AT795: The Latest Advance in FCC Feed Upgrading from ART

Greg Rosinski

Technical Services Engineer

Advanced Refining Technologies

Chicago, IL USA

Brian Watkins

Technical Services Engineer

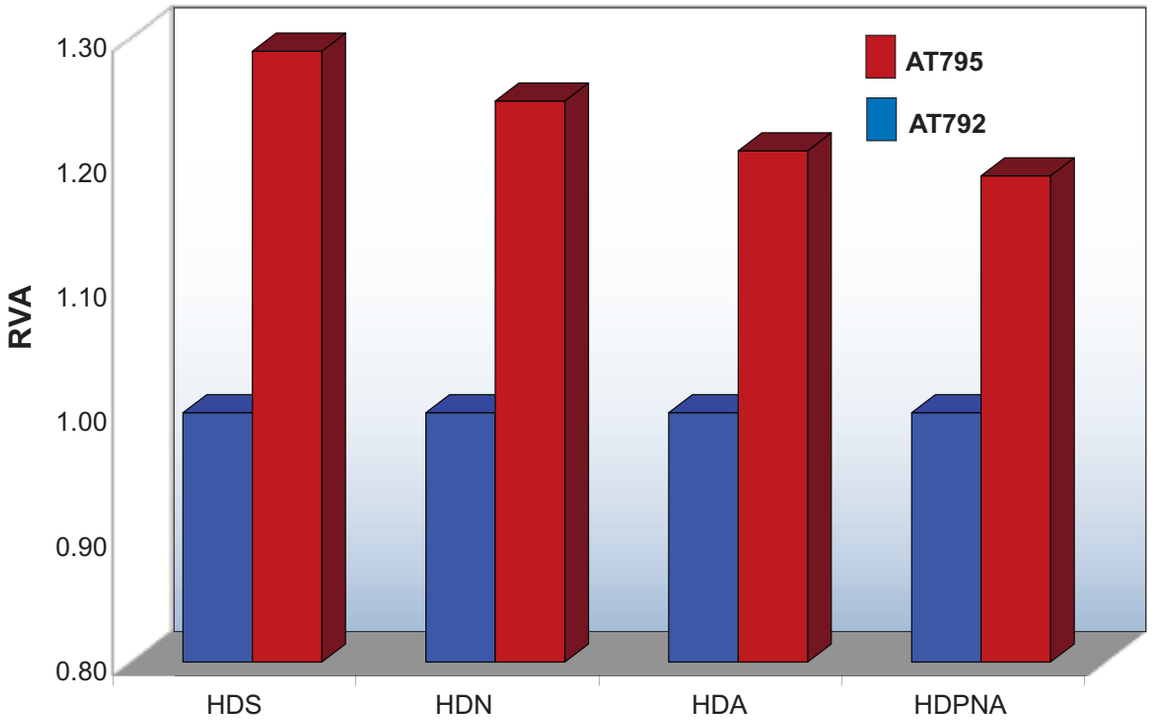
Advanced Refining Technologies

Chicago, IL USA

Advanced Refining Technologies first introduced the ApART™ catalyst system for superior FCC feed pretreating in 2002. The ApART technology was designed to provide maximum HDS activity while also providing significant upgrading of FCC feeds. This technology has been widely accepted with over 50 units in commercial service since its inception. As challenges in meeting clean fuels regulations continue to become more daunting, ART continues to improve its line of high activity FCC Pretreat catalysts, and strives to provide refiners with superior technology and first-class performance.

ART's AT575, AT775 and AT792 have long proven their performance advantages of outstanding stability and exceptional ability to provide consistent, high quality feed for FCC units. In keeping with this tradition, ART is introducing its newest high activity VGO HDS catalyst, AT795. AT795 benefits from using ART's expertise in alumina synthesis which enables an increase in the surface support acidity promoting higher HDN activity and saturation activity at severe

Figure 13
AT795 Catalyst Activity Advantage Over AT792 Catalyst

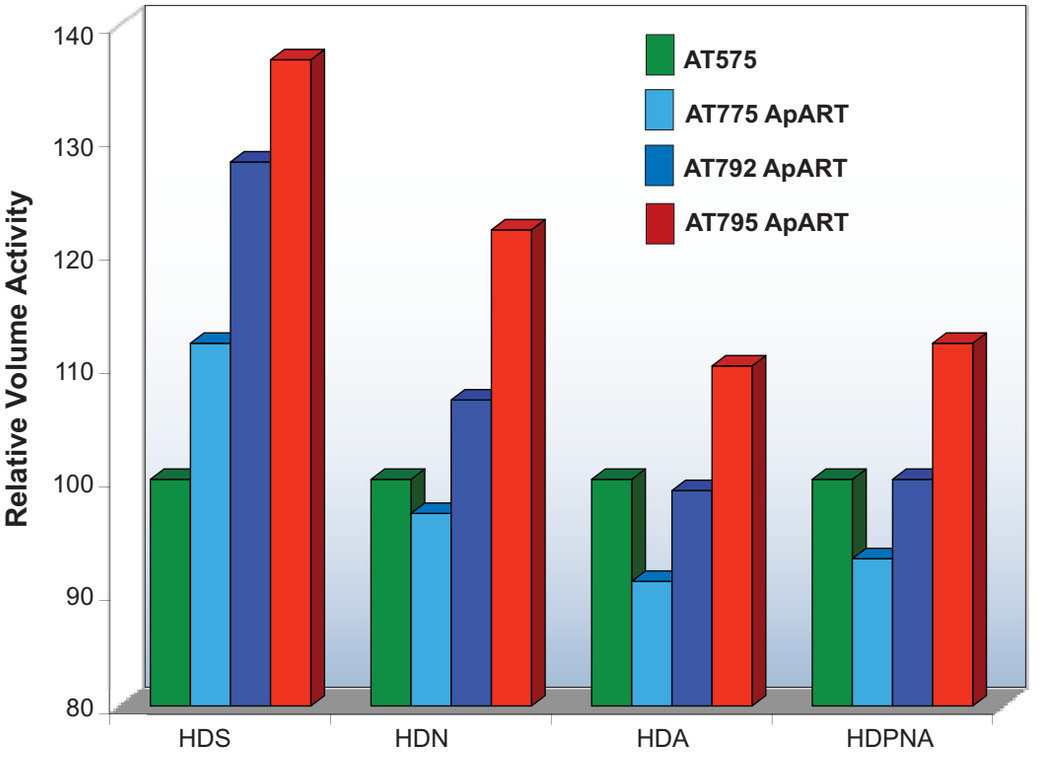


conditions. This enhanced ability for HDS and HDN allow for use of this product in a wide range of operations.

Figure 13 compares the activity of AT795 to its predecessor AT792. The results from side-by-side testing clearly show that AT795 outperforms AT792 by greater than 20% for HDS, HDN and aromatic saturation. This indicates that AT795 offers refiners a significant increase in their ability to produce lower sulfur FCC products as well as improve FCC yields from higher nitrogen and poly aromatics removal from the FCC feed.

Coupling the improved HDS activity of AT795 with the activity of AT575 allows refiners to produce low sulfur and nitrogen FCC feeds at significantly lower SOR temperatures. This gives

Figure 14
Comparison of ApART Systems on a West Coast Feed Blend



refiners the choice between increasing cycle life or processing more difficult feeds. Figure 14 shows the advantage of using the new system over previous ApART systems with AT575.

Not only is the improvement seen for HDS, but significant boosts above an all NiMo system for HDN and aromatic conversion are observed as well. This pilot plant work was completed at high pressure using a West Coast feed containing 40-45% coker gas oil. This confirms that not only is this system capable of delivering the low sulfur FCC products, but is also capable of improving FCC yields due to the increased PNA saturation ability of the AT795 catalyst system.

Figure 15 compares two ApART systems containing 25% each of AT792 or AT795. A consistent 5 number advantage in aromatics conversion can be observed for the AT795 ApART system. This work was conducted using a feed with 1.5 wt.% sulfur and over 4700 ppm nitrogen.

Refiners operating low pressure units typically designed primarily for sulfur removal will also benefit from using AT795. Figure 16 illustrates pilot plant work showing the advantage is still in excess of 10% as compared to AT792 for HDN while still having an advantage in HDS performance.

The proper choice of an FCC pretreat catalyst system must, in addition to other potentially important considerations such as feed metals removal, represent an optimization of sulfur removal capability as well as HDN and saturation activity. The flexibility of the ApART system offers the potential to provide maximum HDS activity, and thus lowest FCC gasoline sulfur content, while also providing a maximum in FCC unit conversion at constant coke operation. In a more general view, optimum ApART catalyst systems will exist with respect to gasoline sulfur and gasoline yield for specific FCC pretreater/FCC combinations. ART's understanding of its ApART catalyst systems capabilities and their influence on the operation and performance of the FCC unit permit these optimum solutions to be identified for the specific refiner's situation.

Figure 15
Comparison of Two ApART Catalyst Systems for Aromatic Saturation

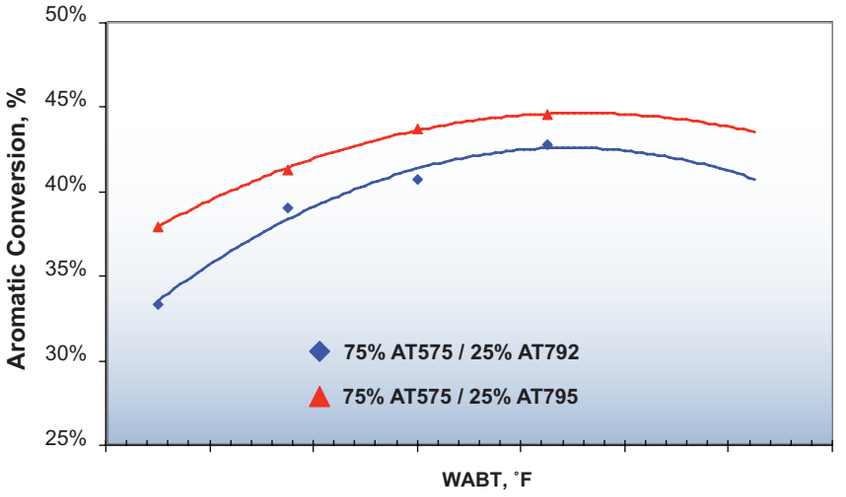
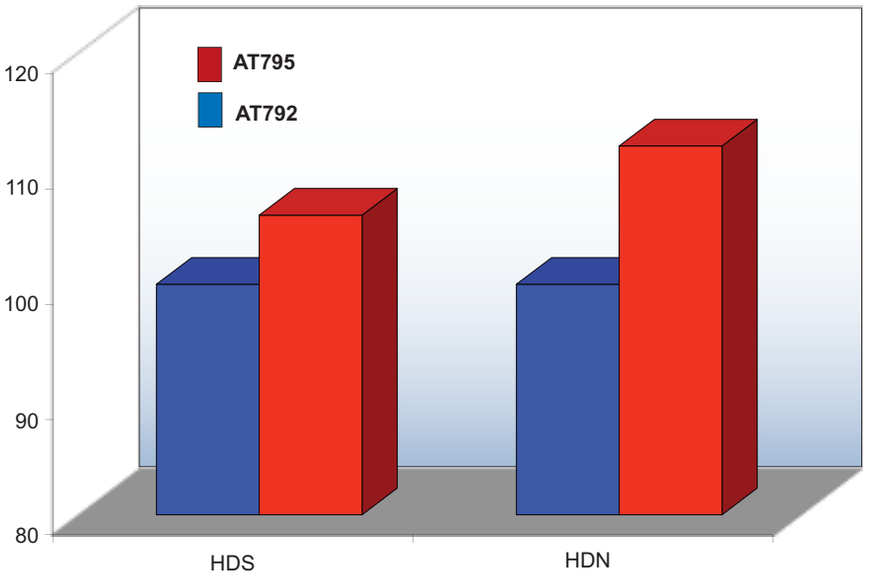


Figure 16
Comparisons of AT795 Catalyst and AT792 Catalyst at 800 psig



AT795 is a VGO HDS catalyst that has shown outstanding HDS activity coupled with extremely high HDN and HDA activity. This catalyst will augment refiners need for better FCC feed conversion as well as providing support in producing lower sulfur clean fuels. Refiners looking to drive more hydrogen into their FCC feeds to gain additional conversion are going to see the benefits of the ApART system using AT795 with its high HDN and HDA activity. Combining this with the demonstrated stability of AT575 and other ApART system components indicates that AT795 will be able to provide this ultra high activity with excellent stability.