Excel® Technology: The Sustainable Solution for HydroProcessing Catalysts

PTQ Webinar

2023, Sept. 27th

EVONIK
Leading Beyond Chemistry

Speakers

Madeline Green

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Business Segment Manager HPC

Madeline holds a BSc in Chemical Engineering. She joined Evonik in 2018 as a Business Manager for Hydroprocessing Catalysts and Specialty Adsorbents. In 2022 she became a Business Segment Manager for Hydroprocessing Catalysts and Services and took over global responsibility for Excel Rejuvenation in 2023.

Ahmet Mercan

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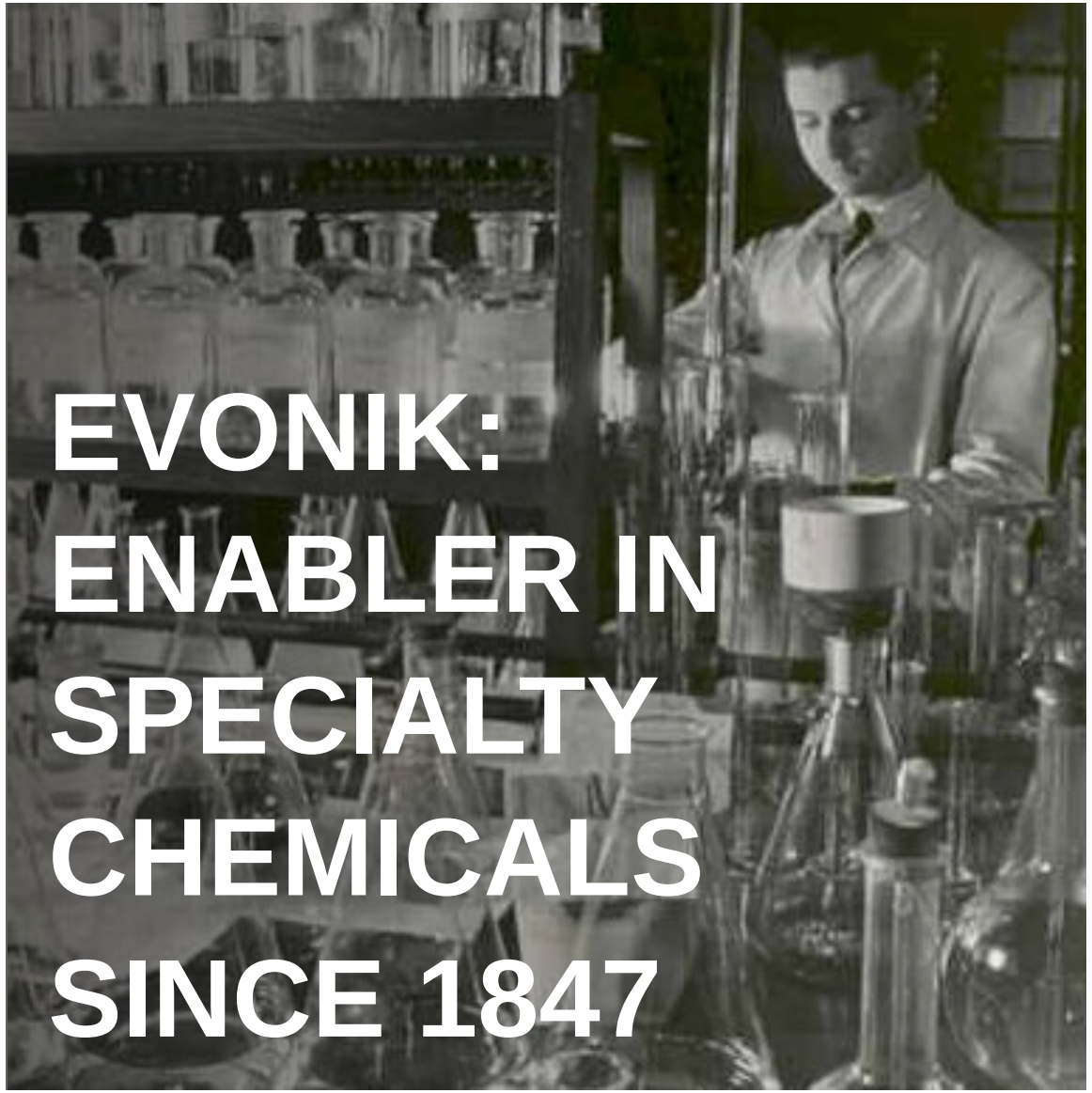
Market Manager PM & Sustainability

Ahmet holds a MSc in Business Chemistry. He started his career with Evonik in 2014. From 2014-2019 he was Product Manager for Precious Metal Powder Catalysts. Since 2019 he is globally responsible for the Precious Metal Management and Sustainability Roadmap of BL Catalysts.



EVONIK: ENABLER IN SPECIALTY CHEMICALS SINCE 1847

- We are **one of the world leaders** in specialty chemicals
- Active in **more than 100 countries**
- **€18.5 billion** sales volume
- **~ 24.000 patents** in Portfolio
- **280** new patents
- **464 million €** F&E-expenses
- **> 1 billion €** Additional sales in innovation growth areas
- Customizing catalysts **since 1957**

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Business Line CATALYST

Global Presence

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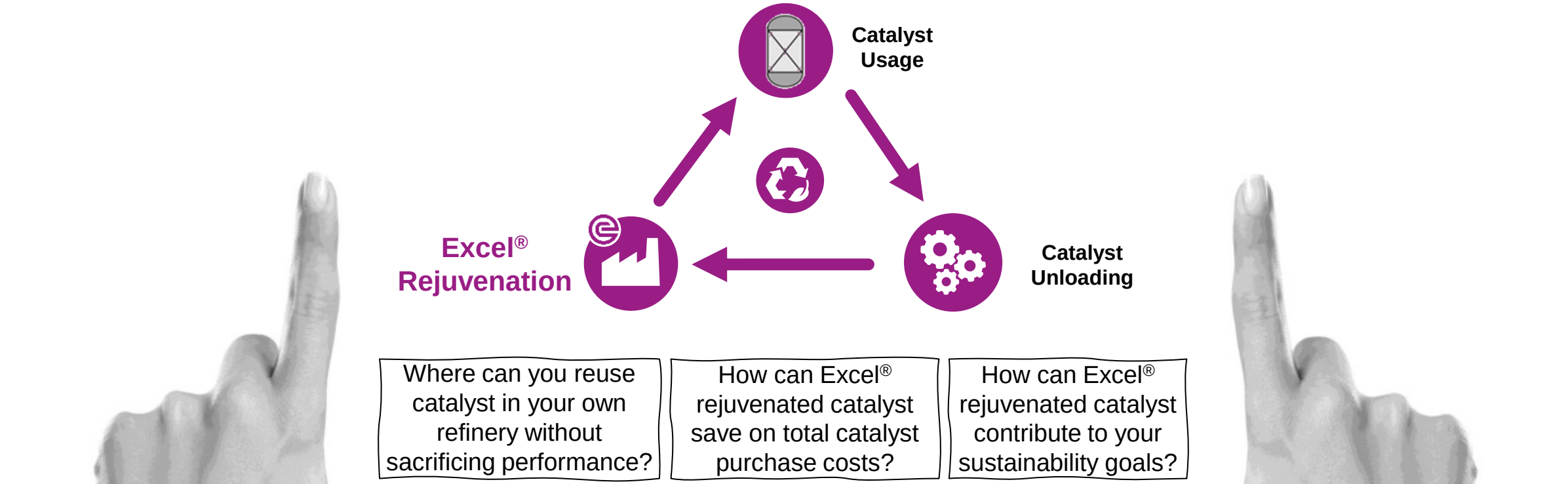
Your key takeaways from today‘s webinar will be:

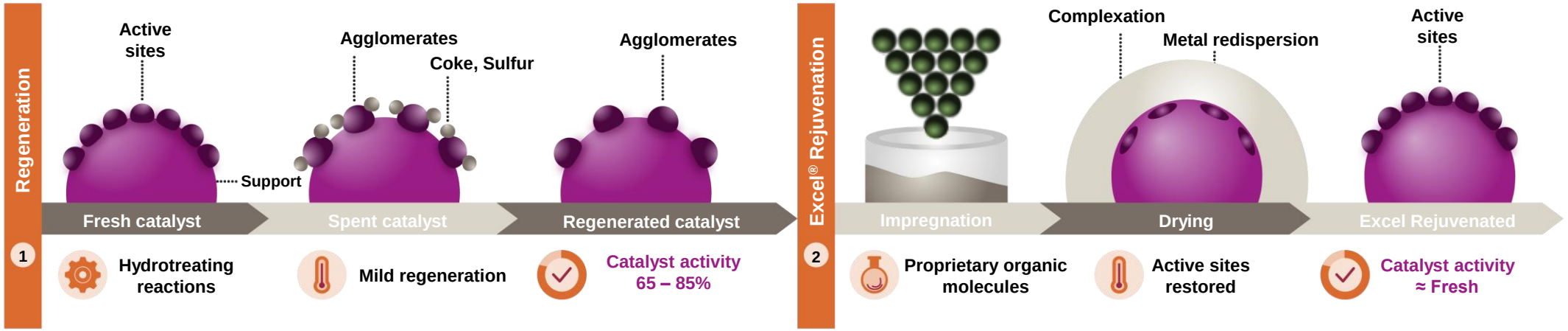


Where can you reuse catalyst in your own refinery without sacrificing performance?

How can Excel® rejuvenated catalyst save on total catalyst purchase costs?

How can Excel® rejuvenated catalyst contribute to your sustainability goals?

Excel® Rejuvenation: Fundamentals



1st step: Regeneration

- Maximize sulfur and carbon removal while carefully controlling local temperatures
- Unique moving belt process to minimize catalyst breakage (attrition) and maximize yield

2nd step: Excel® Rejuvenation

- Efficiently re-disperses the active metals to restore activity back to fresh levels
- Applicable to all type 1 and type 2 catalysts
- Compatible on a wide range of catalysts and applications

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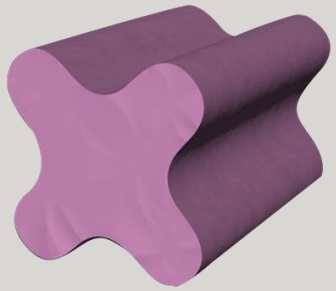
Excel® Rejuvenation: Value Drivers

- Customized Loading Profile
- Technical Projections
- Guaranteed Performance
- 30 – 70% The Cost of Fresh Catalyst
- Sustainable
- Unit Monitoring
- Technical Support During Start-Up
- Troubleshooting
- Similar activity as fresh catalyst



Excel® Catalyst

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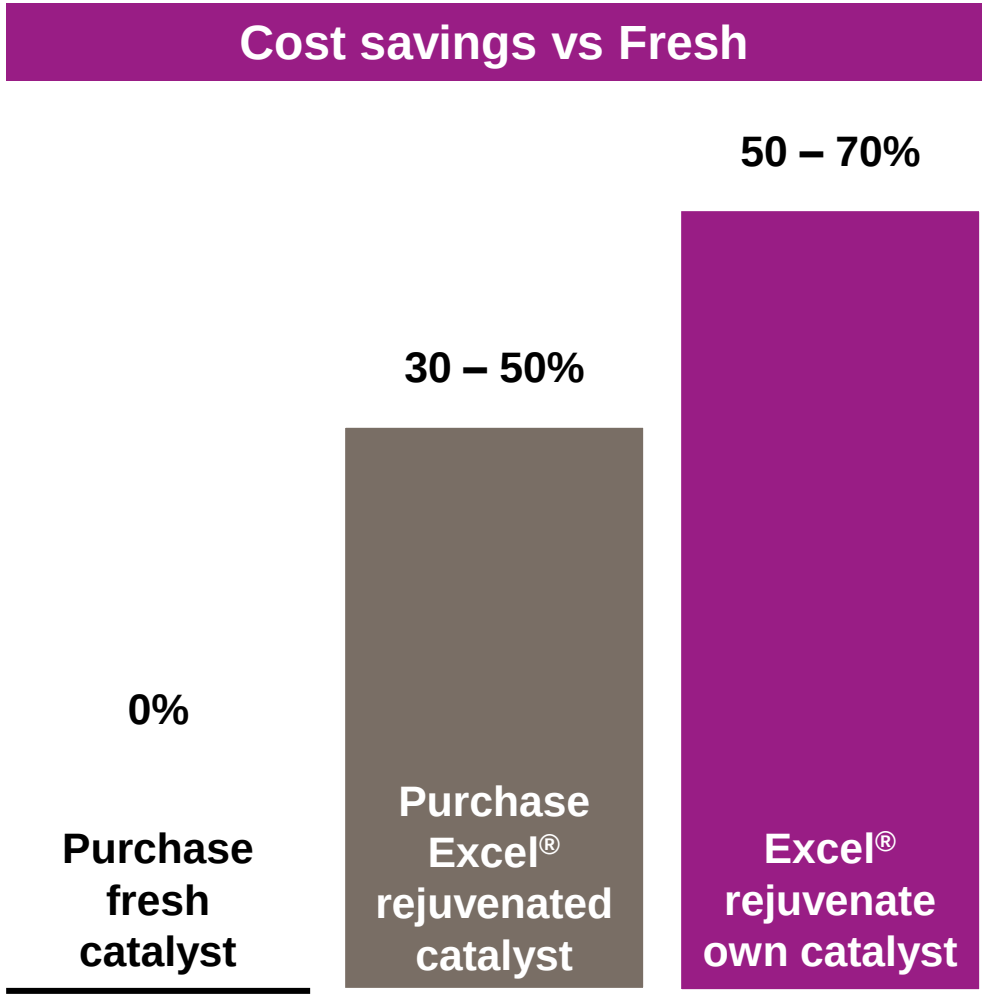
Excel® Rejuvenation: Value Drivers

- Significantly reduce refill cost
- Minimize environmental impact and reduce waste
- Reduce catalyst lead time
- Maximize catalyst reuse and savings with pool management
- Global inventory to meet refinery demands
- Meet cycle length expectations



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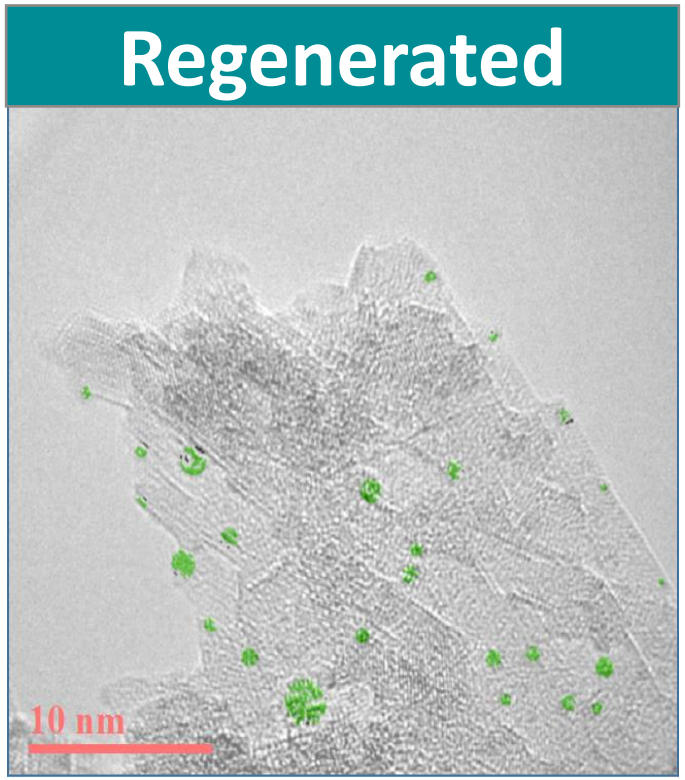
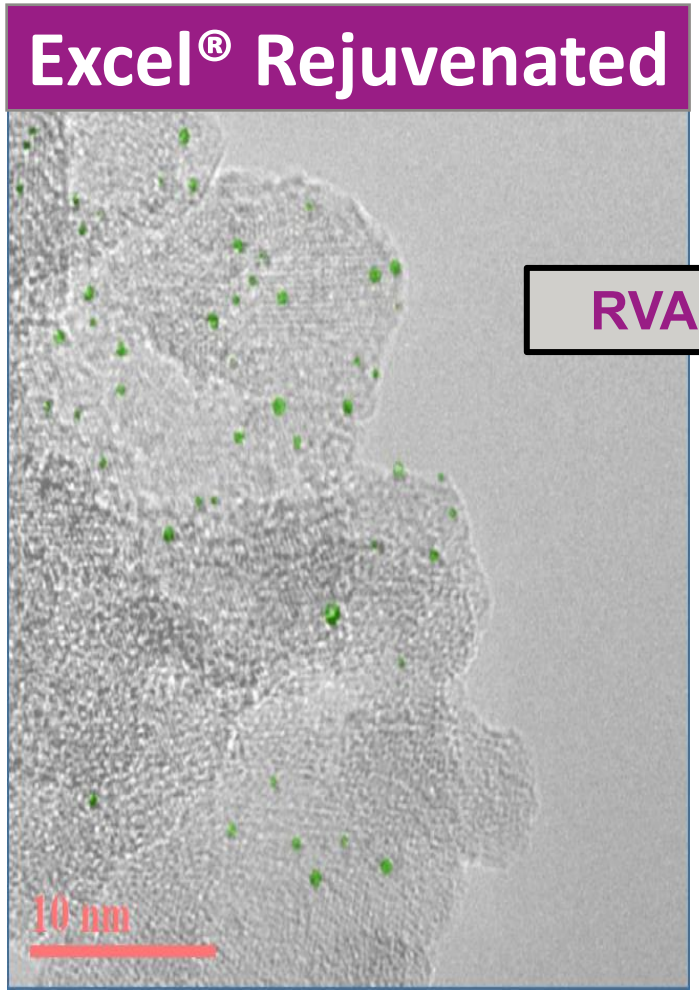
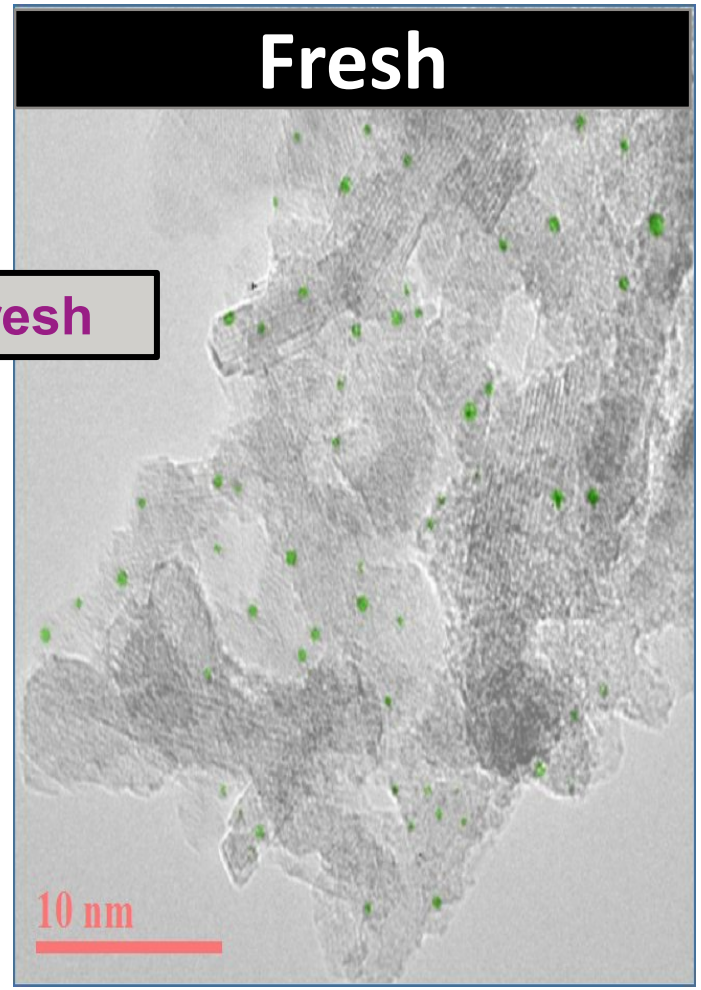
Hydroprocessing Catalyst: Relative Volumetric Activity (RVA)

RVA = 65 – 85%





RVA ≈ Fresh



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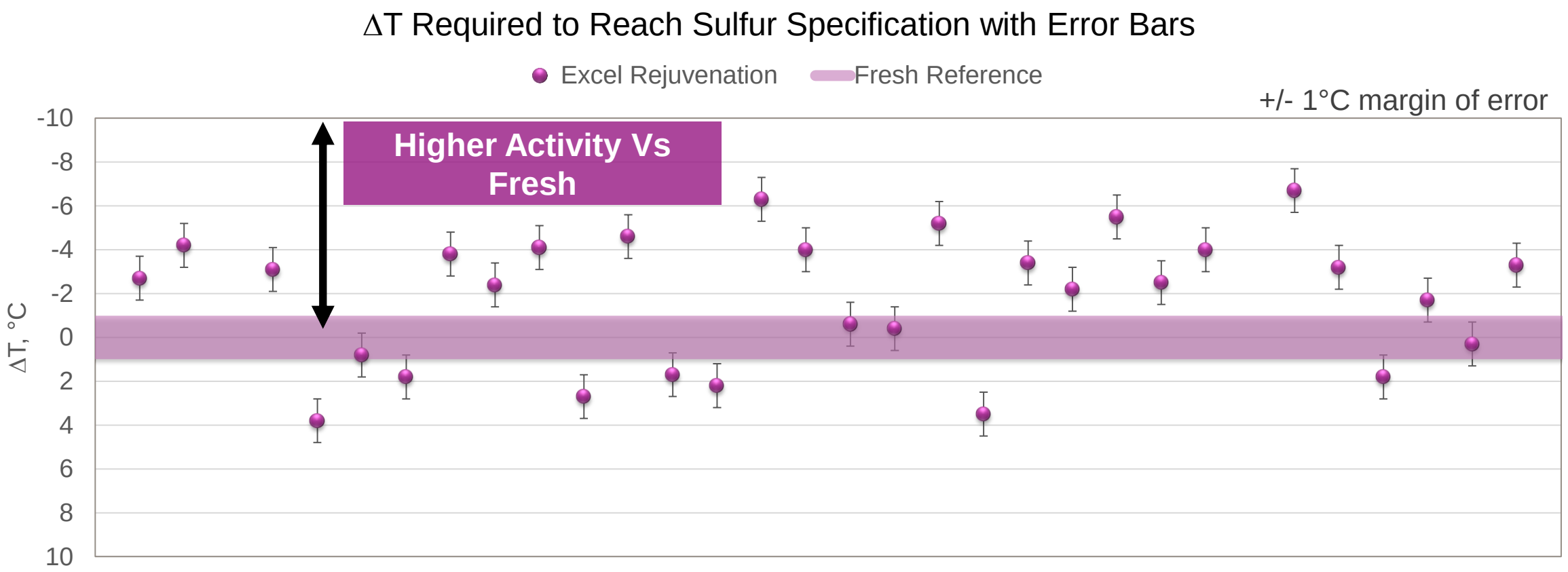
Excel® Rejuvenation: Commercial Production Activity



Excel® Rejuvenation typically performs equivalently or better than its fresh counterpart in internal activity testing

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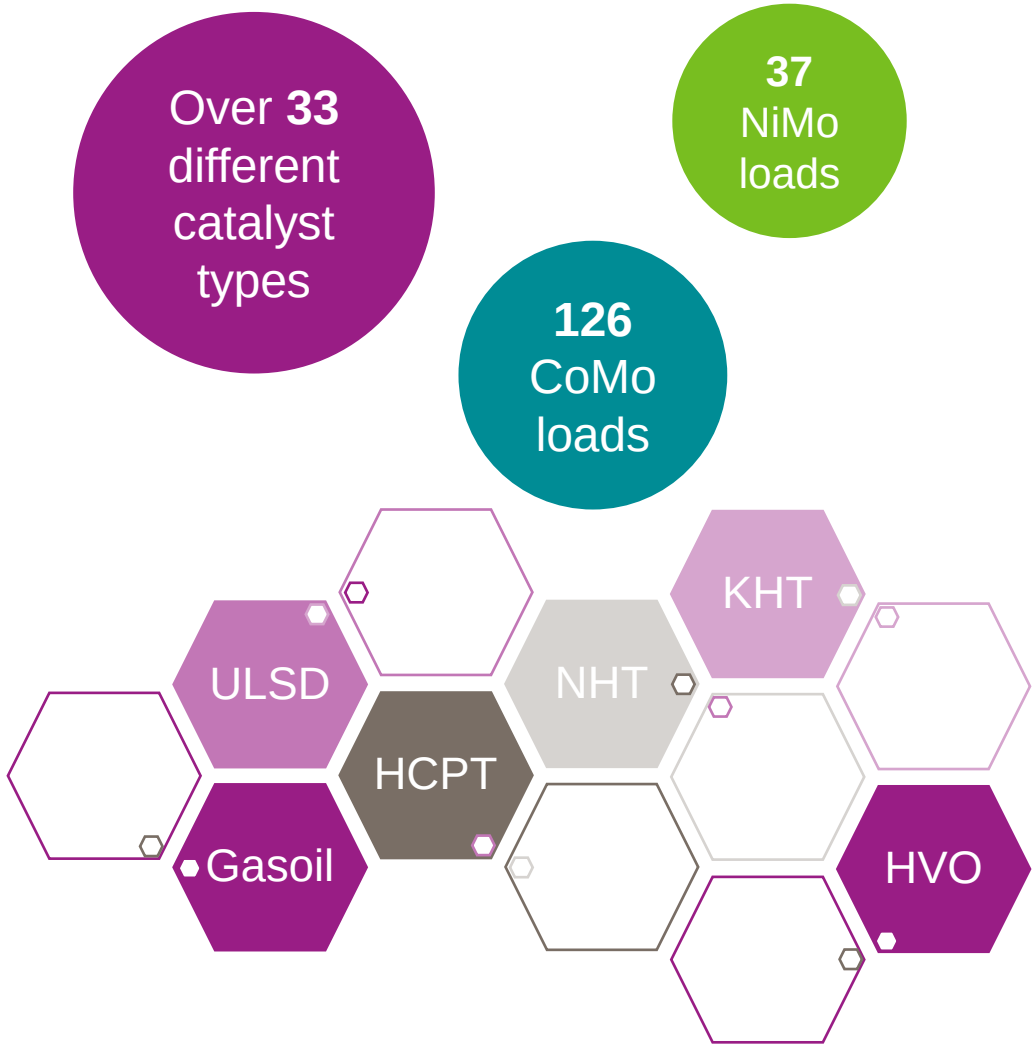
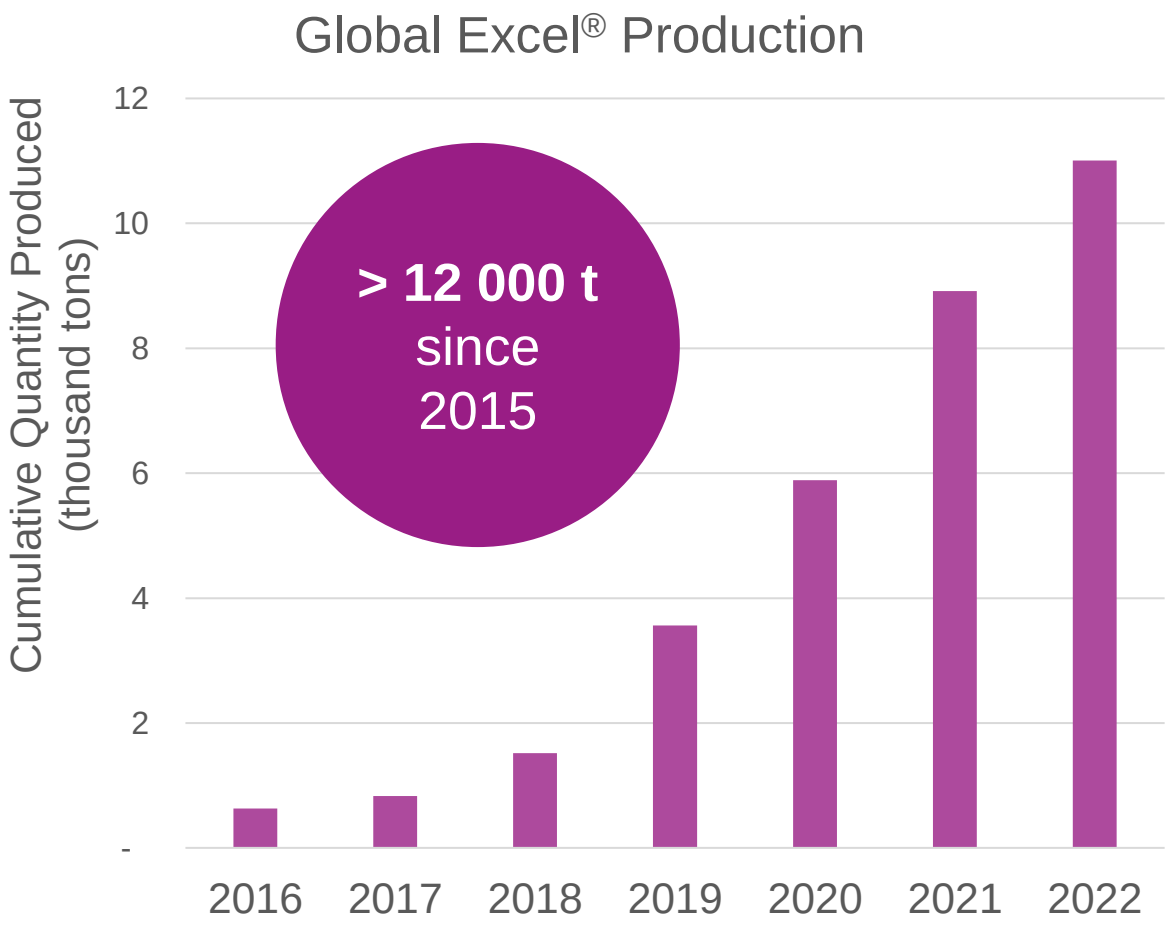
Excel® Rejuvenated Catalysts: Commercial Experience





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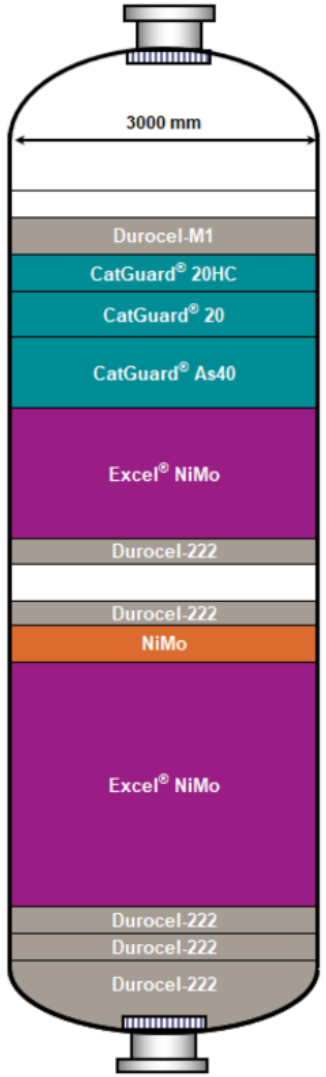
Excel® Rejuvenation Case Study: Europe Refinery - DHT



Feed		
SRGO, VGO, Coker Diesel		
		Diesel Mode
Density	g/mL (°API)	0.86 (33.0)
T90%	°F (°C)	635 (335)
FBP	°F (°C)	680 (360)
Sulfur	wt%	0.34
Nitrogen	ppmw	350
Operating Conditions		
LHSV	hr^{-1}	2.9
Rx Pressure	psi (bar)	1015 (70)
Performance		
Product Sulfur	ppmw	< 11

- **Technical projections**
- **Guaranteed performance**
- **Onsite startup support**
- **Reduced catalyst expense**
- **Reduced Scope 3 Emissions**

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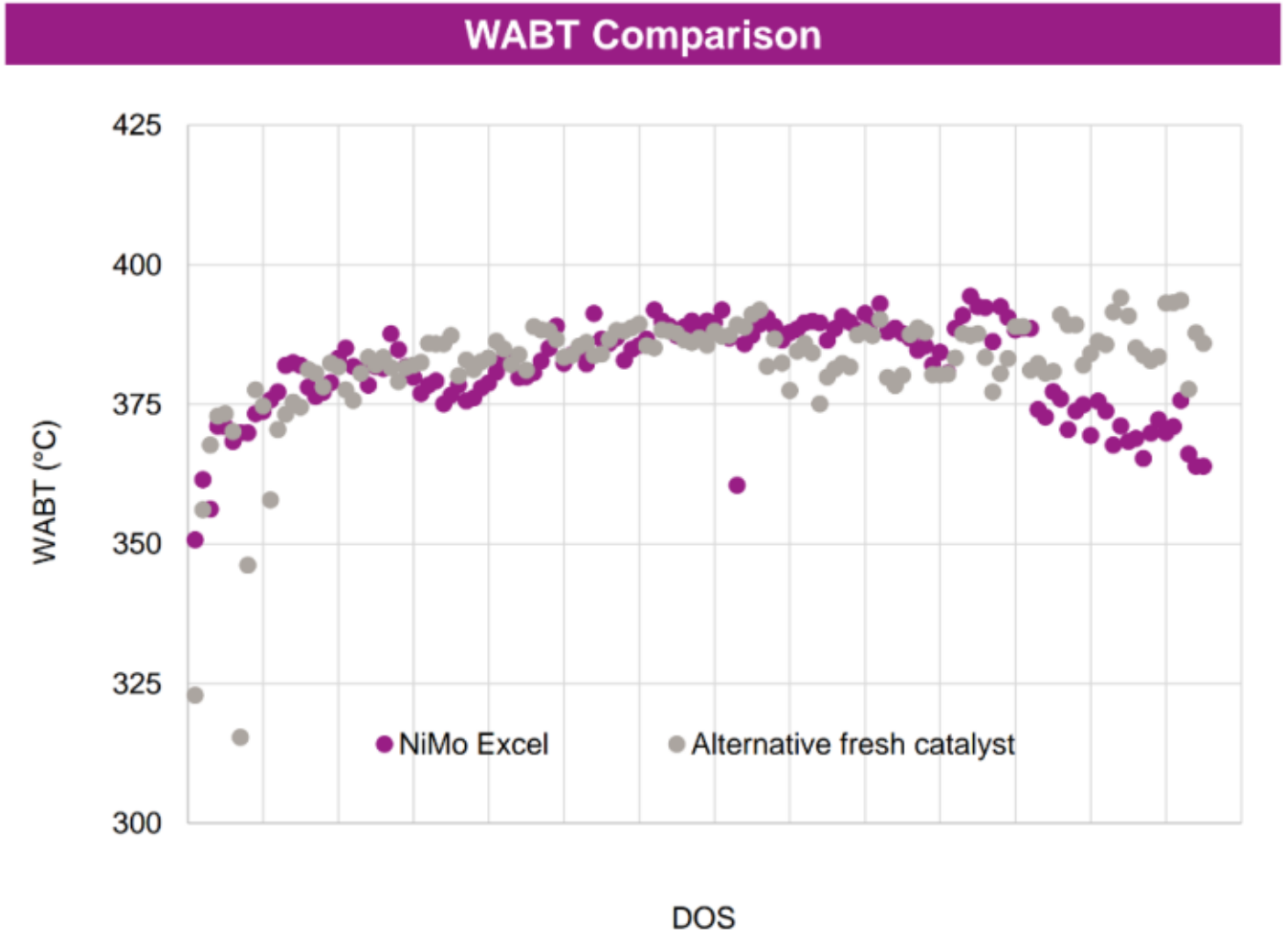
Excel® Rejuvenation Case Study: Europe Refinery - DHT



Excel® rejuvenated catalyst provided **equal performance** compared to previous fresh catalyst

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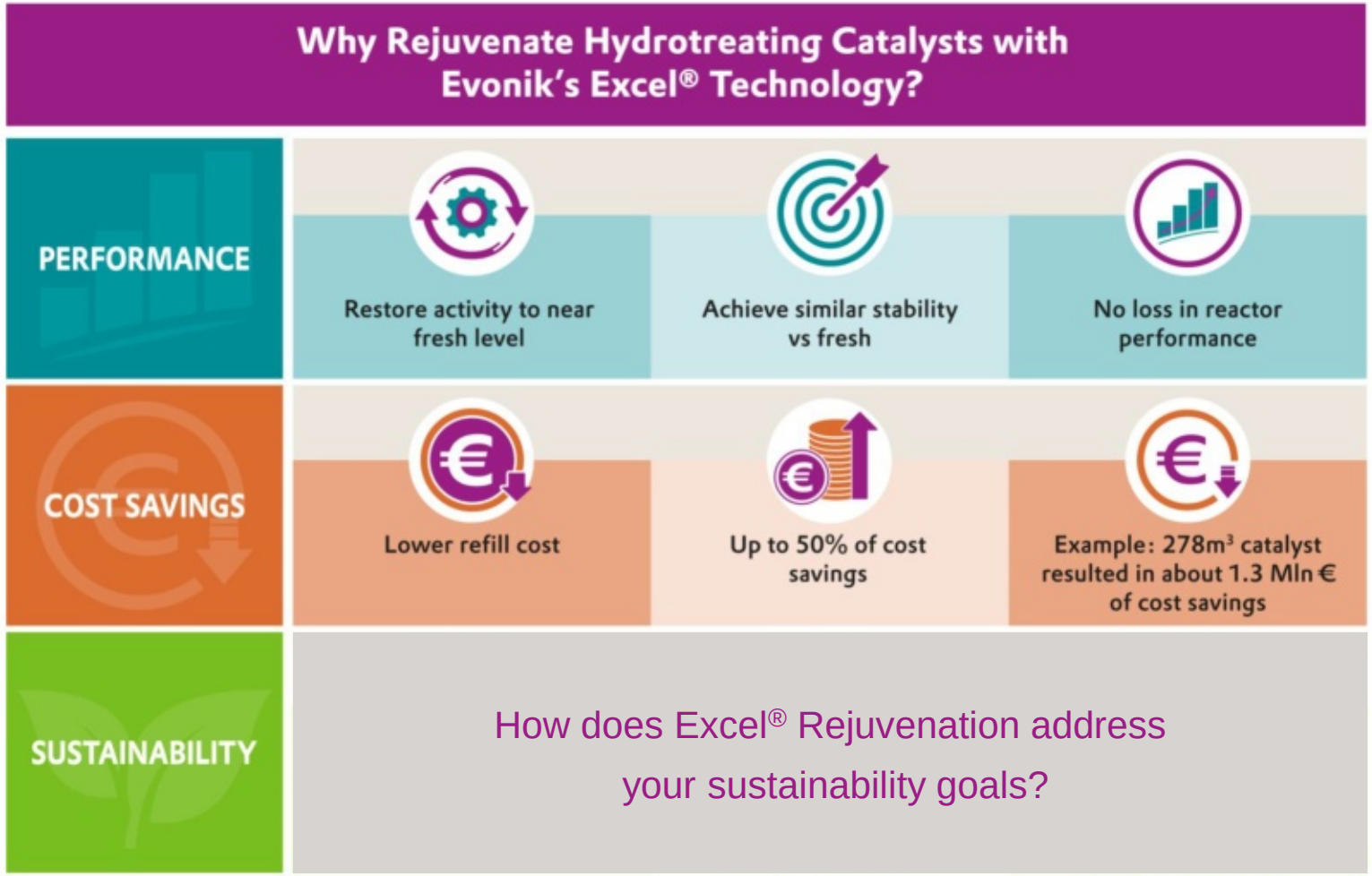
Summary: Excel® Rejuvenation brings performance and cost together



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Excel® Technology: Sustainable Solution for HydroProcessing Catalysts

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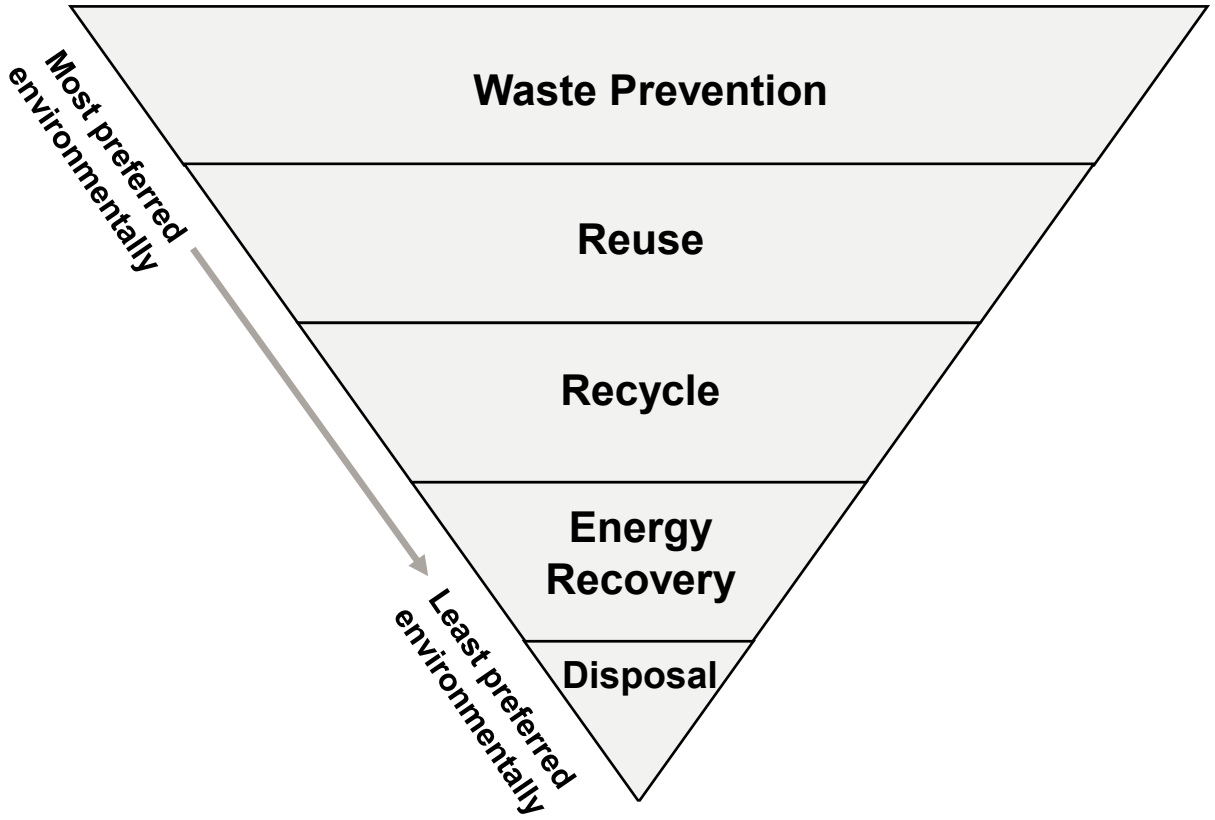
“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Brundtland Commission of the UN (March 20th, 1987)

How to run your process sustainably?
Avoid waste and drive your process resource efficiently!

Waste hierarchy is a set of priorities for the efficient use of resources



Prevent waste & reduce disposal!

E.g. relevant for metal containing catalysts

Ni **Co** **Mo**

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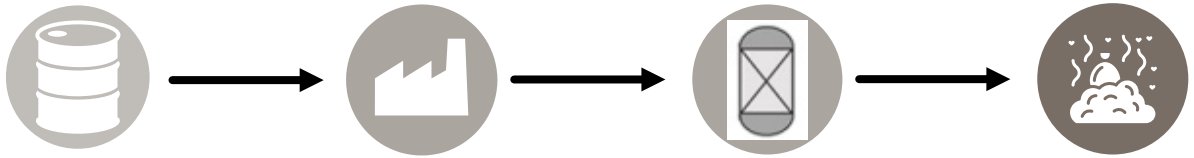
Avoid waste and drive your process resource efficiently!
Current Situation

Linear Economy



- Today's chemical business is a linear economy
- The production of new catalysts emits greenhouse gases that contribute to climate change and requires a lot of resources

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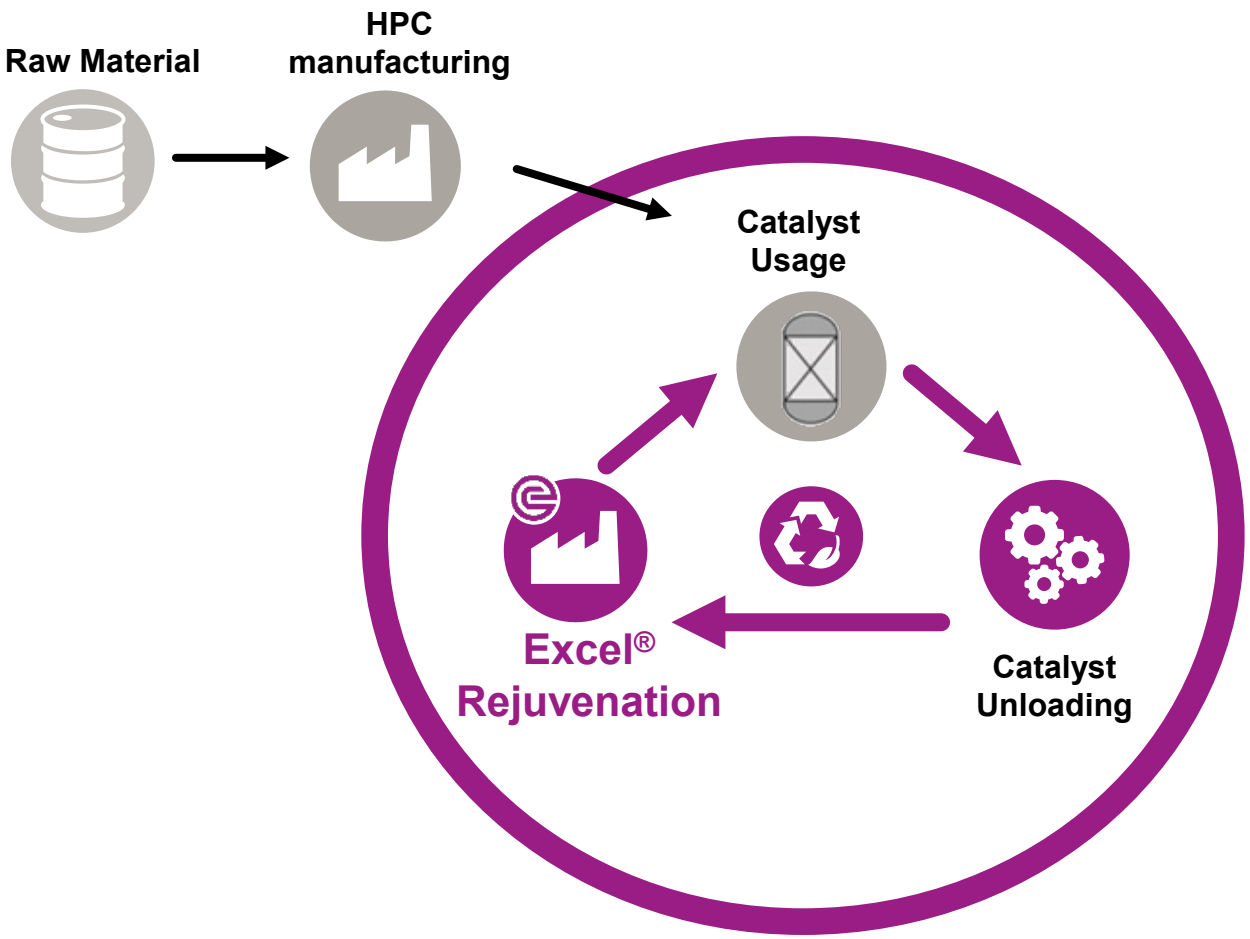
Avoid waste and drive your process resource efficiently!
Evonik's Excel® HydroProcessing Catalysts (HPC) meets the need



Excel® is the effective way to save natural resources, protect the environment & save money

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We can provide you with avoided emissions data through our certified comparative Life Cycle Analysis (LCA)

LCA Process

Data collection

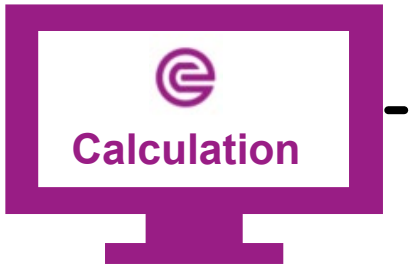
Scope 1 & 2
Own operations emissions

Scope 3

Emissions caused by sourcing and producing raw materials

Cradle-to-Gate

Data validation & calculation



Result interpretation & certification

Global Warming Potential
fresh Catalyst

Global Warming Potential
Excel® HPC

vs.

Result

Communication

Customer benefits

- Emissions transparency
- Identifying key levers

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LCA Process

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Cradle-to-Gate

LCA

Global Warming Potential
fresh Catalyst

Global Warming Potential
Excel® HPC

vs.

Customer benefits

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TÜVRheinland® CERTIFIED

Life Cycle Assessment
Regular Surveillance

www.tuv.com
ID 0000085019

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Significant reduction in global warming potential (GWP) with Excel® Rejuvenation for our customers

GWP
Fresh Catalyst*

vs.

GWP
Excel® HPC*

- Use of Excel® Rejuvenated catalyst results in a **60% reduction in CO_2eq emission compared to fresh**
- Rejuvenation of spent catalyst reduces waste by **60%** respectively

GWP excl. biogenic C, kg CO2e
System boundary: Cradle-to-gate (without packaging)
Applied Life Cycle Assessment(LCA) Standard: ISO 14040:2006 + A1:2020 /ISO 14044:2006 + A1:2018 + A2:2020
Certified ID: C01-2023-03-21257003; TÜV Rheinland Group,
* GWP of ReJuv. catalyst in comparison with literature values of fresh CoMo/γ-Alumina catalyst

TÜVRheinland® CERTIFIED
Life Cycle Assessment
Regular Surveillance
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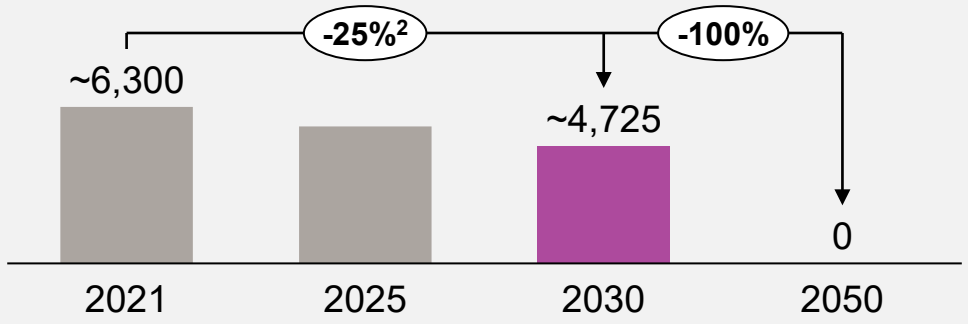
Evonik is also working to reduce emissions in its own production to further support our customers' sustainability ambitions

Our path to climate neutrality

2050 -100%

Scope 1 & 2



Targets for GHG emissions' reduction

Scope 1 and 2
(Well below 2° C)

2030 -25%

Scope 3

2030 -11%

1) SBTi = Science Based Targets initiative; commitment letter signed and handed in for SBTi, 25th April 2022 2) Gross emissions; reference year 2021

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Evonik offers a wide range of sustainability services to support your business

How we can support you

CO_2+ We have the in-house expertise to carry out Life Cycle Assessments for superior transparency of your products, processes and operations

We are partners in your innovation projects - supporting you from development through to a viable sustainable solution

We can help you communicate the benefits of your sustainability efforts

We provide sustainability training and knowledge support to help you make better decisions in your day-to-day work.

The first step

… for creating value through sustainability is to contact us!

In a nutshell: Four compelling reasons to use Excel® Rejuvenation

01
Performance

02
Stability

03
Cost Savings

04
Sustainability

Take advantage of Evonik's Excel® Rejuvenation Technology combined with our global technical service team to optimize your HydroProcessing capabilities


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