

FCC EXPANDER FLOW PATH EROSION

By David Linden

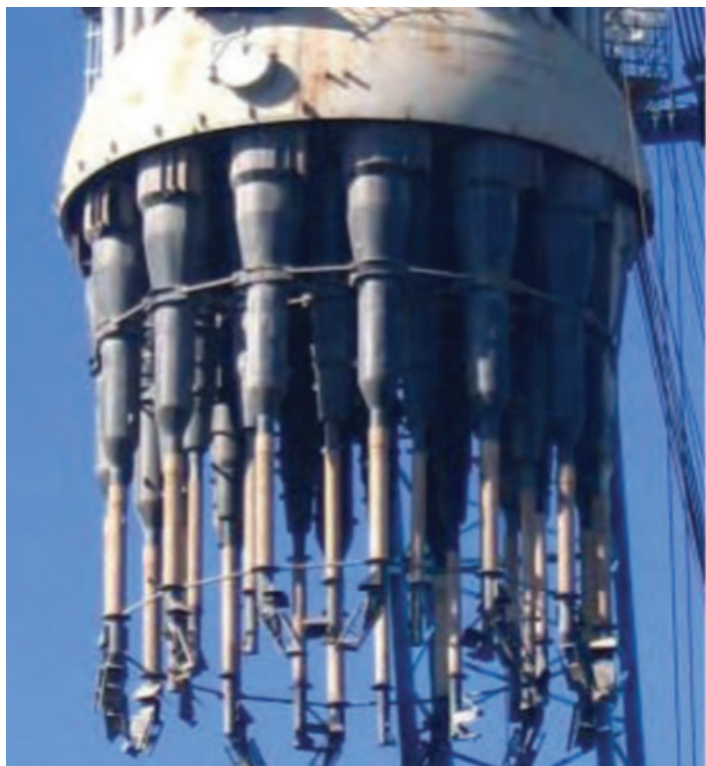


Figure 1: FCC Regenerator Cyclones

The root cause of expander flow path erosion and deposition is catalyst carry over from the FCC regenerator. FCC catalyst is an alumina-silica based powder that aids in cracking heavy oil molecules into the more commercially desirable lighter end products such as gasoline, heating oil, jet fuel, etc.

FCC regenerators are constructed with cyclone separators to separate and collect as much of the process catalyst as possible and return it to the FCC cycle for reuse. Despite these particle separators being more than 98% efficient, typical catalyst carryover to the downstream power recovery system can be in excess of 400 ppm. For a 90 KBPD FCCU, this can translate into more than 300 lbs/hr of catalyst being lost and potentially carried over to the PR Expander and/or the atmosphere.

Catalyst particles carried over from the regenerator can range from sub micron to over 80 microns in size, with an average particle size of approximately 40 microns. The alumina-silica (sand) catalyst particles are very erosive when carried over in the process flue gas.

During the initial application of power recovery expanders, the flue gas was sent directly to the expander with the full catalyst carryover. The operating experience was not good and expander blades were being worn out in as short as three months of operation. This operating experience highlighted the need for additional particle separation capabilities and hence the third stage separator (TSS) was developed.

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