • Lower fuel consumption
Lower visbreaker heater pressure drop	Less power consumption
Deep Thermal Gasoil: distillate cracking heater	Maximum naphtha yield • Maximum gasoil yield

Performance Characteristics

Typical Feedstock		Typical Product		
		Product in % wt on feed	Deep Thermal Conversion	Deep Thermal Gasoil
Vacuum residue	Middle East	Gas	4.0	4.0
Viscosity, cst @ 100°C	770	Gasoline ECP 165°C	8.0	8.0
		Gasoil ECP 350°C	18.1	40.6
		Waxy distillate ECP 520°C+	22.5	–
		Residue ECP 520°C+	47.7	47.4

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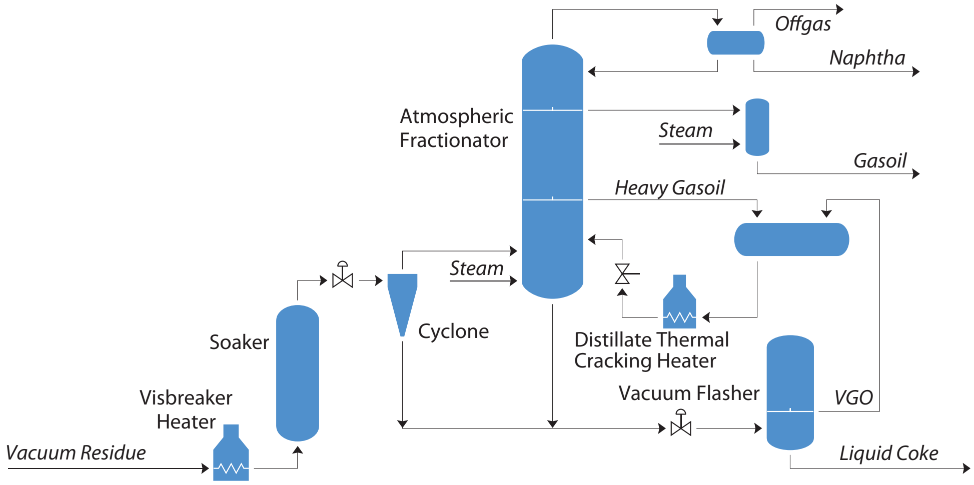
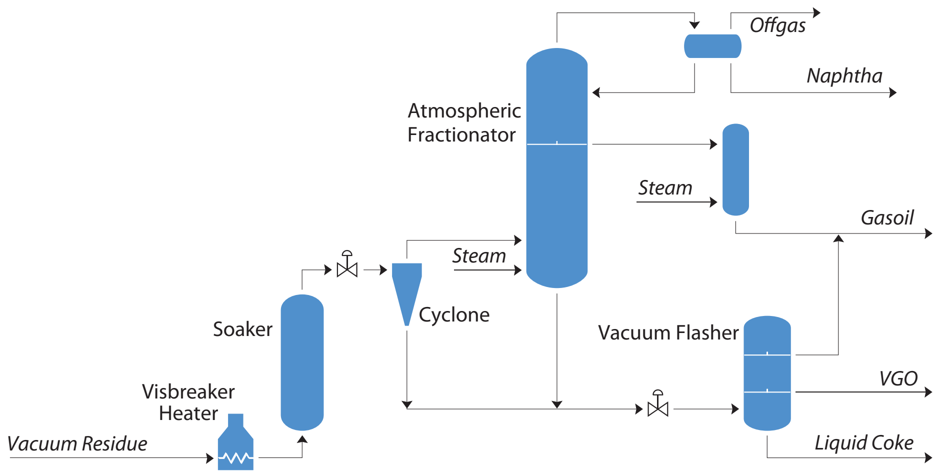
Deep Thermal Gasoil Process Flow Diagram



Deep Thermal Conversion Process Flow Diagram



Process Description

Deep Thermal Conversion: Preheated vacuum residue is charged to the visbreaker heater and from there to the soaker, where the deep conversion takes place. The conversion is maximized by controlling the operating temperature and pressure. The soaker effluent is routed to a cyclone and the cyclone overheads are charged to the flash zone of the atmospheric fractionator to produce the desired products like gas, LPG, naphtha, kero and gasoil. The fractionator bottoms are routed to a vacuum flasher, which recovers additional gasoil and vacuum gasoil (VGO). The residual liquid coke is routed for further processing depending on the end use.

Deep Thermal Gasoil: The heavy gasoil from the atmospheric fractionator and the VGO from the vacuum flasher are cracked in a distillate thermal cracking heater. The cracked distillates are routed to the fractionator.