



Process Notes

Crude units can be designed for reliability.

Maximize Reliability in Grassroots Crude Units

Crude unit operators are far too familiar with a long list of crude unit reliability problems including fouling in heat exchangers and fired heaters, poor desalting, corrosion of piping and equipment, and coking in the vacuum column wash zone. Many millions of dollars have been spent fighting these problems, yet they continue to force unplanned shutdowns with depressing regularity.

Revamps must address reliability issues, but project scope is hindered by the limitations of existing equipment. Grassroots design of crude and vacuum units presents an opportunity to get everything right the first time. Here are a few tips for designing a reliable and profitable crude/vacuum unit.

HEAT EXCHANGER AND HEATER FOULING

High velocities in heat exchanger tubes produce high shear at the walls, preventing foulants from accumulating. High shell-side velocities, coupled with exchanger designs that minimize dead zones in the flow, eliminate shell-side fouling. In fired heaters, high mass fluxes maximize wall shear, shorten residence time, and lower wall film temperatures, all of which reduce coking. Furthermore, reliable heaters must have correctly sized burners with proper burner-to-burner and burner-to-tube spacing.

DESALTING

Desalter size is highly dependent on crude blend due to dramatic variation in required centerline velocity. A unit must be designed with the flexibility to carefully control desalter temperature, which can range from 110°C to 150°C, by shifting heat from upstream to downstream of the desalters. Vendors are often judged on cost alone, which results in minimum sizing for the design crudes and rates. Carefully consider whether long-term crude trends will soon render these desalters inadequate.

CORROSION

In grassroots design, be realistic about metallurgy. Because modern refineries do not run a steady diet of the same crude, consider the sulfur and TAN numbers of potential crudes outside the unit's design blend. Chronic corrosion issues, or the inability to process high-margin opportunity crudes, will quickly overshadow the initial savings from choosing too low of a metallurgy.

VACUUM COLUMN WASH ZONE COKING

Wash zones are not for fractionation, they are for de-entrainment! Pursuing fractionation efficiency by specifying a deep bed with small crimp packing is a recipe for rapid coking. The correct choice of packing combined with the right wash rate and good distribution will properly de-entrain while preventing coke formation.



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