LC-MAX®

Chevron Lummus Global

Overview

LC-MAX® permits stable operation at higher residue conversion utilizing two reliable, commercially proven LC-FINING technology and solvent deasphalting (SDA) platforms.

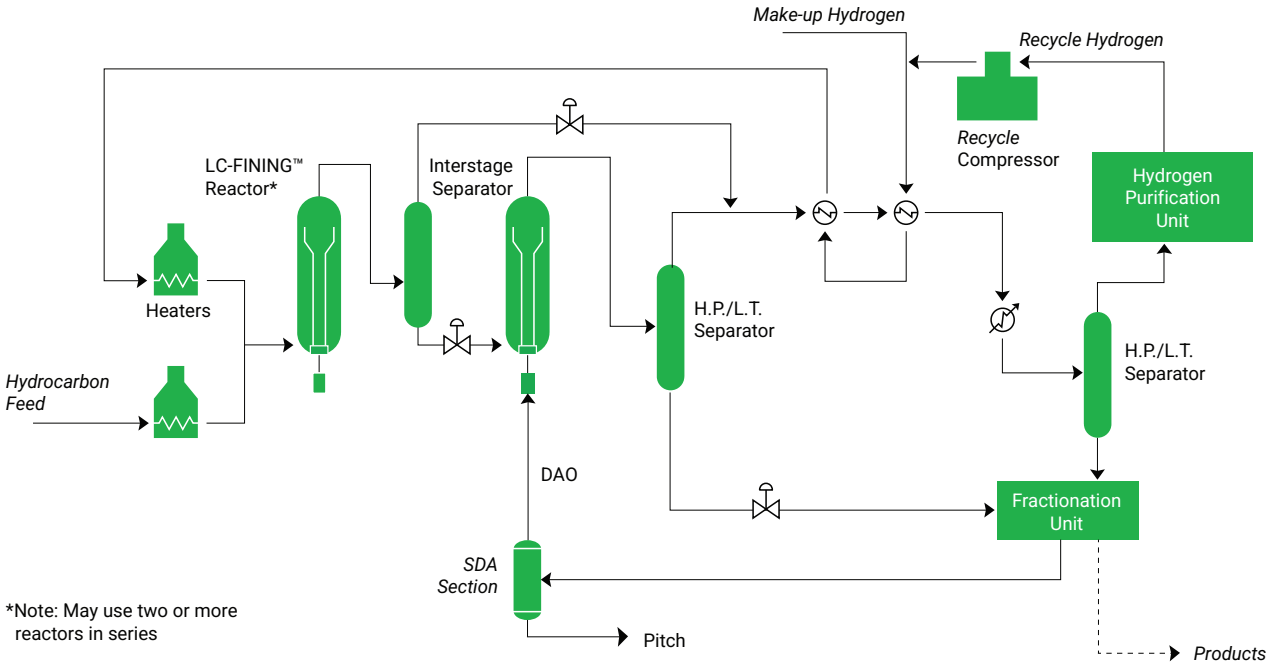
Ebullated bed hydrocracking plays a fundamental role in upgrading renewable feedstocks and in crude to chemical technologies for upgrading a wide range of feedstocks including those with low APIs and high concentration of contaminants.

Chevron Lummus Global (CLG), a joint venture between Chevron U.S.A Inc. and Lummus Technology, is a leading process licensor for hydroprocessing and residue upgrading technologies, alternative source fuels as well as a global leader in catalyst system supply.

Technical Advantages

Process Features	Process Benefits
Expanded Bed Reactor with Continuous, On-Stream Addition and Withdrawal of Catalyst	• Long periods of operation without shutdown (5+ years for some operating plants) • No feed quality limitations – handles wide range of heaviest feedstocks • Constant product quality maintained • No reactor pressure drop build-up • Maximizes kinetic effect via continuous good distribution and contacting of catalyst, H2 and oil • Operation at an optimum reactor temperature • Ability to change catalyst type while operating
Advanced Reactor Section Design	Significantly increases throughput and conversion from earlier designs
Advanced Controls Monitoring And Surveillance System	• Safe, Reliable Unit Operation • Smooth, Fast Start-Up
High Pressure Membranes	• Lower Gas Rates • Lower Investment • Lower Utility Consumption • High Reliability • Low Maintenance
High Conversion Technology	Maximizes bottoms upgrading to valuable distillates (97% + conversion of resid feed)
Variety of Improved Catalysts Available in a Competitive Market	• Demetallization Catalyst Allows Processing of Feedstocks With Highest Metals Content • Desulfurization Catalyst Allows for Production of High Quality, Low Sulfur Fuel Oil • Best Catalyst for CCR Reduction Control of Product Solids Content • Reduced Catalyst Rate

Block Flow Diagram



Process Description

Fresh vacuum or atmospheric residue feed is mixed with hydrogen (H2) and reacted in series of ebullated bed reactors at moderate-to-low temperatures within an expanded catalyst bed. Catalyst bed expansion is maintained by means of internal liquid circulation targeting isothermal operation. After product fractionation, naphtha, diesel and VGO products are recovered. The remaining unconverted oil can be sold as stable, low sulfur fuel oil or further processed such as in coker for example. A commercially proven dual-type catalyst system is utilized to favor desired reactions. Catalyst is added and withdrawn, typically on a daily basis. The majority of H2 is recovered in membrane or PSA systems, which are fully integrated into the process. The bottom of the vacuum tower—unconverted oil (UCO) from the 1st LC-FINING Stage is routed to an SDA operating at high lift. DAO product is further converted in a 2nd-stage DAO ebullated bed reactor.

Process features include on-stream catalyst addition and withdrawal, thereby eliminating the need to shut down for catalyst replacement. The expanded bed reactors operate at near isothermal conditions without the need for quenches within the reactor. Application of membranes for the reaction system pressure while maintaining low treat gas rates. Membranes optimize recycle gas recompression requirements resulting in overall unit power consumption savings while maintaining higher reliability and lower maintenance requirements than previous PSA applications.

Product stability is improved by adjusting 1st- and 2nd-stage operating conditions, allowing mitigation of downstream equipment fouling. The overall conversion that is safely achievable exceeds 92 wt%. Pitch from SDA can be pelletized, stored and burned at power plants or cement plants.

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