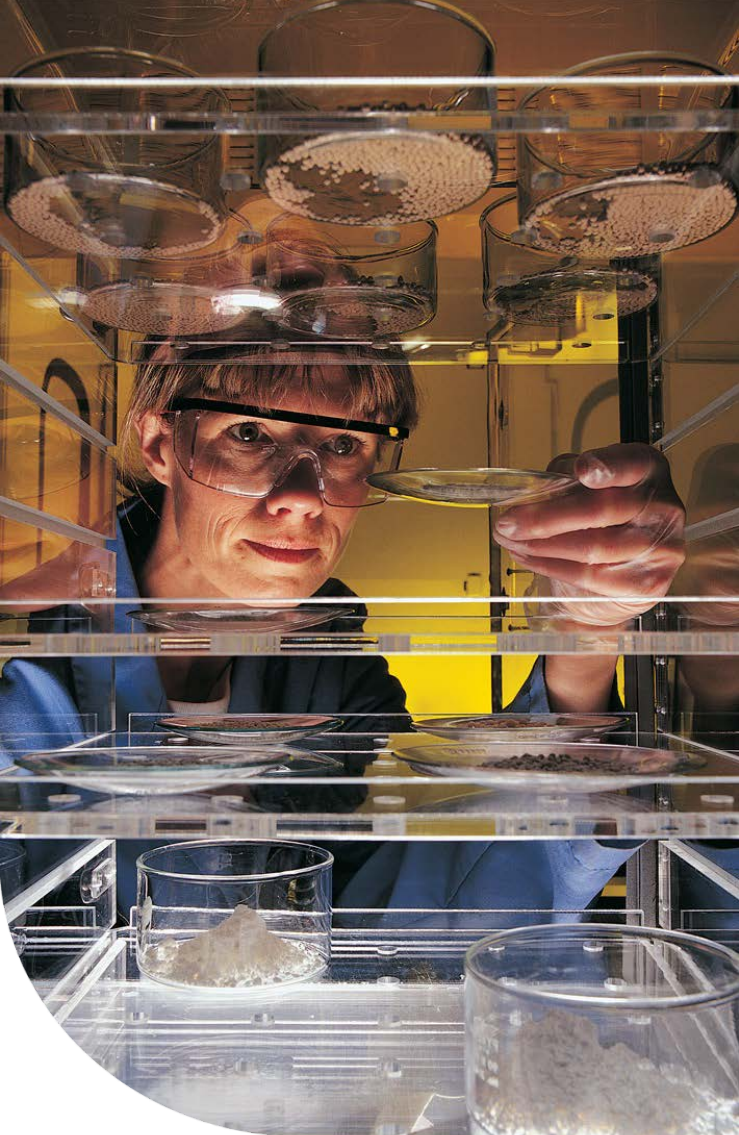




Aravindan Kandasamy

UOP Limited, Guildford, UK

Unity™ Hydroprocessing Catalysts

A unified approach to enhance your refinery performance

2017 Honeywell Oil & Gas Technologies Symposium

May 15, 2017
May 17, 2017

Cairo, Egypt
Alexandria, Egypt

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Outline

- UOP Unity™ Hydroprocessing Portfolio
 - Unity™ Case Story A: Profitability through Increased Diesel
 - Unity™ Case Story B: Profitability through upgrading to Exportable Diesel
- Key Learnings

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Unity

Unicracking Uniflow
Uniflex Unibon Unionfining

Honeywell UOP Unity Portfolio

UNITY HYDROTREATING							
DEMETALLIZATION			CLEAN FUELS			PRETREAT	
Si DEMET	As DEMET	Ni/V DEMET	FCC GASOLINE	NAPHTHA	DISTILLATE	FCC VGO PRETREAT	HYDROCRACKING PRETREAT
HYT-9110	UF-75	HYT-8109	HYT-2018	HYT-1118	HYT-6119	HYT-5119	HYT-6119
HYT-9119	UF-80	HYT-8119	HYT-2117	HYT-1119	HYT-6219		HYT-6219
			HYT-2118	HYT-9129	HYT-4118		
			HYT-2119				

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Unity



Unity portfolio includes:

- ✓ hydrotreating catalysts
- ✓ hydrocracking catalysts

UOP Unity Hydrotreating catalysts available to you

Honeywell UOP Unity Portfolio



UNITY HYDROTREATING							
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			HYT-2118	HYT-9129	HYT-4118		
			HYT-2119				

HYT
8109

First stage demetallization catalyst utilized to help protect downstream catalysts from deactivation due to metal contamination.

HYT
8119

State-of-the-art hydrodemetallization catalyst with high capacity for nickel and vanadium uptake.

Honeywell UOP Unity Portfolio



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			HYT-2119				

HYT

4118

High-performance cobalt/moly hydrotreating catalyst for the ULSD applications.

HYT

6119

High-performance nickel/moly hydrotreating catalyst for the removal of sulfur and nitrogen from gas oil and lighter feed streams.

HYT

6219

Desulfurization catalyst for hydrocracking and ULSD applications.

Honeywell UOP Unity Portfolio



UNITY HYDROTREATING							
DEMETALLIZATION			CLEAN FUELS			PRETREAT	
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HYT
6119

High-performance nickel/moly hydrotreating catalyst for the removal of sulfur and nitrogen from gas oil and lighter feed streams.

HYT
6219

Desulfurization and saturation catalyst for hydrocracking and ULSD applications.

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Flexibility Through Comprehensive Choice:

UNITY HYT	UNITY HYDROCRACKING				
PRETREAT	- ACTIVITY +				
HYDROCRACKING PRETREAT	MAX DIESEL AND 2ND STAGE	DIESEL AND LUBES	DISTILLATE	FLEXIBLE	NAPHTHA
HYT-6119	HC-205	HC-115	DHC-32	DHC-41	HC-24
HYT-6219	HC-310	HC-410	DHC-39	HC-43	HC-26
	HC-320		HC-120	HC-140	HC-29
	HC-325		HC-130	HC-150	HC-185
			HC-425	HC-470	
			HC-520		

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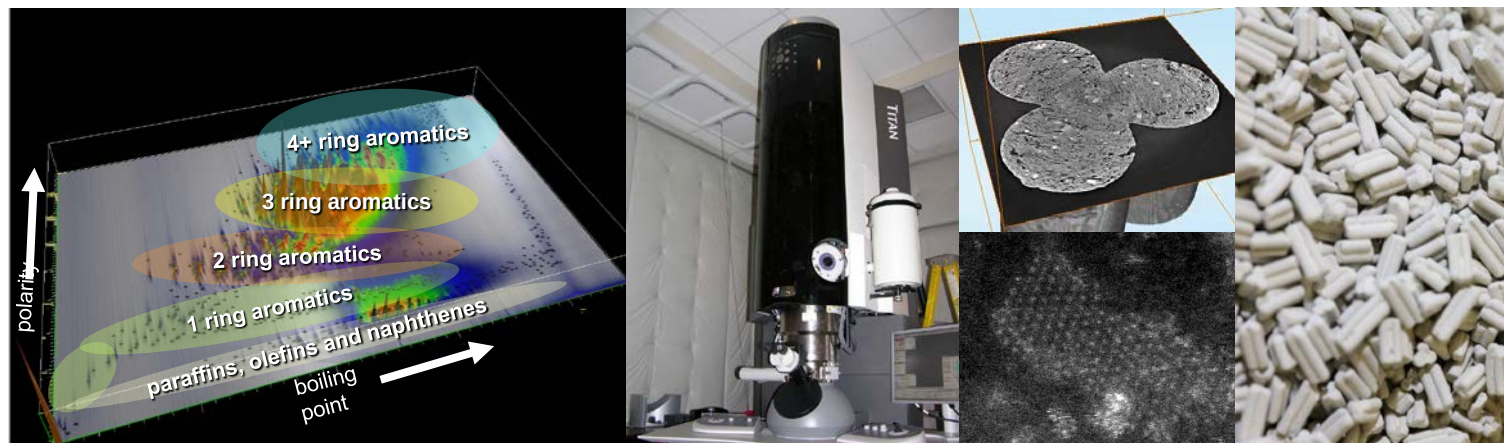
Unity



- Hydrotreating and Hydrocracking
- Unified approach to drive profitability
- Intended to meet your Needs

Flexibility allows profitability

Fundamental R&D Knowledge - An Enabler:



UOP's Fundamental knowledge developed over time:

- Alumina technology, particle morphology and surface chemistry
- Forming techniques and precise control of pore size distribution
- Catalyst physical properties impact on diffusion properties and reactivity
- Feed characterization
- Manufacturing techniques and methods for metals loading

UOP Unity | Hydrocracking Pretreat Catalysts

HYDROCRACKING PRETREAT

HYT-6119

HYT-6219

- Effective on a wide range of feeds
 - Atmospheric and Vacuum Gas Oil
 - Heavy Coker Gas Oil
 - Light Cycle Oil
 - Deasphalted Oil
- Designed to deliver the required HDN, HDA and HDS performance
- Prepare feeds for improved conversion to desired products

Commercially Proven



Rigorous R&D and manufacturing – Robust performance

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HYT-6219 Commercial Experience:

Improved Profitability Through increased Diesel

Cycle Objectives

- Achieve cycle length of 2 years
- Produce EURO V diesel quality product
- Increase diesel yields

Type of hydrocracking technology

- Non-UOP design of single stage recycle with Recycle to R-1

Feed Composition

- CGO, AGO, VGO
- Opportunistic feeds

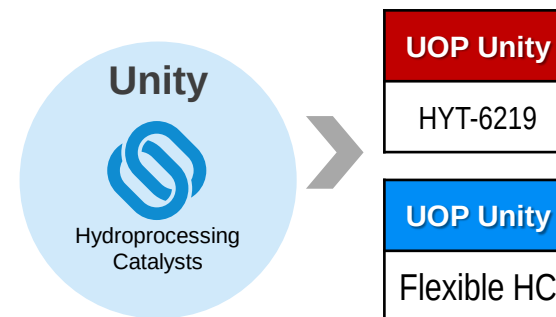
Conversion:

- 95% vol

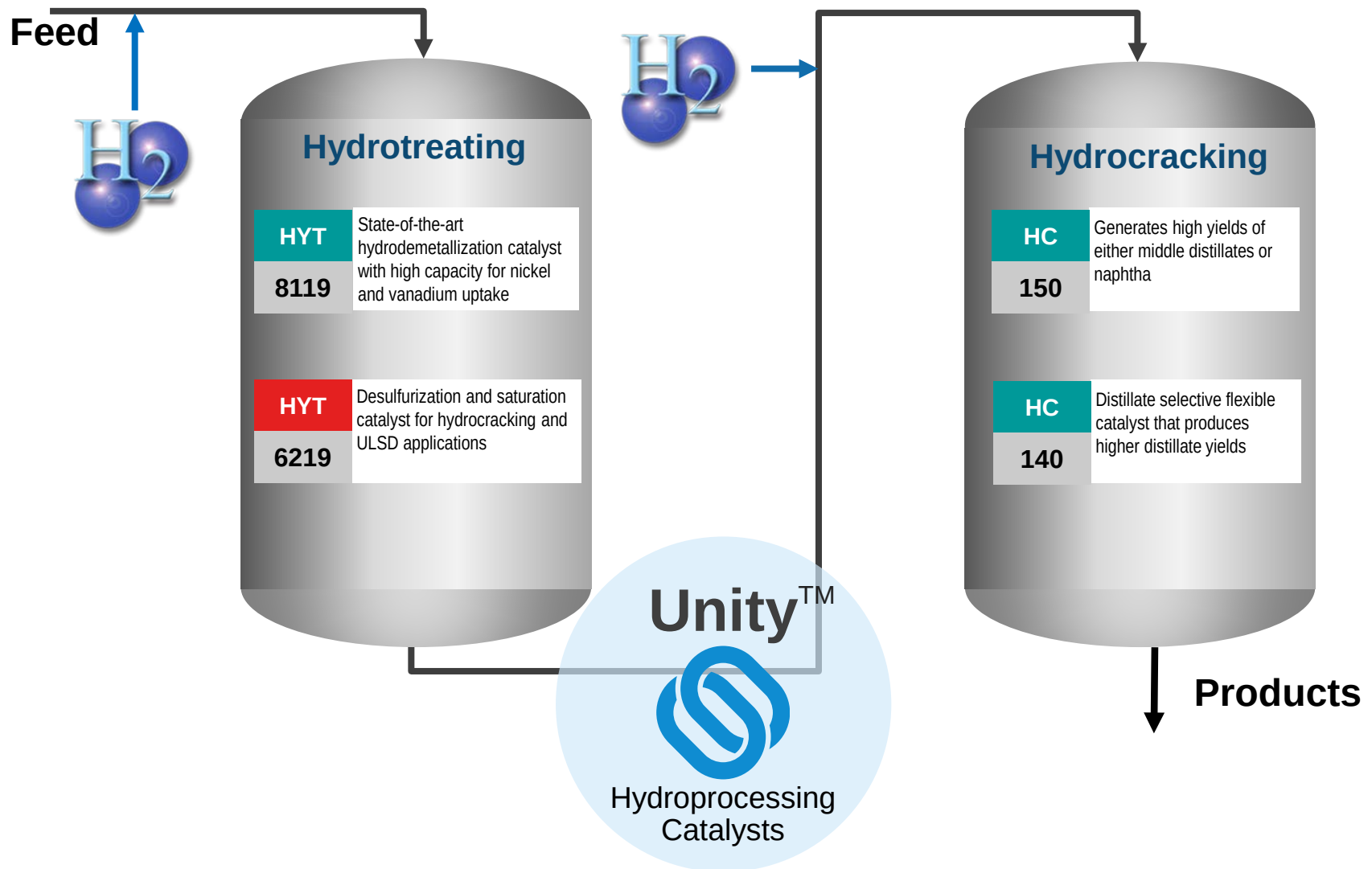
Cut Point:

- ASTM 370°C (698°F)

UOP Catalyst solution:

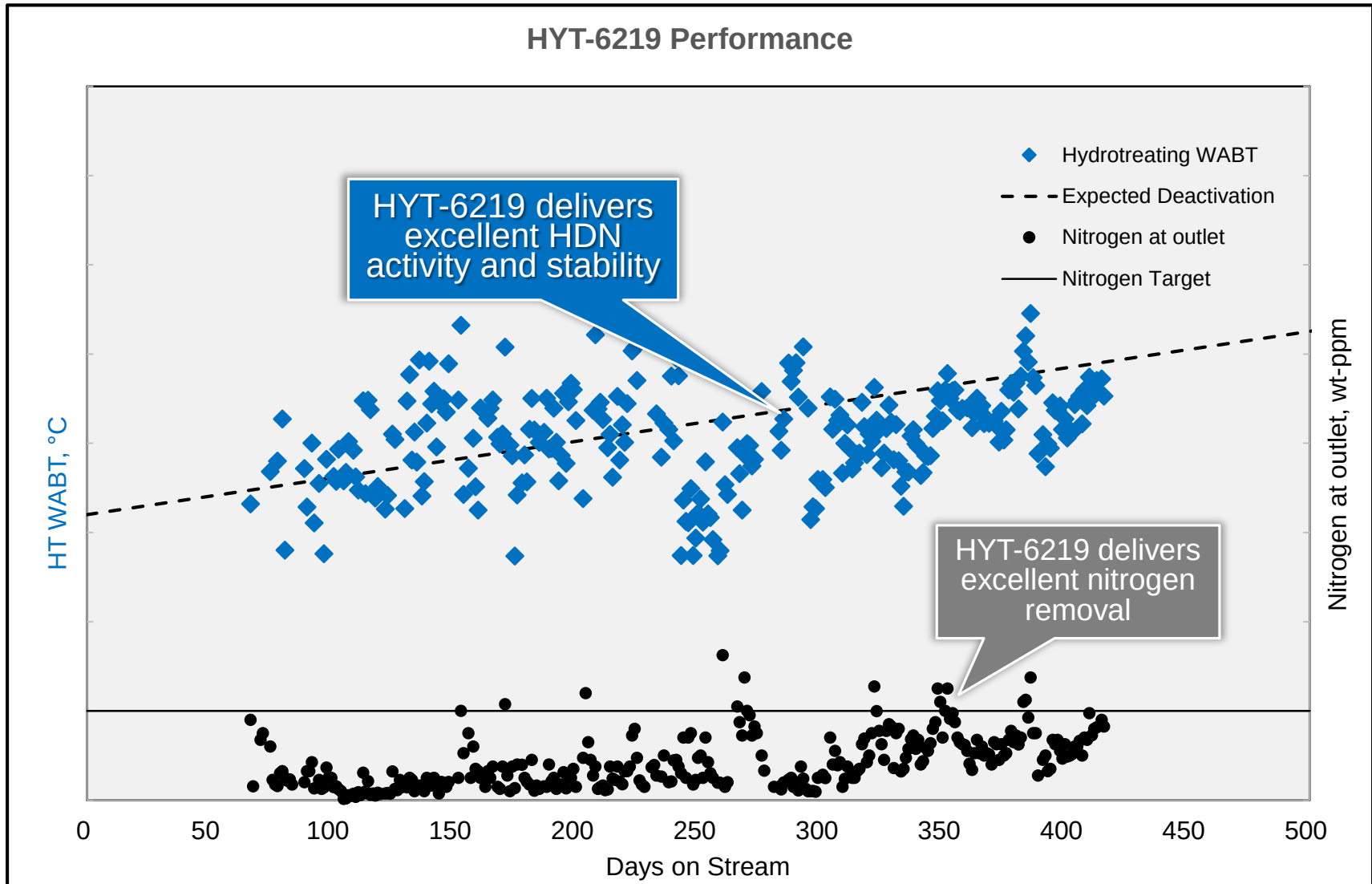


HYT-6219 in Hydrocracking Pretreat Service



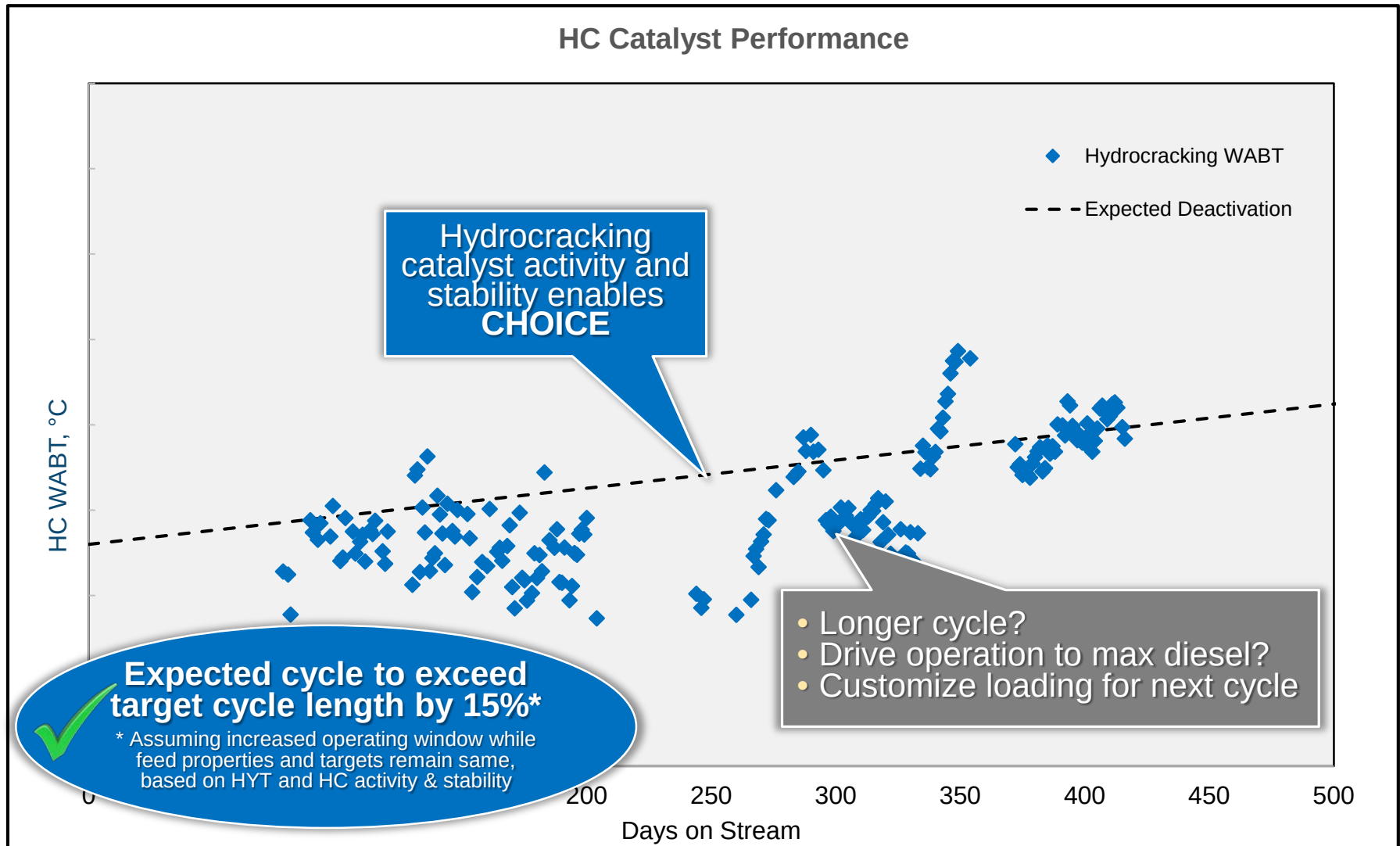
Enhance performance of both catalyst systems

Hydrocracking Pretreat Catalyst Performance



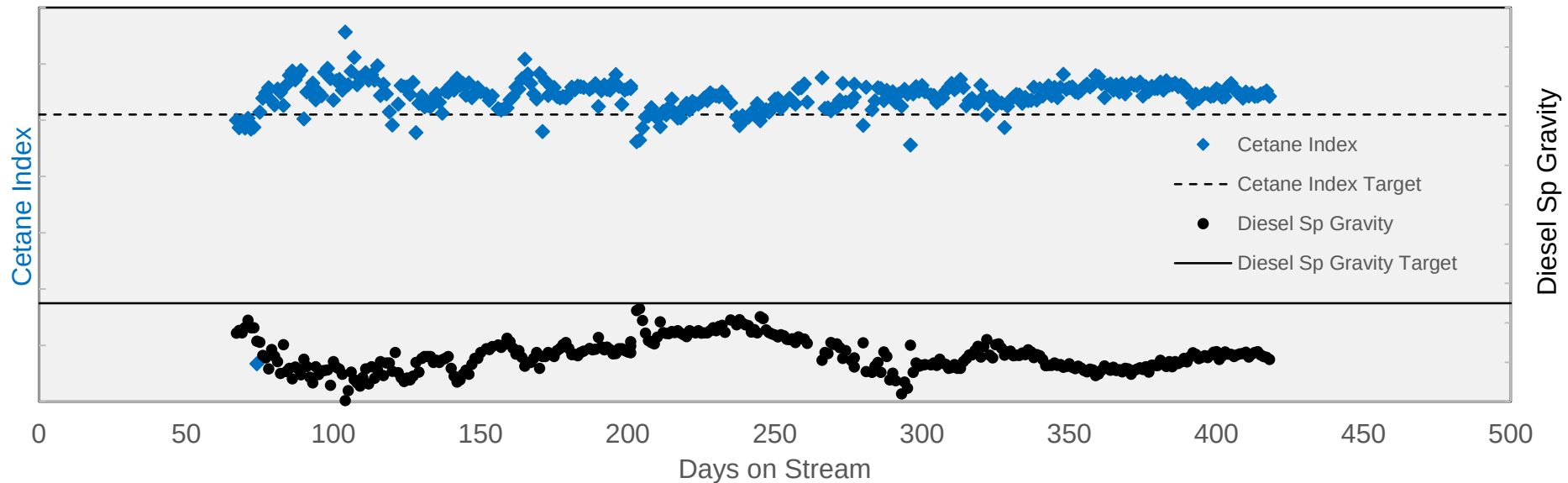
Robust activity and stability to enable cycle

Hydrocracking Catalyst Performance



The extra activity enables options for profitability

Excellent Diesel Product Properties



- Diesel quality is better than EURO V, enabling more options for the diesel pool and overall refinery economics

Specification	Target	Achieved
Density @15C, kg/m ³	Max 845	<<845
Sulphur, wppm	Max 10	<<10
ASTM D86 T95%, °C	Max 360	<360
Cetane Number	Min 51	>51

Unity Case Story:

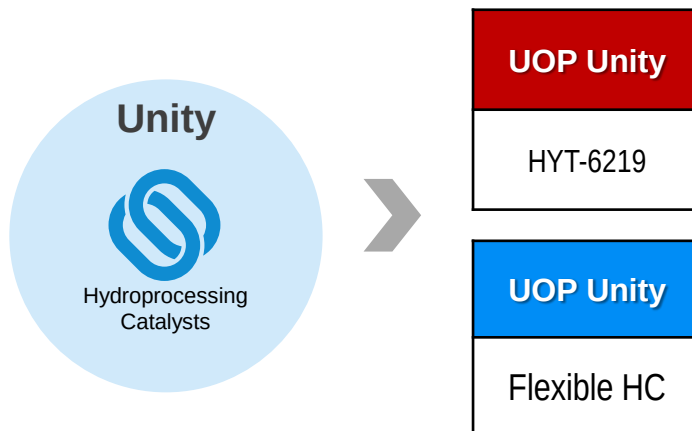
Improved Profitability Through increased Diesel

Cycle Objectives

- Achieve cycle length
- Produce EURO V diesel quality product
- Increase middle distillate yields

UOP Unity Results:

- ✓ Expected to exceed target cycle length by 25%, based on catalyst activity and stability
- ✓ Diesel product properties better than EURO V



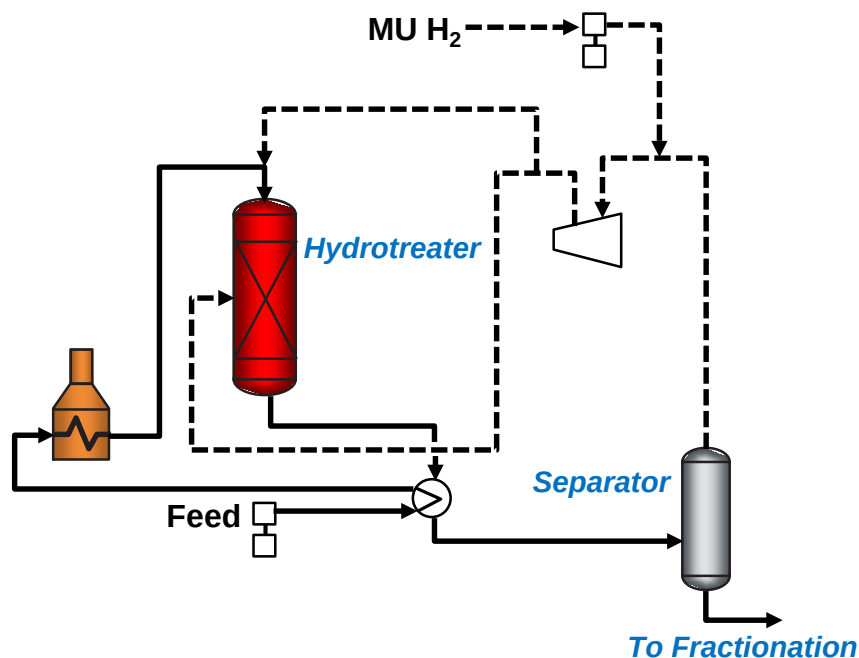
- Hydrotreating and Hydrocracking
- Unified approach
- Intended to meet your Needs

UOP Unity helps refiners increase profitability

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Commercial ULSD Unit with HYT-6219



Feed Details	Blend
Source	Imported
Blend	45% LCGO 27% CN 15% SRD 13% LCO
API	43
Sp Gravity	0.81
Sulfur, wt-%	0.3
Nitrogen, wt-ppm	1100
Bromine Number	35
150 °C + content, Wt-%	85*

* Est from Naphtha Yield

Operating Conditions	Value
Reactor I/L H ₂ PP, MPag	7.0
SOR WABT (Main Catalyst), °C	350
H ₂ to Oil, Nm ³ /m ³	740

HYT-6219 Improves Unit to Meet ULSD Specifications

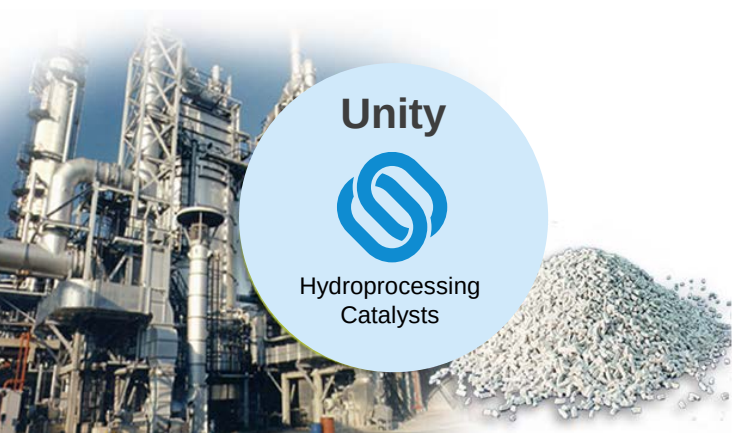
Product Quality	Previous Cycle	After Reload with HYT-6219
Sulfur, wt-ppm	50 – 150	3 - 8
Cetane Index	46 – 51	48 – 53
Pour Point, °C	-5 to – 18	-13 to < -20
CFPP, °C	-3	– 10
Flash Point, °C	64 – 66	60 - 68

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Unity Hydrotreating Catalysts

- Manufactured in USA
- State-of-the-art catalyst technology for high performance
- Commercially proven in several challenging applications
 - HC Pretreat
 - VGO Pretreat
 - ULSD
 - Mild hydrocracking
- Combine with HYT-8109 and HYT-8119 for demet of challenging feeds
- Combine with Cat Trap for feeds with fouling tendencies



Key Learnings

What Can UOP Unity Catalysts Do For You?



- **Unity** - Honeywell UOP hydrotreating and hydrocracking catalyst portfolio



- Benefit from **Tailored Performance** through UOP Unity portfolio



- **Extra Profitability** for your Hydroprocessing units within your refineries and petrochemical complexes



- **Complete Solution** from UOP:
 - Process technology
 - Catalyst Solutions
 - Equipment Solutions
 - and Operational Support

Now UOP Unity is available to you!

Honeywell UOP

Unity™



Hydroprocessing Catalysts

Unified approach | Hydrotreating and Hydrocracking | Universal compatibility



