



DENALI AFX™

Real Performance. Where It Counts.

Max propylene units benefit from Albemarle's zeolite innovation.

DENALI AFX™ is the incorporation of **DENALI™** zeolite technology with the **AFX™** platform – the recognized benchmark for max propylene FCC applications for years. In FCC operations that are integrated with petrochemicals, **DENALI AFX** raises the bar to new performance heights.

DENALI comprises Albemarle's innovative zeolite technology that provides better coke selectivity, enhanced olefinicity, and lower slurry yields due to better stability and lower hydrogen transfer. **DENALI** is based on the **GRANITE™** platform, which was named Best Catalyst Technology in 2018 by *Hydrocarbon Processing* and has been received favorably by refiners.

DENALI AFX Demonstrates Step-out Performance

DENALI AFX has commercially proven to enhance customer profits and provide robust performance in several max propylene applications. In all cases, the innovative zeolite technology of **DENALI AFX** demonstrated improved coke selectivity. This resulted in lowered regenerator temperatures, giving refiners more flexibility in operations (Figure 2). An example¹ of this was one application where the refiner targeted a heavier crude slate and **DENALI AFX** enabled the RFCC unit to achieve this goal. Despite feed iron soaring from 9 to 15 ppm, Albemarle estimated that **DENALI AFX** improved the margin by \$0.36/bbl, of which \$0.11/bbl came from a higher throughput that was enabled by a lower regenerator temperature and \$0.25/bbl came from better yields. These include higher propylene, higher butylene, lower slurry yield, and a liquid volume gain (Figure 1).

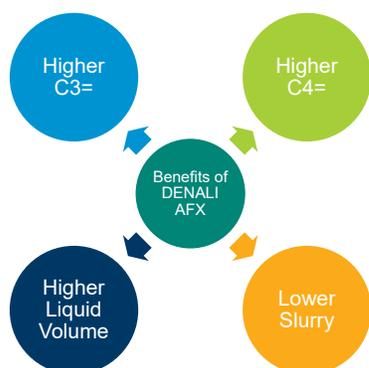


Figure 1: DENALI AFX performance benefits.

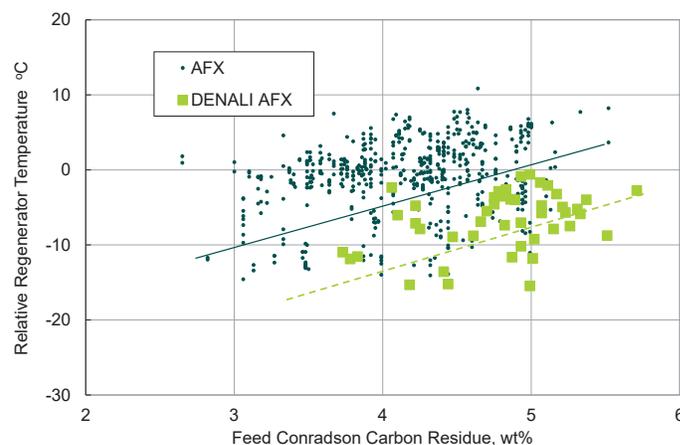


Figure 2: DENALI AFX reduces regenerator temperature which allows for processing higher CCR feeds or increase feed rate.

Built on the AFX Platform

DENALI AFX is built on Albemarle's successful **AFX** platform, the industry recognized benchmark for max propylene FCC applications. It is the preferred choice by leading refiners as the most profitable solution for maximum propylene.

¹ Manabe K, Pouwels C, Wang PS, Kotani T, Increased propylene from heavier residues, *PTQ*, Catalysis 2021, 45-49.

AFX has a long reference list across the full spectrum of feeds, ranging from very light hydrotreated VGO to heavy treated and untreated residues. **AFX** applications include conventional FCC and RFCC units for all licensor technologies and applications that operate in very high severity modes such as DCC and HS-FCC™².

AFX combines Albemarle's unique technologies that are engineered to maximize generation of olefinic precursors in the gasoline range which are converted and preserved to the highest levels of propylene and butylene. Minimization of hydrogen transfer reactions throughout the proprietary catalyst components and Albemarle's high accessibility assembly technology are instrumental to premium olefinicity LPG (Figure 3).

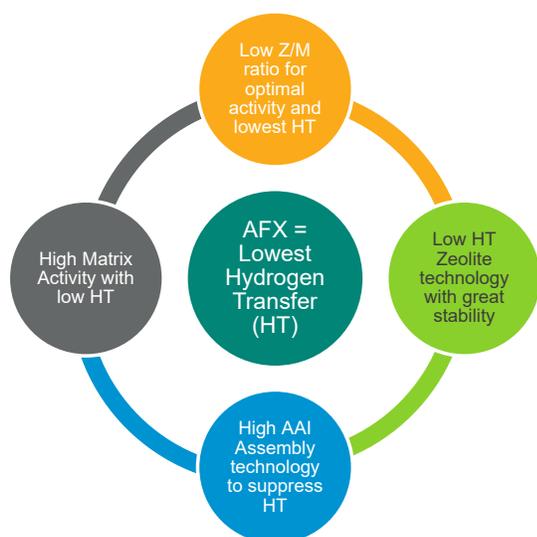


Figure 3: AFX's unique low hydrogen transfer design for max propylene.

The **DENALI** technology augments **AFX** through zeolite innovations. The novel zeolite provides greater stability and lower hydrogen transfer activity which is essential to the preservation of more olefins and enhanced olefinicity. The improved zeolite stability was identified in research studies and has been confirmed in commercial applications (Figure 4). The unique characteristic of this zeolite technology is that stability and activity are increased while hydrogen transfer is simultaneously lowered.

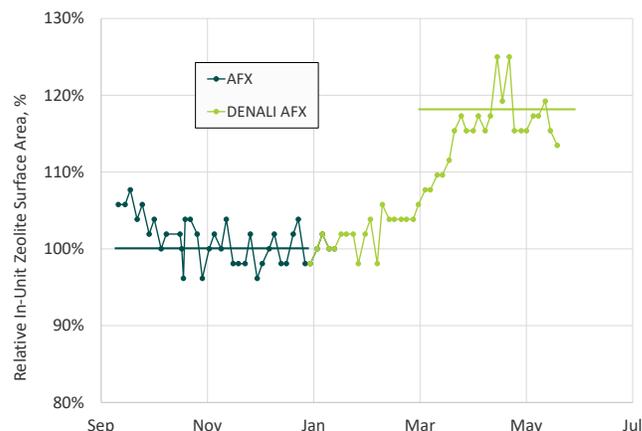


Figure 4: Innovative zeolite in DENALI AFX enhances stability.

Albemarle Offers World-class Predictive Capabilities and Applications Know-how for Your FCC Unit

To assess the potential of **DENALI AFX** for individual max C3= applications, Albemarle provides thorough and customized evaluations. Albemarle has deep knowledge of fundamental kinetic mechanisms and catalysis. A wealth of commercial experiences in max propylene applications provides Albemarle specialists key information for designing the optimal catalyst for each individual application with solid predictive capabilities. Refiners who are interested to know what **DENALI AFX** can bring to their FCC unit are invited to contact an Albemarle representative to learn more.

² HS-FCC™ is a licensed technology offered by Axens & Technip Energies. Name used with permission.

FOR MORE INFORMATION ON THIS OR OTHER ALBEMARLE PRODUCTS AND TECHNOLOGIES, PLEASE CONTACT YOUR ALBEMARLE REPRESENTATIVE.

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