UOP
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UOP/FWUSA Solvent Deasphalting Process

Refining

Solvent deasphalting is a unique separation process in which residue is separated by molecular weight (density), instead of by boiling point, as in the vacuum distillation process. The UOP/FWUSA Solvent Deasphalting process produces a low-contaminant deasphalted oil (DAO) rich in paraffinic type molecules. These fractions can then be further processed in conventional conversion units such as an FCC unit or hydrocracking unit.

The pitch product contains the majority of the residue's contaminants (metals, asphaltenes, Conradson carbon) and is rich in aromatic compounds and asphaltenes.

A three-product unit, in which a resin stream, intermediate between DAO, and pitch, can be recovered, is also available. This design allows for a range of bitumens to be manufactured from various resin/pitch blends.

Process description

The feed is mixed with a light paraffinic solvent, typically butane, where the deasphalted oil is solubilized in the solvent. The insoluble pitch will precipitate out of the mixed solution. (Figure 1)

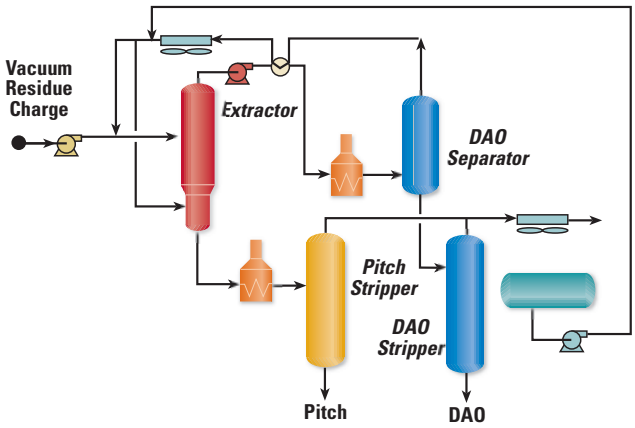
Separation of the DAO phase (solvent-DAO mixture) and the pitch phase occurs in the extractor. The extractor is designed to efficiently separate the two phases and minimize contaminant entrainment in the DAO phase.

The DAO phase is then heated to conditions where the solvent becomes supercritical. Under these conditions, the separation of the solvent and DAO is relatively easy. This occurs in the DAO separator.

The DAO from the DAO separator and the pitch phase contain solvent. The entrained solvent is then stripped out at low pressure and the DAO and pitch are sent to the battery limits.

The solvent recovered under low-pressure from the pitch and DAO strippers is condensed and combined with the solvent recovered under high pressure from the DAO separator. The solvent is then recycled back to be mixed with the feed.

Figure 1 ■ **UOP/FWUSA Solvent Deasphalting Process**



Feedstock

Normal feedstock is vacuum residue. Usually, vacuum distillation is a more economic method to recover VGO and, therefore, it is common to maximize VGO end point before sending vacuum residue to the UOP/FWUSA SDA unit. There are situations where atmospheric residue is more cost-effectively processed directly in the UOP/FWUSA SDA unit.

Process variables

The proper operation of the UOP/FWUSA SDA process is affected by several variables:

- **Yields versus product quality**

  Increasing DAO yield increases contaminants in the DAO.

- **Solvent selection**

  As the solvent gets heavier, the yield of DAO increases, but quality declines. This trade-off between yield and quality is important when DAO is processed in a conversion unit. Solvent changes are usually not considered a day-to-day operating variable.

- **Extraction temperature**

  Extraction temperature is the usual control variable. At a constant solvent composition and pressure, a lower extractor temperature increases the DAO yield and decreases the quality. An increase in the extraction temperature reduces the solubility of the heavier feedstock components.

  The critical temperature of the solvent limits the maximum extraction temperature, since at the critical temperature, no portion of the feedstock would be soluble in the solvent and no separation would occur. For this reason, the extractor temperature must be maintained below the solvent's critical temperature.

- **Extraction pressure**

  The extractor's operating pressure is determined by the solvent and the need to ensure the solvent/residue mixture is maintained in the liquid state.

- **Solvent/Oil ratio**

  Increasing the amount of solvent in the extractor, at constant DAO yield, improves the degree of separation of the individual components and results in the recovery of a higher quality DAO.

  However, since the quantity of solvent recirculated within the unit is significantly greater than the amount of feed processed, any improvement in product quality from an increased solvent re-circulation rate must be balanced against:

  - Additional operating costs associated with the increased solvent re-circulation and solvent recovery requirements
  - Increased capital costs associated with the larger equipment sizes

- **Extraction technology**

  Solvent-to-oil ratio can be reduced with the use of specialized extractor internals. UOP has several options, depending on the application.

Experience

UOP has designed 13 UOP/FWUSA SDA units, ranging in size from 7,000 to 35,000 BPD. In addition, UOP's partner in solvent deasphalting, Foster Wheeler USA Corporation, has designed 40 units.

For more information

UOP/FWUSA Solvent Deasphalting 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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