Question 50: How do you monitor the integrity of internals, and how do you determine when to replace reforming unit reactor center screens? What is the typical life of the center screens, and when are repairs considered excessive?

DUBIN (Axens North America)

Typically, we have seen internals last between 15 and 20 years, if not longer. At any point, it becomes a value judgment between the number of repairs you have made, if any, and the potential outcome if the internals do fail. You can consider patching and patching and patching until major damage occurs, or you can take a more proactive approach and say, “We anticipate something happening in the not-too-distant future, so how critical is it for the reformer to stay up within the refinery?” We recommend replacing the internals at the first major turnaround after the 15-year mark as an ideal time. Ultimately, it is a site-dependent issue based on the quality of the inspection program, how often you have investigated the condition of your internals, what repairs you have had to make, and whether you have had any unusual events on your unit. Additional thermal cycling of the reactors (or in the case of a moving-bed unit, the regenerator) beyond the standard operating ranges should be included in the need for internals replacement.

KOONTZ (HollyFrontier)

HollyFrontier does not really have a set proactive plan to replace center screens at a normal interval. Of course, they are inspected during the outages. Typically, the screens have been repaired as needed. We have not experienced any significant problems with our CCRs in our recent history. The two CCRs we have been fairly new, less than 10 years old, so they have not had any major repairs yet.

JOE ZMICH (UOP, A Honeywell Company)

In general, from a CCR Platforming unit licensor perspective, we see that the industry is shooting for around a five-year turnaround cycle. Each five years, you should consider a shutdown so you can do a thorough inspection of the reactor center pipes and on the regenerator side as well. On the center pipes in a CCR Platforming unit, there is no standard time frame. People have gone as long as 10, 20, or 25 years with little to no damage on center pipes, while others have gone 10 years and had significant damage. Some of these issues have to do with the geometry and design of the reactors rather than the thermocycling history of the reactor and whether there has been emergency shutdown. These are the factors to consider regarding the need to change out the internals of the reactor section.

DUBIN (Axens North America)

Axens recommends replacing the reformer internals at the first reasonable opportunity after the internals have been in services for 15 years. This does not mean the refiner should bring the unit down at the 15-year mark to replace internals; rather, plan on replacing the internals at the next major turnaround after the 15 years of service for the internals.

Due the thermal stresses seen by reactors, and regenerator for the continuously regenerated designs, the V wire eventually will become more and more brittle, allowing for a potential failure. Any site-specific issues such as bringing the unit down often for other reasons,
loss of power, etc., causing the V wire to cool down and heat back up will only further stress
the materials.

The drive to replace the internals becomes an overall economic comparison between the chances that the internals fail, the failure severity, and the impact on the rest of the refinery if the reformer must be shut down for an internal-related problem. A major key to preventing unplanned shutdowns, and one that the licensor often cannot help with, is each refiner's inspection program. A thorough review of the internals at each opportunity will give the best overall picture for the quality and viability of each site-specific set of internals.

KOONTZ (HollyFrontier Corporation)

HollyFrontier operates five semi-regeneration reformers and two CCRs. The screens are carefully inspected during turnaround (about every five years). Historically the center pipe screens have required only minor repairs and are not on a regular interval for replacement. If significant damage was found during an inspection a decision would be made as to whether it makes more sense to repair or replace. The current screens have been in service for decades and
there are no plans to replace them. The CCRs are fairly new (less than 10 years) and have not required center screen replacement.

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