
Question 92: What criteria do you use to determine end of run (EOR) catalyst life for a CCR? How many regeneration cycles have you achieved between catalyst replacements?

Willie Morrisette/Joe Zmich (UOP LLC)

There are a number of considerations in determining the End of Run for a catalyst cycle in CCR operations. Refinery economics are typically the ultimate factor used for determining when to replace CCR Reforming catalysts. The useful life of a CCR catalyst is impacted by the operation of the unit and is a function of the ability to maintain the proper metal and acid function of the catalyst as well as the condition of the catalyst base. UOP's CCR PlatformingTM catalyst can achieve very long life because UOP reactor and regenerator operate at optimum conditions. A number of Platforming Unit operations have achieved in excess of 800 regeneration cycles prior to making a catalyst change out. Key considerations for catalyst change out can include one or more of the following:

1. An inability for the catalyst to achieve optimal platinum dispersion through regeneration.
2. An increase in chloride injection requirements during regeneration resulting from a reduction in regenerated catalyst surface area as compared to fresh catalyst and leading to increased chloride loss in the reforming reactor section during normal operation.
3. An increase in catalyst fines production due to irreversible phase damage to the catalyst base resulting in decreased catalyst surface area, increased catalyst attrition, loss in catalyst activity, and fines-induced process equipment plugging problems.
4. A loss of catalytic metal and acid function of the catalyst due to accumulation of poisons such as metals on the catalyst eventually resulting in loss of catalyst activity, selectivity, or regenerability.
5. A loss of catalyst activity resulting in operations approaching the equipment or unit design constraints.
6. An advancement in catalyst technology resulting in sufficient economic benefit to replacing the catalyst before it otherwise reaches the end of its life.
7. A scheduled unit operating shut down providing a convenient opportunity for catalyst change out.

Javier Quintana (Valero Energy)

The EOR criterion for catalyst change out in a CCR is an economic optimization considering a number of factors, including:

- Ability to meet process objectives (rate, octane)
- Chloride consumption and treating costs

–Phase change content of catalyst inventory

–Level of accumulated contaminants (Fe, Si, etc)

–Ability to disperse platinum (activity, yield)

Valero's expectation for ultimate life of CCR catalysts is in excess of 600 cycles for early generation CCR units, and in excess of 700 cycles for recent generation units. Not all units reach these targets, but any such shortfall is normally directly attributable to operating issues that lead to the anomalies indicated in the list of factors above.

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