



2024 AFPM
SUMMIT
Excellence in Plant Performance

The main title for the event is positioned in the upper right. It features a white line-art logo of a mountain range above the text '2024 AFPM' in a white sans-serif font. Below this, the word 'SUMMIT' is written in a larger, bold, white sans-serif font. Underneath 'SUMMIT', the tagline 'Excellence in Plant Performance' is written in a smaller white sans-serif font.

afpm.org

American Fuel & Petrochemical Manufacturers

Hydrocracker Economic Performance Improvements

Case Study: Boosting Hydrocracking Performance with Celestia™ Catalyst to Extend Run Length and Enable Cold-Flow Improvement with MIDW™ Catalyst

American Fuel & Petrochemical Manufacturers

Speakers

ExxonMobil

 Ketjen



Speaker
Mitchell E Loescher, PhD PE
Technical Sales Manager
ExxonMobil Product Solutions



Speaker
Christy Anderson
Technical Services Manager
Ketjen Corporation



Moderator
Oscar Brown
SME Hydroprocessing
Valero Energy



Case Study: Unlocking value from a constrained hydrocracker within an existing asset



Processing Parameter

Pressure	150 barg / 2175 psig
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Feed Quality

API Gravity	20
Sulfur	1.7 wt%
Nitrogen	880 wppm
FBP	520°C / 970°F

Feed Blend

HAGO / VGO / HKGO / SRGO

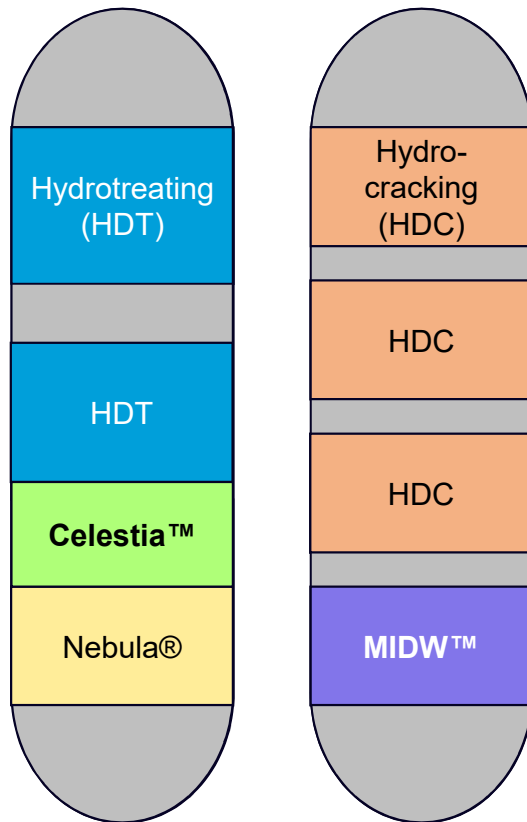
Unit Pain Points

- Severe performance degradation at EOR
- Maxed-out temperatures
- Reduced HC activity
- Need to run an existing separate dewaxing unit

Improvement Goals

- Meet run length objectives without feed tailoring and minimizing product downgrade
- Less performance drop-off at EOR
- Enable MIDW™ catalyst in hydrocracking reactor
- Improve yield profile

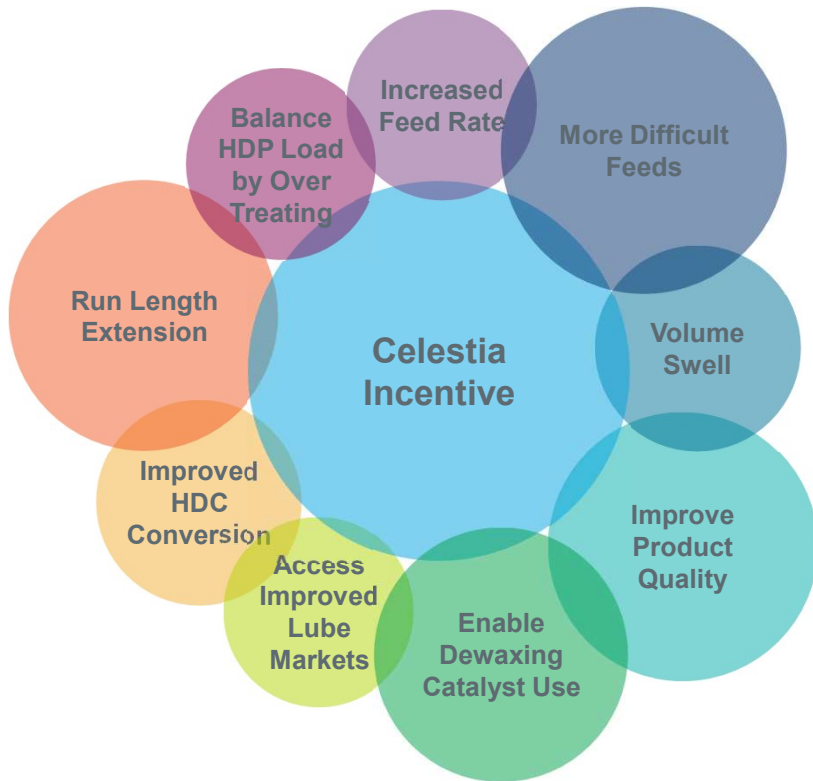
Case Study: Applying Celestia™ catalyst to optimize hydrocracking catalyst function



Approach

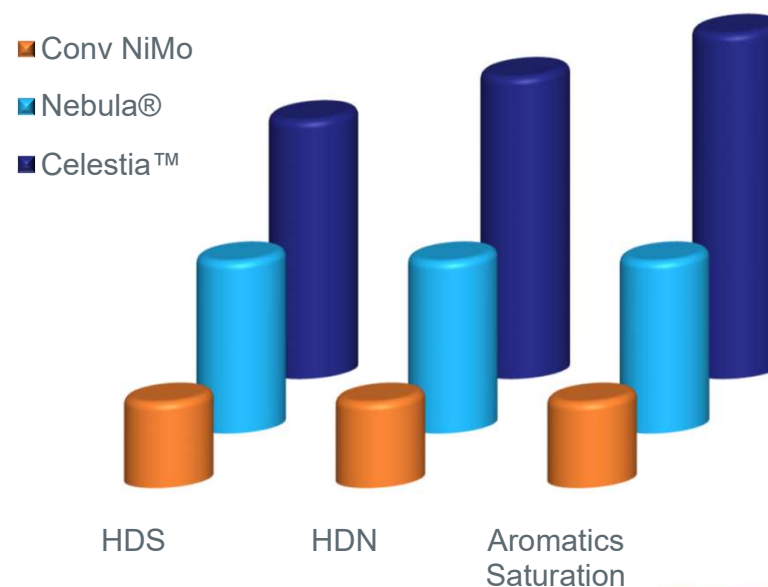
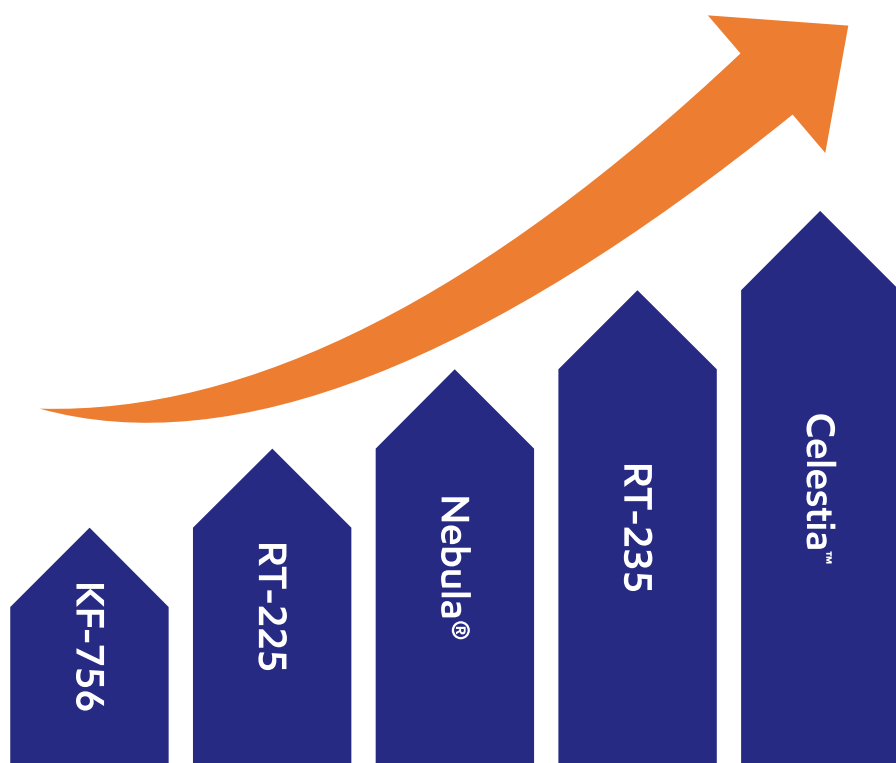
- Unit already using Nebula® bulk metal catalyst
- Replaced ~25% of pretreat reactor with Celestia catalyst
- Reduced Nebula catalyst by ~33%
- Expected 1.35x pretreat activity increase versus prior cycle
- Improved pretreat enabled reduction of cracking catalyst volume
- MIDW™ catalyst employed in remaining volume

What is Celestia™ catalyst?

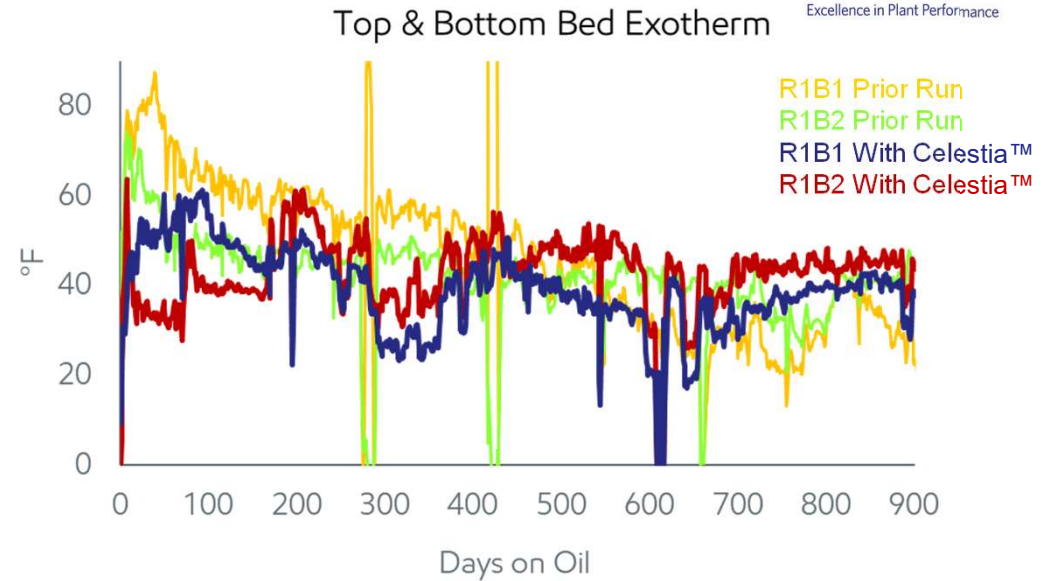
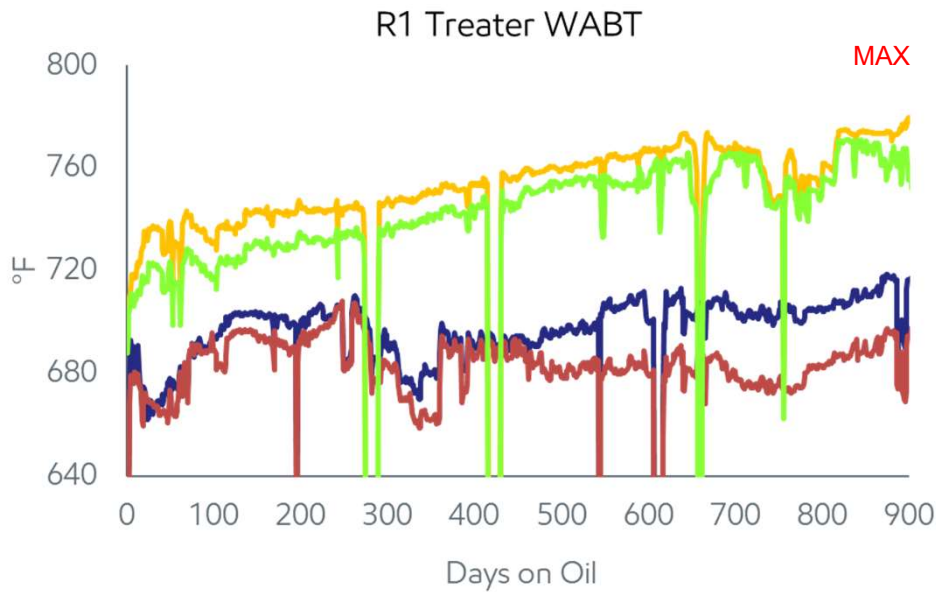


- **A bulk metal hydrotreating catalyst**
 - Composed of hydrotreating metals and proprietary organic
 - No inert Al support → more active metals in equal reactor volume
- **Highest activity hydrotreating catalyst**
 - Step-out aromatic saturation (volume swell) and HDN activity
 - Enables higher performance of non-BMC reactor beds
- **Incentives extend beyond the individual unit:**
 - Meet lower sulfur targets without capital
 - Rebalance internal feeds to improve utilization
 - Widen the available crude diet
 - Product blending opportunity to relax a constraint
 - Coordinate HDT turnaround schedules
 - Improve energy efficiency

ExxonMobil & Ketjen: A long history of collaboration & specialty hydroprocessing catalyst innovation



Case Study: Celestia™ catalyst in action



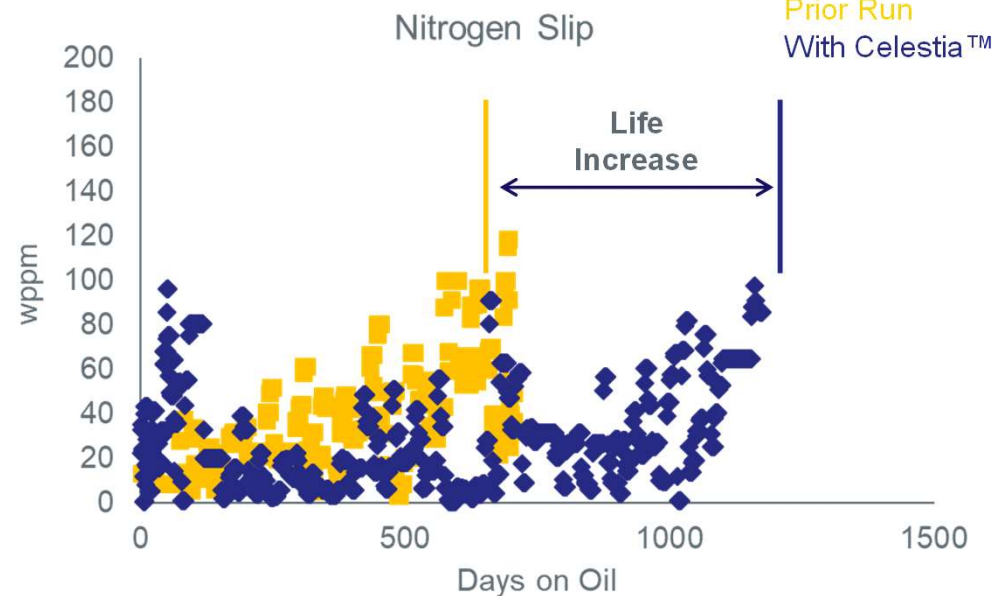
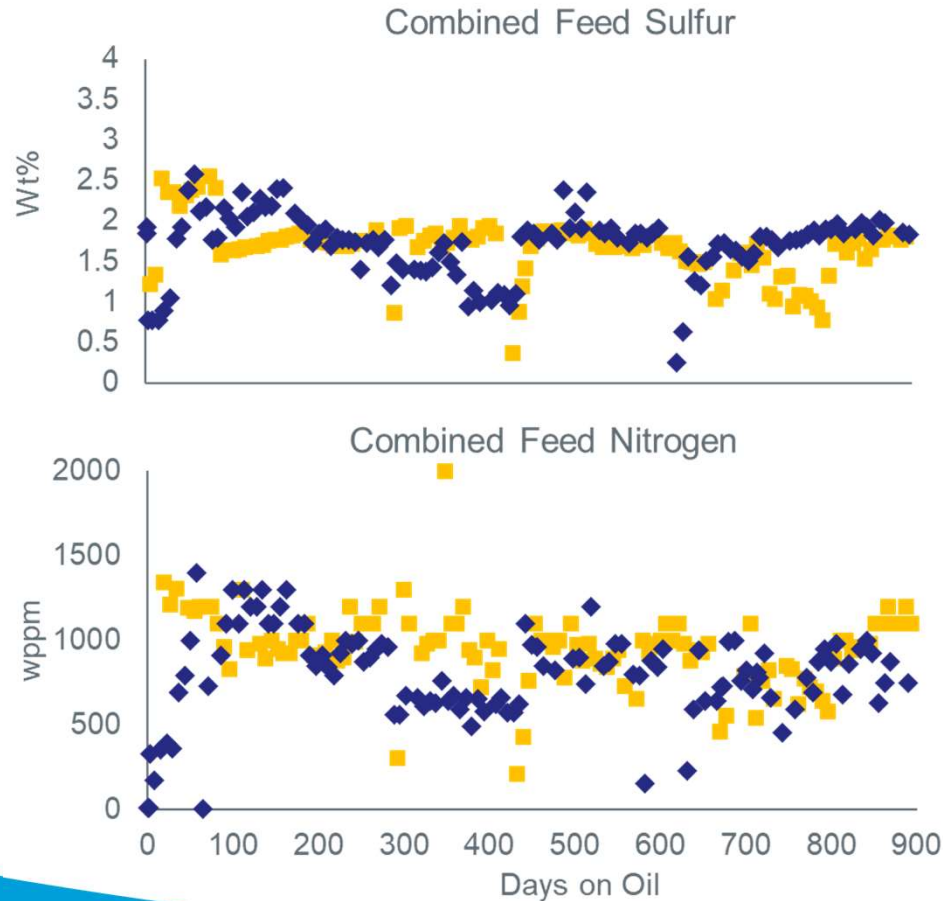
Significant
Improvement in
SOR Activity

40°F lower SOR temperatures

Exceeded expected 1.35x RVA

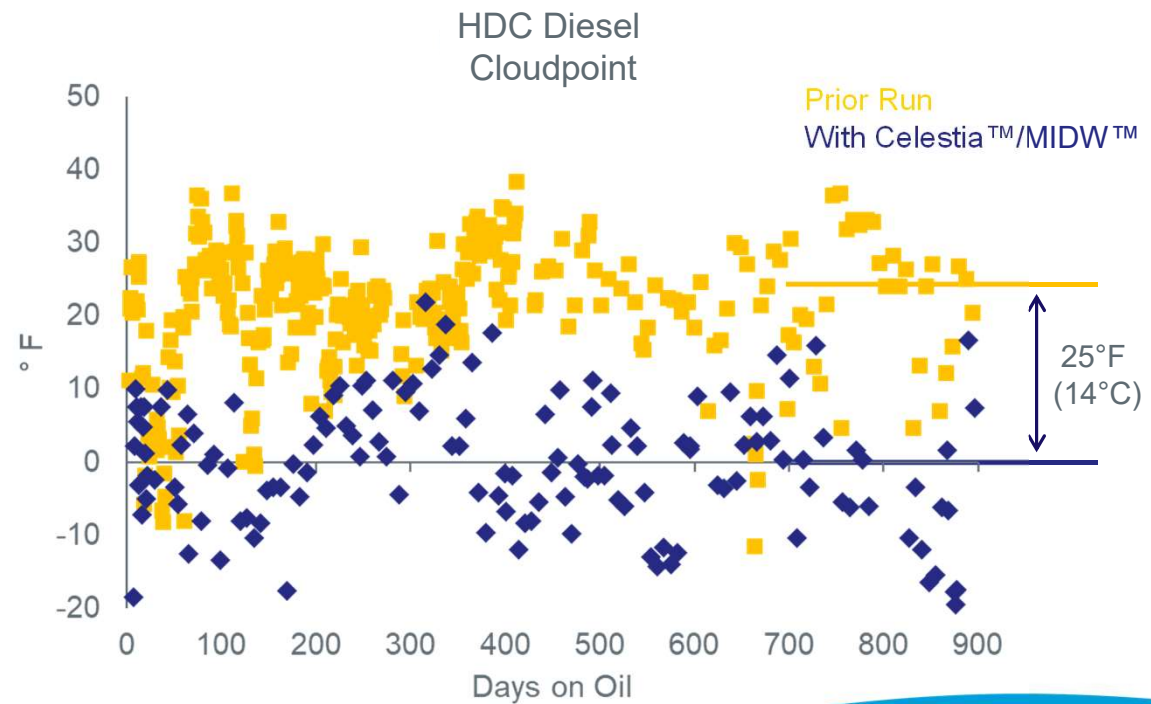
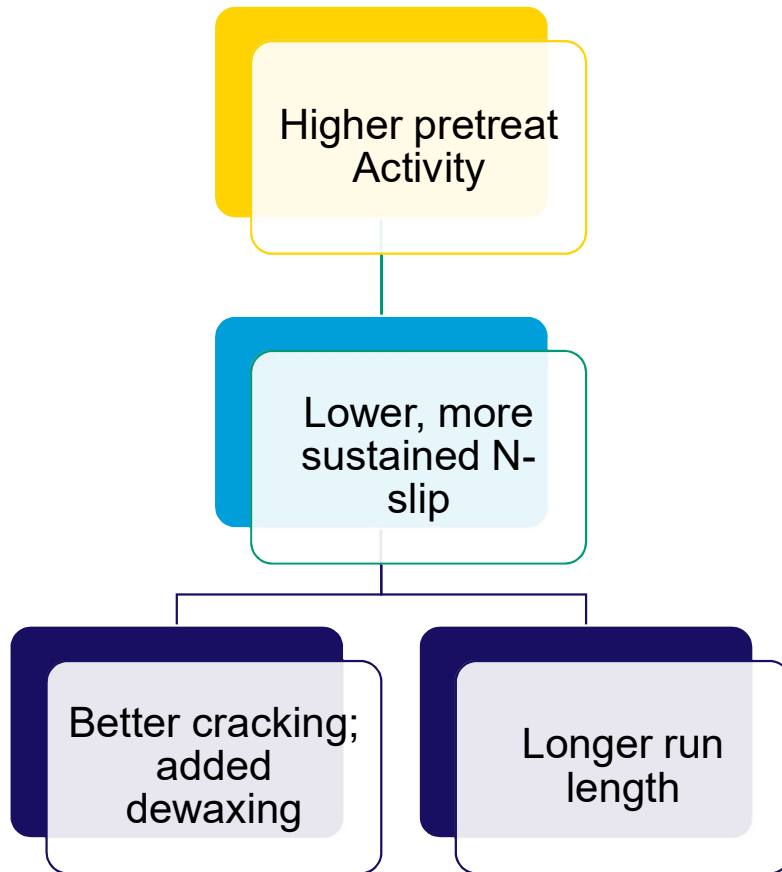
Low temperatures drive stable aromatic
saturation, low deactivation

Case Study: Harnessing unparalleled HDN

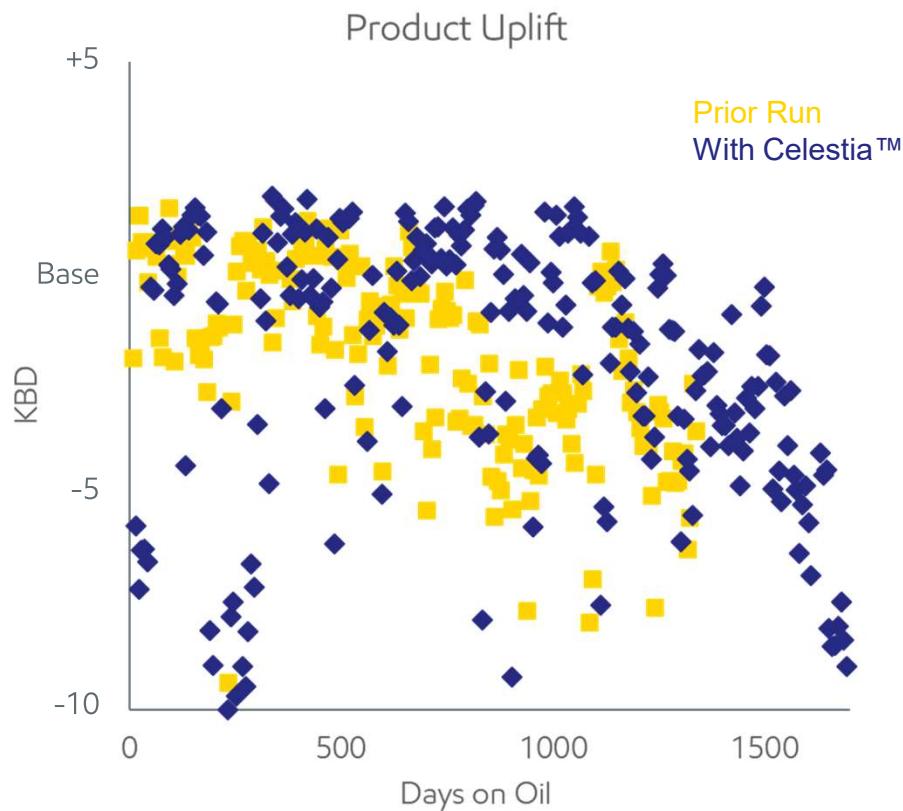


Improved N-Slip & Arosat
Key to Unlocking Cracking

Case Study: Benefits work synergistically



Case Study: Improving refinery economics



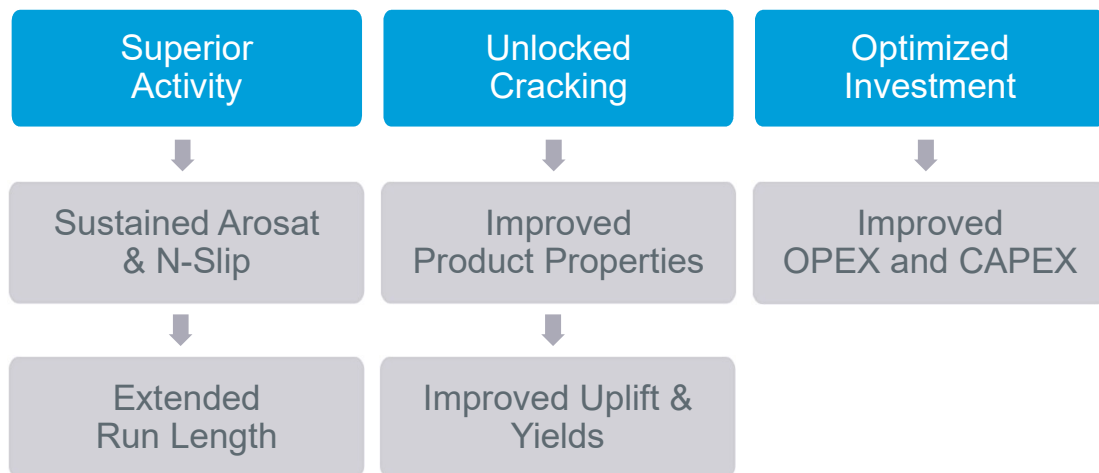
Values Captured

- HDC yields and performance*
- Increased product uplift throughout cycle
- HDC diesel product quality
- Reoptimization & repurposing of downstream assets
- Additional OPEX savings

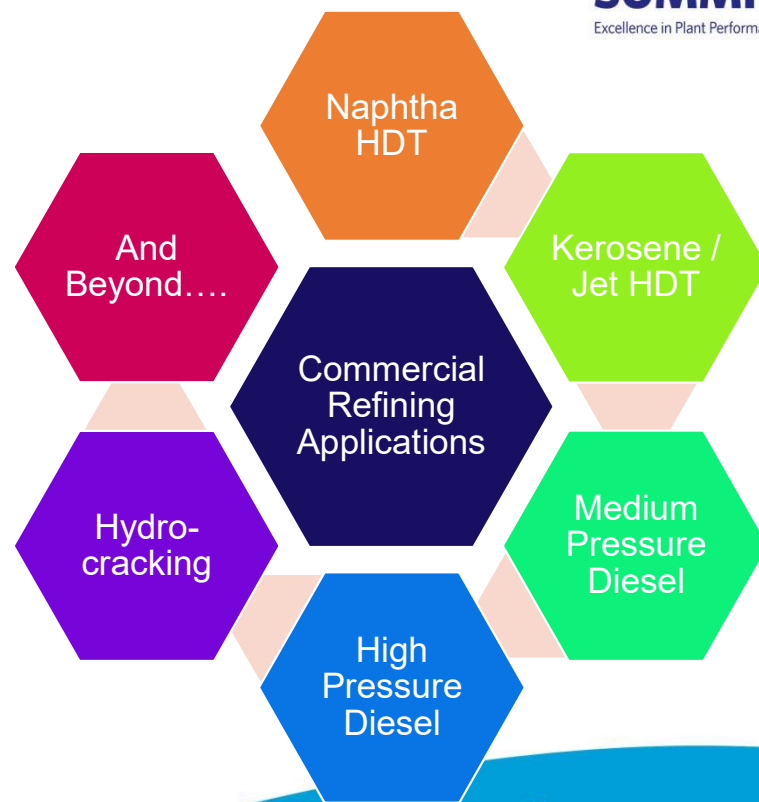
\$15-25M / yr*

Celestia™ Catalyst: Proven value for you

Exceptional hydrocracker pre-treat activity maximized this unit's profitability via:



What can Celestia catalyst bring to your refinery?



Questions?



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AFPM Reference Material



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[ExxonMobil Catalysts & Licensing](#)

[Ketjen Clean Fuels Technology](#)