Advanced Solutions For Challenging Feeds

Unity™ Hydrotreating Catalysts
Part Of Our Unified Approach

Honeywell UOP’s hydrotreating catalyst portfolio is called Unity™ because we deliver complete catalyst, equipment, licensing and technical support solutions for hydrotreating and hydrocracking. The advanced hydrotreating lineup helps you get the most from heavier and opportunity crudes while meeting tight environmental regulations on fuel quality.

### UNITY HYDROTREATING

<table>
<thead>
<tr>
<th>DEMETALLIZATION</th>
<th>CLEAN FUELS</th>
<th>PRETREAT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Si DEMET</td>
<td>FCC GASOLINE</td>
<td></td>
</tr>
<tr>
<td>HYT-9110 UF-75</td>
<td>HYT-2018</td>
<td>HYT-5119</td>
</tr>
<tr>
<td>HYT-9119 UF-80</td>
<td>HYT-2117</td>
<td>HYT-5219</td>
</tr>
<tr>
<td>HYT-9129</td>
<td>HYT-2118</td>
<td>HYT-6219</td>
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</tbody>
</table>

**Hydrotreating In Action:** From technical experts working together with you to catalysts that help optimize unit performance, you get it all with Honeywell UOP. Our commitment to serving customers with quality products, expert support, and new technologies is stronger than ever.

**Meet All Your Needs With Honeywell UOP**
Complete Portfolio

Honeywell UOP hydrotreating catalysts are pilot-plant tested and commercially proven. You’ll have access to a full range of hydrotreating solutions, so you can meet your exact needs. From Demetallization to Clean Fuels to Pretreat, each Unity Hydrotreating catalyst has been developed and manufactured to Honeywell UOP quality performance standards. Plus, they’re universally compatible and can be used in UOP-designed units as well as other units.

Flexibility To Meet Your Processing Objectives

You have processing goals for your hydrotreating units. Honeywell UOP has the hydrotreating catalysts to achieve these goals. We’ll work with you to find the catalyst or combination of catalysts to help achieve your desired outcome. Whether you want to reduce sulfur, nitrogen and aromatics or enhance cetane, density and smoke point — or often all of the above — you can count on UOP hydrotreating catalysts and our expert team to deliver.

More Than A Century Of Know-How

Honeywell UOP has been serving the refining industry for more than 100 years, including 65 years in hydroprocessing. We have the hydrotreating catalysts and proven technical expertise for optimizing your operations.

Complete Solutions

- Process technology
- Revamp design solutions
- Catalyst solutions
- Equipment solutions

Global Supplier

- A leading supplier of hydrocracking catalysts
- Experience processing a wide range of feedstocks
- Investing in new hydrotreating catalysts

Industry Experience

- 100+ years in the refining industry
- 65+ years in hydroprocessing
- Proven technical expertise
Solutions For Every Need

Demetallization
Removing metals from a hydrotreating unit’s feed helps to maintain longer cycle lengths and get the most from your hydrotreating catalyst. Honeywell UOP demet solutions capture silicon, arsenic, nickel, vanadium and more before they impact downstream units and valuable catalysts.

<table>
<thead>
<tr>
<th>DEMETALLIZATION</th>
<th>SiDEMET</th>
<th>AsDEMET</th>
<th>Ni/V DEMET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYT-9110</td>
<td>UF-75</td>
<td></td>
<td>HYT-8109</td>
</tr>
<tr>
<td>HYT-9119</td>
<td>UF-80</td>
<td></td>
<td>HYT-8119</td>
</tr>
</tbody>
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Clean Fuels
Helps to improve the quality of your fuel products and meet environmental regulations. Whether you need high-activity catalysts for removing nitrogen and sulfur or you’re seeking the selective removal of sulfur in gasoline, these catalyst solutions provide a range of options. The catalyst formulations enable the right level of hydrogen addition and resilience to feed contaminants.

<table>
<thead>
<tr>
<th>CLEAN FUELS</th>
<th>FCC GASOLINE</th>
<th>NAPHTHA</th>
<th>DISTILLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYT-2018</td>
<td>HYT-1118</td>
<td>HYT-4118</td>
<td></td>
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<tr>
<td>HYT-2117</td>
<td>HYT-1119</td>
<td>HYT-6119</td>
<td></td>
</tr>
<tr>
<td>HYT-2118</td>
<td>HYT-9129</td>
<td>HYT-6219</td>
<td></td>
</tr>
<tr>
<td>HYT-2119</td>
<td></td>
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</tbody>
</table>

Pretreat
For a range of contaminant removal and downstream protection, Honeywell UOP pretreat catalysts have you covered. They work with a variety of feeds and configurations to remove nitrogen and sulfur while providing excellent saturation. These high-performance catalysts also feature superb stability for a long cycle length.

<table>
<thead>
<tr>
<th>PRETREAT</th>
<th>FCC VGO PRETREAT</th>
<th>HYDROCRACKING PRETREAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYT-5119</td>
<td>HYT-6119</td>
<td></td>
</tr>
<tr>
<td>HYT-5219</td>
<td>HYT-6219</td>
<td></td>
</tr>
</tbody>
</table>
Hydrotreating Portfolio Examples

Honeywell UOP offers a complete range of advanced hydrotreating catalysts and technologies. Here are details on just a few:

**HYT 9119**

Helps protect valuable downstream hydrotreating, reforming and isomerization catalysts from deactivation due to silicon poisoning.
- Improved capacity for silicon and sulfur removal performance compared to leading silicon trap catalysts
- Provides transition activity to handle highly reactive diolefins and prevent excessive gum formation

**UF UF-80**

High-capacity catalyst used for the removal of arsenic compounds in hydrotreating unit feeds.
- The feed applications include straight-run feedstock, cracked feedstock, and FCC unit feedstock
- Provides protection of downstream catalysts that are sensitive to arsenic to help prevent premature catalyst deactivation

**HYT 1119**

High-performance NiMo hydrotreating catalyst for the removal of sulfur and nitrogen.
- Designed for use in light distillate or naphtha hydrotreating service
- Increased stability and silicon pickup
- Lower loading density for improved fill costs

**HYT 9129**

NiMo catalyst balancing a high silicon pick-up capacity with high activity for sulfur and nitrogen compound removal.
- Helps protect valuable downstream hydrotreating, reforming and isomerization catalysts from deactivation due to silicon
- Provides high activity to remove sulfur and nitrogen compounds
- Helps extend cycle lengths in coker naphtha service

**HYT 4118**

Enhances ULSD unit performance through superior desulfurization and low hydrogen consumption.
- Designed for low- to medium-pressure ultra-low sulfur diesel hydrotreating
- High activity and stability for longer cycle lengths while meeting ULSD product qualities
- Highly competitive fill cost while achieving high desulfurization performance
- Controls hydrogen consumption to optimize hydrotreating unit
- Works with a range of feedstocks including straight run diesel, light cycle oils, light coker gas oils and other cracked feedstocks

**HYT 6219**

State-of-the-art, high-activity catalyst that provides excellent desulfurization, denitrogenation, and hydrogenation.
- Designed for challenging feedstocks, including distillates, VGO, heavy coker gas oils, DAO, and more
- Achieves longer operating cycles and improves sulfur and nitrogen reduction in hydrocracking pretreat and ultra-low sulfur diesel units
- Enhanced dispersion of metals results in higher activity and increased stability
- Rejuvenation demonstrated up to 95% of fresh catalyst activity
Unity Hydrotreating In Action

Meeting Sulfur Reduction Goals
When a major refiner with a single-stage hydrocracking unit was unable to remove enough sulfur from their feedstock to produce their desired quality of diesel, they turned to Honeywell UOP for help. After analyzing the feedstock and performing pilot plant tests, Honeywell developed a hydrotreating solution using its HYT-6219 catalyst. Once the hydrotreating catalysts were loaded, the refiner quickly achieved its goal of less than 10 wppm sulfur in its diesel product. The activity and stability of the HYT-6219 hydrotreating catalyst stayed in line with predicted levels and continues to meet processing objectives.

Improved Selectivity Without Performance Loss*
To meet EPA guidelines for sulfur content, refiners are required to reduce sulfur in FCC gasoline to very low levels, which presents a significant drop in octane. Honeywell UOP’s HYT-2118, selective desulfurization catalyst, offers higher selectivity than commercially available Non-UOP catalysts. Combined with HYT-2117, Honeywell UOP’s selective hydrogenation catalyst, and HYT-2119, Honeywell UOP’s mercaptan control catalyst, HYT-2118 provides a comprehensive solution for selective desulfurization for FCC gasoline. More importantly, HYT-2118 helps to preserve additional octane at lower product sulfur levels.
Upgraded Quality*
A refiner with a challenging feed of cracked stock and coker material wished to produce ultra-low sulfur diesel, but was unable to achieve the ultra-low sulfur requirements. Working with Honeywell UOP changed that. Using HYT-6219 in the hydrotreating unit helped to dramatically lower sulfur content while also raising cetane levels. The commercial unit now produces high-quality — and highly profitable — diesel fuel.

<table>
<thead>
<tr>
<th>PRODUCT QUALITY</th>
<th>PREVIOUS CYCLE</th>
<th>AFTER RELOAD WITH HYT-6219</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur, wt-ppm</td>
<td>50 – 150</td>
<td>3 – 8</td>
</tr>
<tr>
<td>Cetane Index</td>
<td>46 – 51</td>
<td>48 – 53</td>
</tr>
<tr>
<td>Pour Point, °C</td>
<td>-5 to – 18</td>
<td>-13 to &lt; -20</td>
</tr>
<tr>
<td>CFPP, °C</td>
<td>-3</td>
<td>-10</td>
</tr>
<tr>
<td>Flash Point, °C</td>
<td>64 – 66</td>
<td>60 – 68</td>
</tr>
</tbody>
</table>

Operational Savings*
With utility costs and short cycles eating into the profits, a naphtha refiner asked Honeywell UOP for help. With a switch to highly active HYT-1119, the refiner achieved the needed levels of sulfur and nitrogen removal while dropping the reactor’s operating temperature by 20° C. Not only did the refiner cut utility costs through the lower temperature, but they also saved through a much longer cycle.

*Performance of catalysts and refinery units may vary based on many variables, such as feedstock quality, environmental conditions, system configuration, age of catalysts and others. Results shown cannot be expected in all cases.
Part Of The Unity Portfolio

Hydrotreating technologies and catalysts are one piece of the complete Honeywell UOP Unity hydroprocessing portfolio. Whether your goal is to meet new stringent product specifications, improve flexibility or meet catalyst cycle length, count on Honeywell UOP for the catalysts, processes, and more needed to help improve unit performance.

Customer Portal

The Honeywell UOP portal offers information on products and services pertinent to our customers and partners. The portal also offers site-specific support and tools that will help you manage and operate your Honeywell UOP processes.

Login at www.accessuop.com.

Learn More

For more information about Honeywell UOP’s hydrotreating catalysts, please contact your Honeywell UOP representative or visit www.uop.com.

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