

The Experience of a Team of Experts to Resolve Severe Regenerator Maldistribution

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A US gulf coast refiner experienced severe maldistribution in their FCC regenerator and intermittent catalyst losses, primarily due to design issues. Several attempts have been made to lessen the impact of this maldistribution on afterburn, CO and NO_x emissions through the years. To date, the impact of these modifications have had limited impact on improving operations. A recent modification to the cyclones had increased the NO_x in the flue gas to non-sustainable, long term levels.

Recently, a team of experts was gathered which include two FCC independent consultants, a cyclone vendor and CPFD Software together with refinery engineers to evaluate six potential modifications to the combustion air distributor, primary and secondary dipleg trickle valve orientations and secondary dipleg heights in an attempt to reduce maldistribution in the regenerator and minimize intermittent catalyst loss events. This team gathered together to evaluate each of these modifications in detail in advance of a recent shutdown.

This paper summarizes the maldistribution observed within the regenerator, describes the potential modifications to regenerator internals, describes the solutions chosen and finally reports on the operation of the regenerator after startup. Preliminary regenerator operation following startup has demonstrated better CO while running at lower excess O₂ and significantly reduced promotor usage. CO and NO_x in the flue gas have been reduced by 31% and 21%, respectively, and excess O₂ has been decreased from 2.1 to 1.5 vol%.

Guidelines are offered to other refineries facing similar issues with their regenerators. A set of recommendations for the optimal use of outside resources available to refiners will be discussed.

