Catalysts & Technology Licensing case study

ExxonMobil

# Refiner dramatically improves diesel yield by converting to MIDW™ technology

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By switching to MIDW technology from a cracking-based dewaxing catalyst, a big margin impact was achieved by a US refiner.

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Estimated dollars per barrel processed

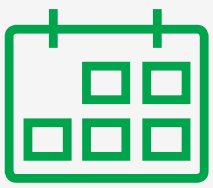
$5.50

Estimated winter diesel yield improvement

>40%

Catalyst investment recovered in

Less than 2 months



## Challenge — Improve diesel yield and quality

A US refiner was using a competitor's cracking-based dewaxing catalyst in a 3 kbd Diesel Hydrotreating Unit (HDT) to process a local crude that can be fairly sweet but contains a high N-paraffin content in distillate. The diesel yield ranged from 20 to 40 percent based on a cloud point reduction target ranging from 20 to 60°F using cracking dewaxing technology. Respectively, outside of the poor cold flow properties, paraffins provide high octane, low density and low T90.

The major challenge with paraffin-containing distillate feeds and conventional cracking dewaxing technologies is the over-cracking of diesel to less valuable products: LPG and Naphtha. By contrast, isomerization of the paraffin produces a high diesel yield and the isomerized paraffin has a very high diesel quality.

### HDT configuration

In one case, a refiner's distillate hydrotreater includes a two-bed lead reactor (R1) followed by a single-bed lag reactor (R2). R1 is loaded with hydrotreating and cracking dewaxing catalyst, while R2 is loaded only with hydrotreating catalyst. **Figure 1** shows the distillate HDT configuration.

## Solution — Switch to MIDW™ technology

ExxonMobil Catalysts & Licensing technical experts concluded that a drop-in catalytic solution could meet the refiner's needs with existing hardware. The experts recommended changing to MIDW, which would enable the refiner to:

- Meet the desired diesel cloud and pour point specifications
- Significantly improve diesel yield and quality relative to cracking dewaxing technology
- Use existing hardware, thereby minimizing capital expenditure

**Figure 2** shows the typical diesel yield advantage of MIDW compared to cracking dewaxing. MIDW is a commercially proven technology installed in over 14 units worldwide that creates value by allowing refiners to produce significantly more distillate, or greater than 10°C delta cloud point (dcp) (18°F). Following an economic and risk analysis, conducted with ExxonMobil, the refiner implemented MIDW as a drop-in catalyst. Only small modifications to the existing trays and the thermocouple layout were needed to bring the reactor up to modern-day standards, costing less than $0.5M, which was recovered in less than two months of operating the new system.

## Estimated benefits — $6M to $12M/yr, or $5.50 per barrel processed

**Figure 3** compares MIDW with cracking dewaxing for a high N-paraffin (~70 lv%) distillate feed for the client's summer and winter specifications. Improvement with MIDW ranged from 26 to 42 wt% diesel yield.

**Figure 1: HDT configuration**

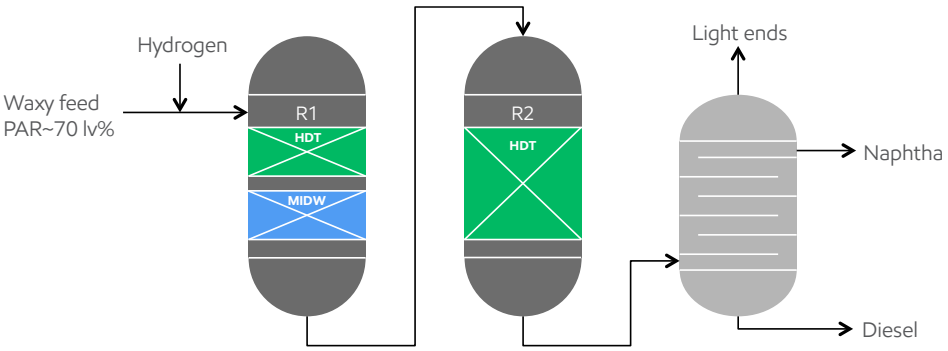



**Figure 2: MIDW vs. cracking dewaxing technology — yield vs. cloud point reduction**

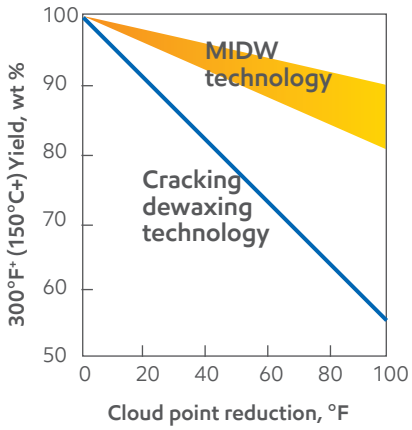
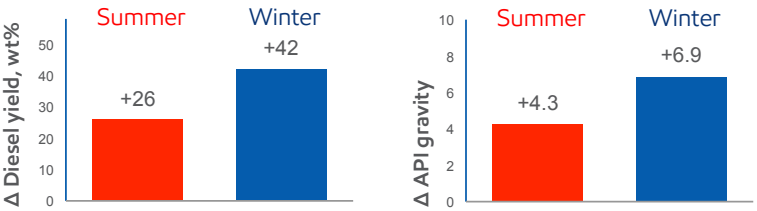



**Figure 3: Estimated improvement in HDT effluent properties by switching from a cracking dewaxing catalyst to MIDW**



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