

GRACE

ProtAgon™ 4G

ProtAgon™ 4G is the latest generation of Grace's propylene maximization technology. Propylene yields of over 12wt% have been achieved with this catalyst technology.

ProtAgon™ 4G is manufactured using the Grace EnhanceR™ Technology Platform, and is an extension of the ProtAgon catalyst family, which is the market leader in the EMEA region (Fig. 1).

of EnhanceR™ applications

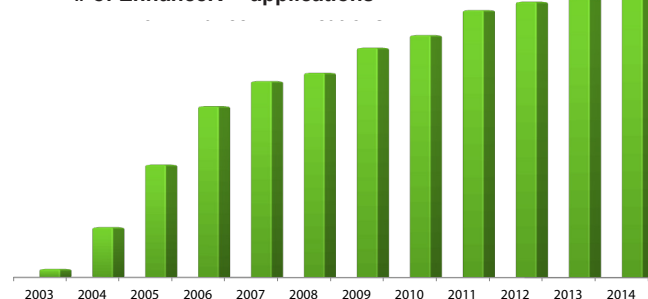


Fig. 1. ProtAgon™ 4G is part of Grace's EnhanceR™ technology, the No.1 platform in EMEA.

ProtAgon™ catalysts bring the following performance benefits to unit operations and product quality:

- highest propylene yields
- high intrinsic cracking activity
- improved operational flexibility
- premium bottoms upgrading
- excellent attrition resistance

The enhanced propylene selectivity of ProtAgon™ 4G catalysts can also be used to provide improved operational flexibility at constant high propylene yields by relieving constraints in FCC units, which are not able to handle very high propylene production levels.

ProtAgon™ 4G Case Study

Refinery F switched to ProtAgon™ 4G to help them achieve the design propylene yield of over 12.5wt% following a major unit revamp in this hydrotreated VGO feed application.

ProtAgon™ 4G Case Study

Feed sp gr	0.89
ecat Ni+V	120 ppm
Gain in propylene yield (ACE data)	+0.7 wt%
Gain in propylene yield (unit data)	+0.7 wt%

Table 1. Refinery F, targeting maximum propylene yields, successfully used the latest ProtAgon™ 4G latest catalyst technology.

By subsequently upgrading to the **ProtAgon™ 4G** technology, the refinery was able to further boost the propylene yield by an additional 0.7wt%.

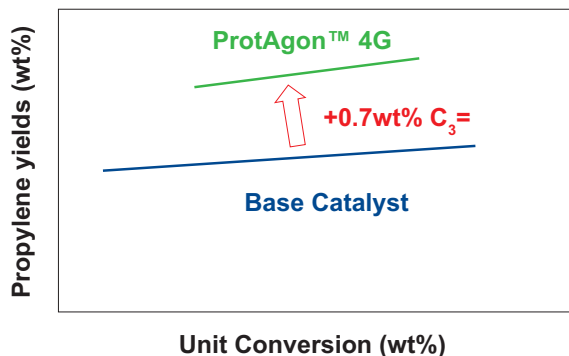


Fig.2. ProtAgon-4G provides 0.7 wt% additional propylene at Refinery F.

ProtAgon™ 4G catalysts are fully compatible with all Grace additives.

Technical Service

An equally critical component associated with processing challenging feeds is solid technical service support. Grace has been providing industry-leading technical service to the refining industry since 1947.

Grace's experienced engineers support FCC customers with:

- Application and operations expertise
- Start-up and optimization assistance
- Industry benchmarking
- Feed characterization and pilot plant studies

Understanding feed impacts earlier allows opportunity to optimize the operating parameters and catalyst management strategies, enabling a more stable and profitable operation.

Innovation

The ProtAgon™ 4G is the latest in a long line of Grace's innovation in catalyst technology, and is the product of Grace's global team of research scientists.

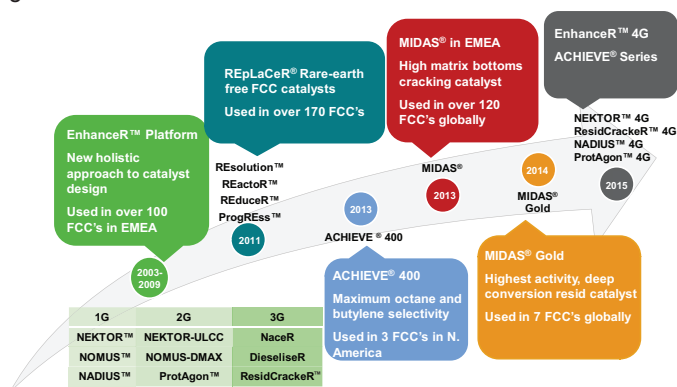


Fig. 3. The latest ProtAgon™ 4G result from Grace's innovation in FCC catalyst technology.

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