

Strategies for Fouling Abatement

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There is increasing awareness in the industry that refiners can substantially improve the profitability of their hydroprocessing reactors by installing the latest-generation reactor internals.

However, the importance of taking steps to prevent foulants from reaching those trays and internals is often underappreciated: fouling can reduce their performance. Moreover, most refineries are seeing higher levels of fouling because of the trend towards processing increasingly difficult feeds.

Fouling of catalyst beds causes pressure drop increases that limit the performance of many hydroprocessing units. The resultant issues can include short run lengths, unplanned downtime, unused catalyst activity, increased maintenance and lost revenue.

The fouling challenge is complex and depends on the type of feed, the upstream processing and the unit operating conditions. So, in this presentation, we will explain how to identify the root causes of fouling and develop solutions to prevent it from limiting performance. Shell Global Solutions has developed a three-tiered approach to fouling abatement that can help unit technologists to identify the root cause, select the right strategy for its abatement, outside and inside the reactor, and develop solutions.

In Tier 1, we determine the cause and location of the fouling problem. This involves performing a detailed investigation of past operations and feed handling; using proven reactor sampling techniques; and determining the foulant's source through sample analysis.

Tier 2 involves devising an improved fouling abatement strategy. Top-bed grading is key here, but, for maximum effectiveness, the size and shape of the bed-grading materials should be tailored to the specific unit.

In Tier 3, we evaluate the results and refine the solution. This may involve evaluating different grading schemes; installing latest-generation reactor internals, as this can sometimes be a more economical way to address specific foulant sources; and applying feed filters.

By following Shell's three-tiered approach to fouling abatement, refiners may be able to benefit from: enhanced cycle lengths; improved plant reliability; shorter catalyst unloading times; and quicker cleaning.

We will include real case studies that show how operators have prevented fouling from constraining their unit's performance by following this methodology. One US refiner increased the days on-stream of its catalytic feed hydrotreater by more than 300%, while another increased the cycle length of a gas oil hydrotreater from 12 to over 30 months.

This presentation will show practicing engineers the steps they can take to understand the origin and characteristics of fouling, which is essential for tackling the problem. With fouling problems resolved, they can focus on capturing maximum value from their unit.