

**REFLUX****18-20 October 2019**

### **SENIOR INDUSTRY DEFINED PROBLEM**

Diesel hydro-treater unit process object is to remove sulphur from diesel so as to honour BS VI specification of maximum 10 ppmw sulphur levels. The unit's reactor is operated at 340°C-360°C at a pressure of 70g bar. The unit is tightly heat integrated for maximum energy efficiency and accordingly choice of hot & cold streams have been determined. Combined Feed Exchanger (CFE) is one such key shell and tube heat exchanger wherein shell side reactor effluent diesel at around 360°C & 68 barg pressure exchanges heat with cold reactor feed diesel at around 205° & 75 barg pressure.

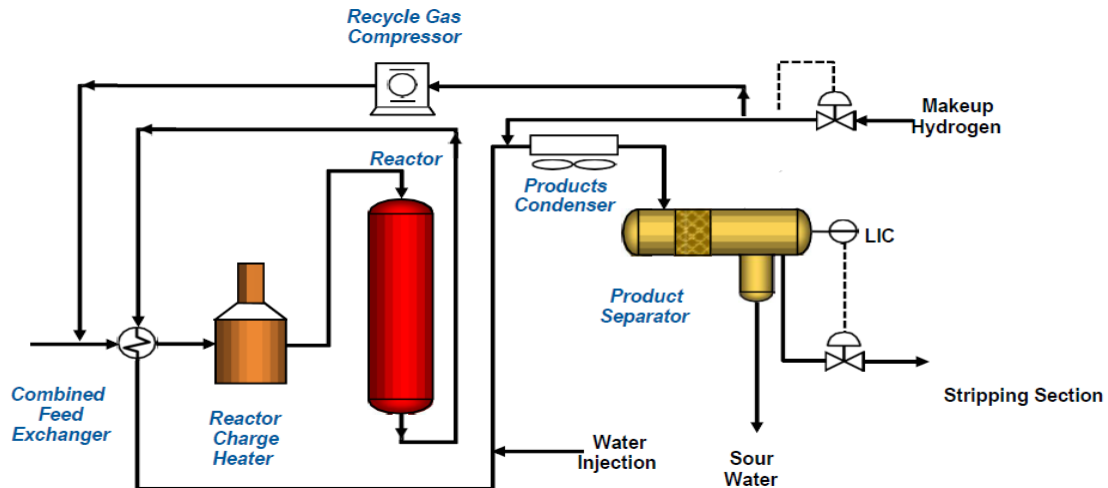
The heat exchanger is prone to ammonium chloride corrosion due to inevitable presence of chlorides in the feed and eventual leakage. Any small amount of leak in this exchanger causes high pressure, high sulphur (10,000 –1,00,000 ppmw sulphur) feed diesel to mix and contaminate low pressure ultra-low sulphur (7 ppmw sulphur) product thereby jeopardising BS VI grade diesel production.

By design, the exchanger has best protective measures such as Inconel alloy metallurgy, welded exchanger cover, double tube sheet etc. despite which there are occurrences of leak and product getting contaminated with high sulphur diesel. The figure below depicts the overall process flow:



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With this background, the problem is defined as follows:

Develop a process design concept for heat exchange between high pressure, high sulphur feed diesel and low pressure, ultra-low sulphur product diesel which is not prone to product contamination even if there is leakage. Shell and tube type of heat exchangers are only to be considered.

Ease of design, operation, maintenance and retrofitting in an already operating plant to be factored in the design concept. The proposed design shall not compromise on process safety and shall be free from any hazard.