

UOP HYDROPROCESSING SOLUTIONS

Improved Catalyst Performance with UOP Reactor Internals

Case Study





Hydroprocessing reactor internals (HRI) play an important role in the effective utilization of catalyst volume. This becomes even more important given tightening product specifications, the use of complex and more difficult feedstocks and the need for flexible operations to switch from diesel and gasoline production as demand changes. Any reduction in the turnaround time for HRI maintenance can significantly impact a refiner's profitability.

Recent Advancements

UOP has been at the forefront of HRI technology, and has introduced various advancements based on its operating experience and the known challenges facing refiners today. UOP's proprietary reactor internals have been used in more than 400 commercial hydroprocessing units worldwide. This latest generation reactor internals design was made possible through the use of sophisticated mathematical and computer modeling equipment, as well as cold flow testing at UOP's state-of-the-art eight-foot test column.

Features and Benefits

Benefits of UOP HRI equipment include:

- Efficient catalyst utilization with improved radial distribution
- Maximum catalyst volume with reduced quench zone heights
- Reduced downtime during turnaround with the ease of installation and maintenance
- Improved reliability due to lower susceptibility to temperature excursion with the improved distribution
- Large flow rangeability (typically exceeds 12:1), offering flexibility for varying modes of operation
- Distributors occupy a smaller fraction of the total distribution tray, offering improved ease of access for installation and cleaning
- Distributors are resistant to fouling due to large flow openings

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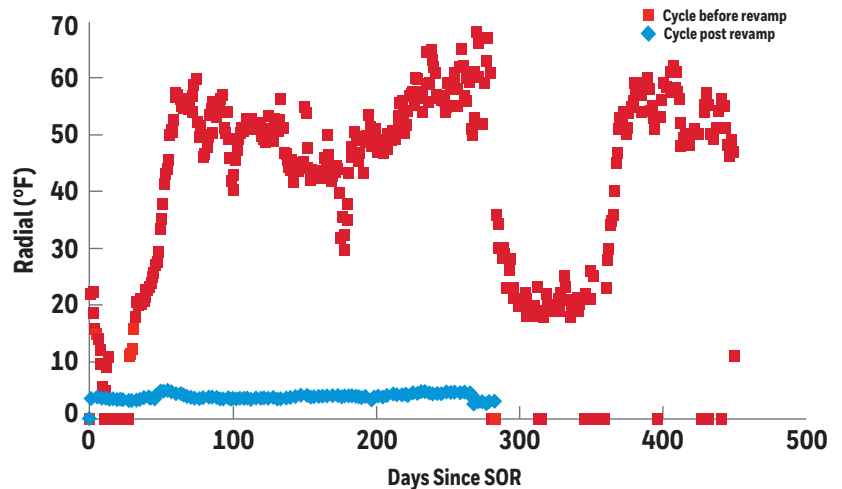
- Robust performance even during out-of-level situations (i.e. all distributors on the tray pass almost identical liquid flow rates regardless of level differences of the tray)
- Distributors provide 100% liquid coverage on top of the catalyst bed due to innovative spray devices at the bottom of the vapor liquid distribution tray resulting in the effective utilization of the entire catalyst system

Success Stories

North American Refiner

A North American refiner installed UOP hydroprocessing reactor internals in late 2014 as a part of a major hydrocracker revamp that enabled processing of deasphalted oil (DAO) in addition to vacuum gas oil. The unit has flexible thermometry with good thermal coverage at the top and bottom of the beds to provide complete understanding of the HRI performance. Figure 1 shows that radial distribution has been reduced significantly after the reactor internals were replaced.

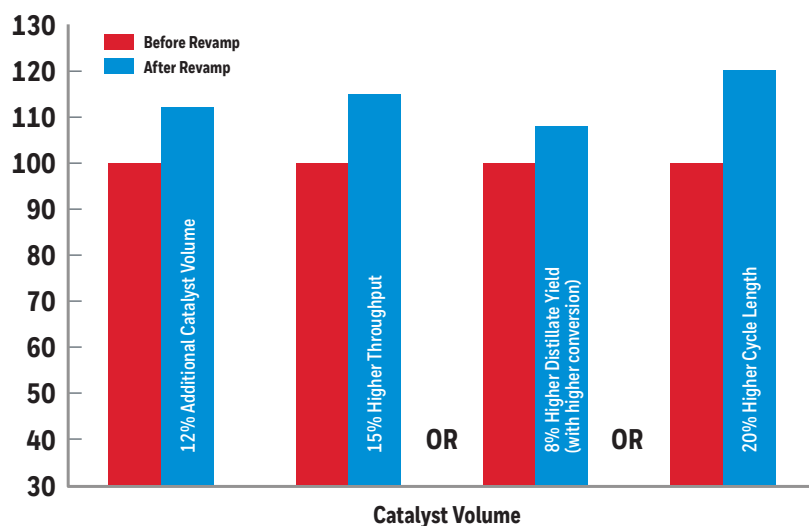
Figure 1 – Bottom of Bed Radial Spreads



Economic Benefits

The primary driver for replacing reactor internals is mainly economic, with the benefits normally being related to cycle length, capacity or conversion. For one refiner, UOP evaluated the economic benefits of replacing their existing reactor internals with UOP hydroprocessing reactor internals and concluded that the refiner could increase throughput by up to 15% or conversion by up to 10%, while retaining the existing cycle length. This higher throughput and the flexibility to increase conversion improved the refiner's profitability significantly.

Figure 2 – Existing vs Reload/revamp System



Improved Catalyst Life

Good radial distribution is essential for maximizing catalyst cycle length. UOP's hydroprocessing reactor internals have been successfully used by refiners to meet this challenge when processing a variety of feedstocks. To further investigate how UOP's HRI can improve your operations, please contact your UOP representative.



For more information

For more information please contact your UOP representative or visit us online at www.uop.com.

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