

Thermocouple Upgrading: Investing in your Regenerator

As a refiner, evaluating how to prioritize investments within the CCR Platforming Unit's regenerator vessel can be overwhelming and at times, misguided. Too often, critical safeguards such as the Temperature Monitoring & Control (TM&C) hardware are overlooked as an area where significant advances in system performance can be realized and they are left for replacement-in-kind or are ignored completely. Before this lost opportunity occurs, it is important to recognize the importance of the TM&C hardware, its effect on the primary internal components, and the best way to ensure those components work in concert to achieve optimum results.

Identifying the Critical Areas

BURN ZONE

PRIMARY BURN – This is the section of the Burn Zone where much of the exterior surface coking is burned off (much like when you light a pile of charcoals on fire, the outer surface burns fast). This section is very important to monitor where the BURN PEAK TEMPERATURE falls. It is important to identify this "level" as not too high and not too low in the overall burn zone. For operational purposes it is essential to evaluate the temperature above any burn, at initial burn, at the Burn Peak Temp, below the peak, and at the point that the temperature flattens or plateaus.

BURNING TOO HIGH an elevation (above the screen perforations) will cause the screen to overheat and potentially melt or cause a reduction in overall integrity. As the coke burns off the catalyst pill, extremely high temperature gases are produced. When the Peak Burn happens above these screen perforations, the high temperature gases will collect and eventually have to travel down (against the reformer's air flow) to reach the perforations and exit the vessel. This undesired phenomena causes a buildup of high temperature gases that will damage the screen, and over time is what necessitates that the screen be replaced. If such an occurrence is not controlled closely, pre-mature repairs and replacement will be required.

BURNING TOO LOW an elevation is identified as the burn taking longer than optimum to burn off the exterior catalyst. This is also a precursor to a slower Diffusion Limited Burn which will ultimately drop catalyst into the transition zone with coke still on the pill. If this takes place, the transition zone's oxygen content will create a highly accelerated burn that will potentially melt the catalyst pill, causing many pills to clump together at an extremely high temperature. This 'clump' can again overheat the screen & hardware and result in a degradation of integrity. Clumping can also lead to clogging the regenerator at the exit of the Chlorination Zone.

DIFFUSION LIMITED BURN – After the primary burn releases most of the coke from the exterior surface of the catalyst pill, coke still remains in the many crevices of the pill. The Diffusion Limited Burn area is longer than the primary burn area as diffusion limited burn takes longer. The oxygen levels should be the same as in the primary burn area so as to not overheat the pill. Failure to achieve a proper burn in this area can negatively promote catalyst melt at later elevations.

TRANSITION ZONE & CHLORINATION ZONE

In these zones the oxygen content is brought to much higher levels. It is very important that all coke has been burned off by this point.

Investing in the Best Solution

TEMPERATURE SENSOR POINT DENSITY

As can be seen, finding the burn-zone 'sweet spot' is a very important component in the long-term health of the internal hardware of the regenerator. Increasing the number and density of the temperature sensors will provide a more complete profile of the regenerator's operation which will allow for increased efficiency as well as enhanced reliability. Daily Thermetrics' patented **CatTracker® Catalyst Tracking System**, chosen by UOP as the mandatory TM&C system for all new UOP CCR Platforming Regenerators, is capable of positioning more temperature sensors within the regenerator than any other TM&C system available, providing a more complete picture of the overall vessel performance.

PRECISION TEMPERATURE MANAGEMENT

Increasing sensor quantity is of little use if the precision of the entire system cannot be relied upon to provide an accurate representation of the operating temperatures. The CatTracker® System employs **Ultra High Precision™ technology**, a proprietary technology that offers the most precise, repeatable quality of data available. Every CatTracker® Temperature Sensor is engineered and manufactured such that the **temperature readings are within 1°C (at 427°C)** from highest to lowest temperature reading per reactor. It is this **Ultra High Precision™** technology that engenders confidence when every decision impacts the bottom line.

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