

## Improving FCC Pretreater Performance Reduces Clean Fuels Investments

By Vito Bavaro, Criterion Catalysts & Technologies

New, drop-in FCC Pretreater technologies enable a U.S. refiner to avoid FCC gasoline post treat investment, saving \$60 million. Another refiner uses drop-in FCC Pretreater upgrades to reduce Ultra Low Sulfur Diesel (ULSD) investment by 20% and save \$20 million.

These two project outcomes occurred during the past year. Each demonstrates the importance of evaluating the potential of all hydrotreating assets when developing a plan for producing Tier 2 gasoline and ULSD.

Approximately 50% of U.S. refineries have FCC pretreatment units that are used to control FCC sulfur dioxide emissions and gasoline sulfur concentrations and to improve FCC gasoline and LPG production. Many refiners have discovered these units can play an even more valuable role in meeting future Tier 2 gasoline and ULSD regulations. Criterion Catalysts and Technologies and Shell Global Solutions offer "Drop-in" reactor solutions that can extract even more value from these units and create unexpected, low investment options for clean fuels production.

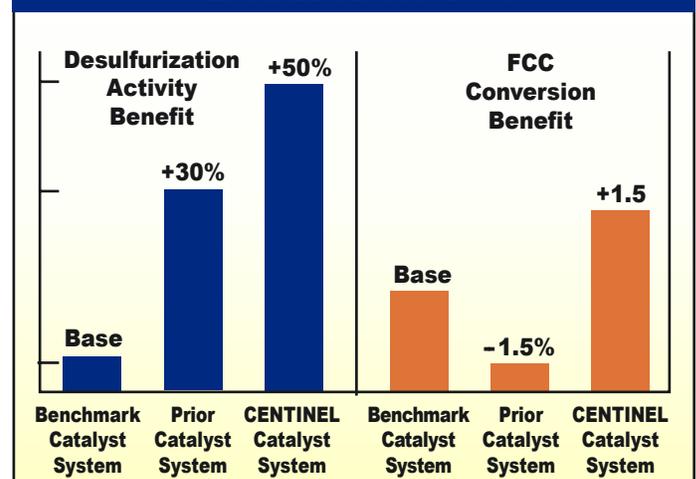
With these drop-in FCC Pretreat solutions, the effective catalyst volumetric activity for many units can be increased as much as two times without spending capital to add reactors. The upgrades can make it possible to consistently control the FCC gasoline sulfur to meet Tier 2 gasoline requirements and significantly reduce LCO sulfur content and volume, which helps reduce the investment for ULSD production. Figure 1 shows a projected "before and after" example of the benefits of Criterion's and Shell Global Solutions drop-in technologies.

A key ingredient of the drop-in solution is Criterion's CENTINEL catalyst technology. Application of this technology has produced desulfurization gains of 50% for many FCC pretreaters (Figure 2). Notably, this technology provides the enhanced desulfurization improvement without reducing FCC conversion. Some previous catalyst developments may have provided increased sulfur removal, but did so at the expense of FCC conversion.

**FIG. 1**  
Impact of Criterion's & Shell Global Solutions' Drop-In FCC Pretreater Technologies

	Before	After
FCC Feed Sulfur, wt%	0.3	0.09
FCC PT Cycle Life, mo	18	24
FCC Gasoline Sulfur, ppm	210	55
FCC LCO Sulfur, wt%	0.45	0.13
FCC Conversion, vol%	75	77

**FIG. 2**  
The Value of CENTINEL TECHNOLOGY



Many FCC pretreat reactors are plagued with poor liquid and gas flow distribution. Additionally, existing reactor distributor designs and loading practices do not allow effective use of the full reactor volume. In some cases, 20-30% of the catalyst bed is bypassed because of poor flow distribution, and another 5-15% of reactor volume is lost because of outdated distributor designs and catalyst bed grading practices. Shell Global Solutions' technology can virtually eliminate catalyst bypassing, resulting in full use of all catalyst in the reactor. An additional 10-15% gain in actual catalyst volume is usually obtained by using these state-of-the-art reactor internals because of their reduced space requirements and the reduced amount of inert and catalyst grading that is required to address bed-fouling problems.

These catalyst and reactor technologies work together to significantly improve FCC pretreater performance and create more hydrotreating capacity without adding reactors. Maximum use of existing assets is the key to minimizing future investments. As many refiners are learning, the experience and technologies of Criterion and Shell Global Solutions can open up new options that substantially trim the investments needed for Tier 2 gasoline and ULSD.