
Question 79: Backwash containing catalyst fines collected by main column bottoms hydrocyclones, filters or electrostatic precipitators are normally routed back to the FCC reactor riser. In your experience, how does the recycle of catalyst fines in main column bottoms impact particulate emissions from the FCCU?

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The distribution of pumparound duties in the Main Fractionator dictates the amount of LCO recovery from the bottom's product. The primary handle to adjust LCO production is the pumparound duty below the LCO section (slurry pumparound or slurry and HCO pumparounds in towers with an HCO section), not the LCO pumparound. When the pumparound duty below the LCO section is reduced, more LCO-ranged material travels up the column, which will increase the LCO section temperature. The LCO product rate and endpoint will both increase.

Often increasing tower traffic by reducing the lower pumparounds may create hydraulic restrictions further up in the column. The refiner may observe high tower pressure drops or a lack of appropriate separation response to a duty adjustment that may indicate flooding in a Main Fractionator with insufficient capacity to handle the increased traffic. The column internals should then be evaluated for replacement with high-capacity tray designs or packing.

Often the management of LCO recovery competes with FCC feed preheat targets due to the slurry pumparound exchanging heat with the incoming gas oil feed. The preheat temperature impacts FCC reactor heat balance and yields and is typically a less flexible target than LCO recovery. For units without an HCO pumparound, there is then very limited ability to control LCO recovery. The refiner may consider the addition of a fired feed preheater to create more flexibility in the system and to decouple the feed preheat objective from LCO endpoint control.

Another problem encountered while trying to maximize LCO recovery is coking above the slurry pumparound. Large reductions in slurry pumparound duty without a corresponding increase in HCO pumparound duty can result in high temperatures in the section immediately above the slurry pumparound return. Additionally, should the refiner choose to adjust the duty by manipulating the pumparound flow, a minimum flow rate can be reached on the return distributor. Poor distribution increases the risk of coking in the slurry packing, which can then force high vapor rates and poor vapor distribution from the remaining unrestricted portion of the bed, resulting in entrainment of high endpoint material into the HCO section.

A similar consequence can actually be observed when the slurry pumparound duty is increased too much. Sufficient distillate must be allowed to travel up out of the slurry section to condense and wash back down keeping the lowest tray or zone of packing fully wetted. This area in the tower can also be subject to coking should that amount of distillate be too low.

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2010