



RCD Unionfining™ Process

Refining

The UOP RCD Unionfining process is a fixed-bed catalytic residue hydrotreating technology that reduces the contaminants in heavy feedstocks, such as atmospheric residue, vacuum residue, and deasphalted oil (DAO).

Currently, the most common application of the RCD Unionfining process is FCC/RFCC feed pretreatment, in which approximately 90% of the sulfur and organometallics are removed. The process is also used for production of low sulfur fuel oil and partial conversion of non-distillables in the feed to distillables.

Process Description

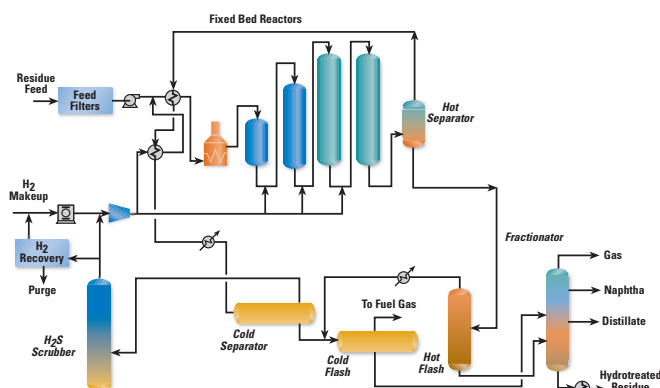
The RCD Unionfining process is a fixed-bed hydrogenation process that uses base metal catalysts to remove contaminants, such as sulfur, nitrogen, organometallics, and asphaltenes, and to increase the hydrogen content of the products.

The feedstock is first filtered before combining with hydrogen and passing through the catalyst beds at elevated temperatures and low space velocities. Because of the typical high contaminant levels, a guard bed reactor is used to control pressure drop associated with large particles and solids that may be in the residue feed. Often several reactors in series are required because of the relatively low reactivities of the feedstocks.

The reactor effluent, which contains the products, recycle gas, and by-products, is then separated into the desired products through a combination of separators, flash stages, and eventually, fractionation equipment. The hydrogen recycle gas requires scrubbing to remove H_2S . Then it is combined with makeup gas before being recycled to the reactors (Figure 1).

Good flow distribution in a trickle-bed resid hydrotreater reactor is critical to both performance and safety. Poor flow distribution can result in an uneven temperature rise in the reactor, which can ultimately lead to shorter catalyst life, hot spots, and product instability.

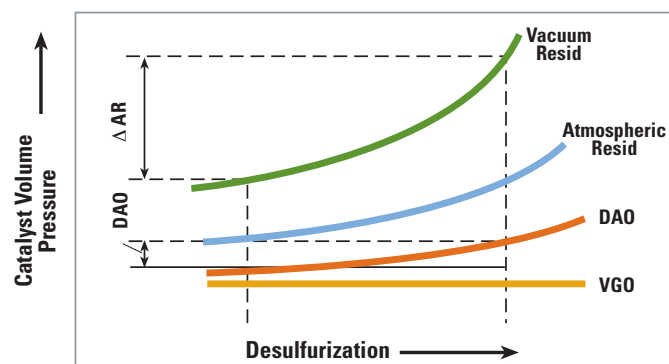
Figure 1 ■ RCD Unionfining Process



Impact of Feedstock Quality and Processing Objectives

The ease of processing a feedstock depends on the nature of the asphaltenic molecule and the distribution of contaminants throughout the resin and asphaltene fractions. Relative processing severity is dependent on feedstock type and processing objectives (Figure 2). Consequently, the process operates over a large range of operating conditions: 1,500-3,000 psi and 0.10-1.0 LHSV. Feedstocks with high contaminants, such as vacuum residues, typically have higher pressures and lower space velocities.

Figure 2 ■ Required Processing Severity vs. Feedstock Type



Catalyst Selection and Loading

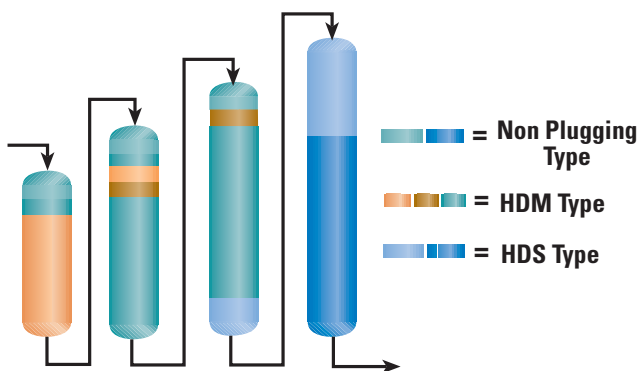
It is essential to tailor catalyst selection to processing objectives and feedstock quality. There are two major concerns:

- Pressure drop build-up across the front-end reactor
- Optimum process performance in terms of desulfurization and demetallization

Consequently, the selection of catalysts is complex in the RCD Unionfining process. Typically, several types of catalysts, which have different functions and relative activities, are utilized to meet the process objectives (Figure 3).

UOP offers a wide choice of catalysts tailored to meet the customer's precise needs. These include catalyst formulations developed by UOP and Albemarle.

Figure 3 ■ Typical Catalyst Loading



Temperature is the normal control variable. As catalyst activity declines over the cycle, temperature is adjusted to maintain catalytic activity. This increases the conversion level of residues to distillates. Some operators may allow the process performance to decline over the cycle, accepting higher product sulfur and metals content as a tradeoff to increased conversion.

Experience

RCD Unionfining technological services are available on request. UOP has designed and licensed 27 RCD Unionfining process units, ranging in size from 7,000 to 75,000 BPD.

For More Information

RCD Unionfining technological services are available on request. For more information, contact your local UOP representative or contact our Des Plaines sales office:

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