Question 81: What is your inspection Best Practices for third-stage separator (TSS) systems throughout a scheduled turnaround? What types of issues or equipment damage should be would you proactively anticipate in order to mitigate potential turnaround delays?

BOUGRAT (Honeywell UOP)

For TSS systems, it becomes important to start by monitoring the operating conditions and process velocities throughout long-term operation to help anticipate the extent of erosion and internal wear of the equipment. Some refiners track velocity hours for the individual cyclones or barrels while others simply track onstream time to help predict when some of the equipment may ultimately fail. But overall, the system should be treated fairly similar to reactor-regenerator cyclones. Make sure you are optimizing the operation, staying within the velocity guidelines and helping mitigate any carryover from your upstream cyclones to the TSS. The TSS may be able to handle increased losses from the regenerator, but long-term operation under these conditions will inevitably lead to increased erosion of the internal components.

With regard to internal inspections, it becomes important to visually inspect all of the barrels and internal equipment on an individual basis. These inspections should include any blanked-off or spare equipment as well. For example, any spare equipment or blanked-off cyclones that serve as future contingency options should be inspected for adequate weld reliability and isolation quality to ensure that they will be properly preserved until needed. In general, any internal equipment or component that is immediately exposed to the incoming flow of flue gas and entrained catalyst fines will be the most prone to erosion. Therefore, sufficient spares should be provided for these components, which can be accomplished through a mix of warehouse and in situ (blanked-off) spares. If the internal components such as cyclones or barrels are large in number, UOP recommends sparing at least 10% of the total inventory.

To summarize, the long-term maintenance plan for TSS systems should include comprehensive monitoring of the process conditions and velocities, leveraged by historical field inspections, to help monitor the conditions of the internal equipment and help predict the necessary maintenance activities throughout subsequent unit outages.

PUI-NANGLIN (Flint Hills Resources)

Does anyone do a pressure test on their cyclones during turnarounds? How do you ensure the integrity of the cyclones during final inspections to confirm that they are pressure-tight or not?

BOB LUDOLPH [Shell Global Solutions (US) Inc.]

My experience relates only to regenerator cyclones when we were trying to track down a catalyst loss. At the time, we went into theunit and saw nothingthat could explain the problem. We restarted the unit; and again, there was a catalyst loss. We shut down and re-entered the regenerator with the plan to

pressure-test the cyclones. To test the cyclones,you need to install a bladder in the cyclone dipleg,along with blank-offs on the cyclone outlet and inlet,with the means to add pressurizing air and pressure reading gauges.

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