

GRACE

ResidCracker™ 4G

ResidCracker™ 4G is the latest generation of Grace's coke-selective bottoms cracking ResidCracker™ catalyst family for residue FCC feed applications.

ResidCracker™ 4G is an extension of the ResidCracker™ catalyst family, a component of the EnhanceR™ technology platform, which is the market leader in the EMEA region (Fig. 1).

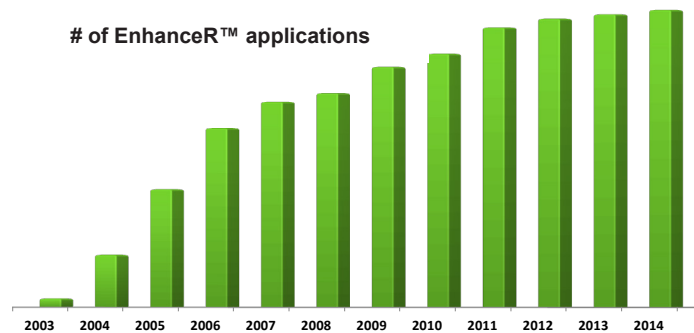


Fig. 1. ResidCracker™ 4G belongs to Grace's EnhanceR™ technology platform, EMEA market leader for residue applications.

ResidCracker™ 4G incorporates new technologies that were developed during the extensive Grace R&D program that was initiated as a result of the tight oil boom in North America and the new challenges faced by European refineries.

This R&D program resulted in advances to the following five functionalities:

- Higher Diffusivity Matrices
- Flexible Hydrogen Transfer
- Higher Activity
- Advanced Metals Tolerance
- Dual Zeolite Functionality.

As shown in Fig. 2, ResidCracker™ 4G features higher diffusivity matrix, advanced metals tolerance and flexible hydrogen transfer.

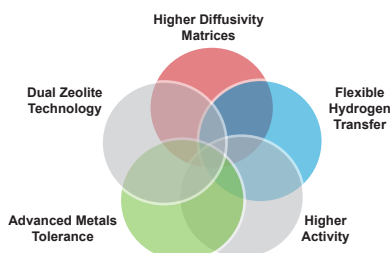


Fig. 2. New functionalities utilized in ResidCracker™ 4G.

ResidCracker™ 4G Case Study

ResidCracker™ 4G was successfully used in Refinery B. Refinery B operates a 30,000-barrel-per-day FCCU and was seeking to improve bottoms upgrading into max LCO, within the regenerator temperatures and air blower limitations.

ResidCracker™ 4G provided a 1-2wt% boost in LCO yield through enhanced bottoms upgrading, as illustrated in Fig. 3, without compromising the excellent coke selectivity of the base catalyst.

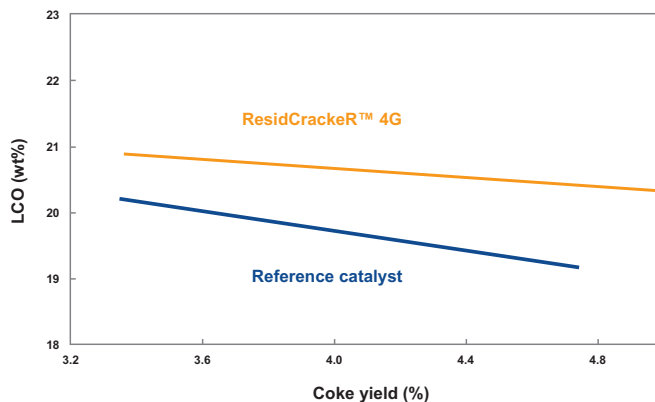


Fig. 3. ResidCracker™ 4G technology improved bottoms upgrading into LCO while maintaining coke selectivity in Refinery B.

The use of ResidCracker™ 4G resulted in better bottoms upgrading into LCO while maintaining excellent coke selectivity. The FCC unit at Refinery B was able to increase its operating window and process more residue.

ResidCracker™ 4G catalysts bring the following performance benefits to unit operations:

- premium bottoms upgrading
- selective cracking towards LCO
- excellent coke selectivity
- excellent attrition resistance

ResidCracker™ 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

ResidCracker™ 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.

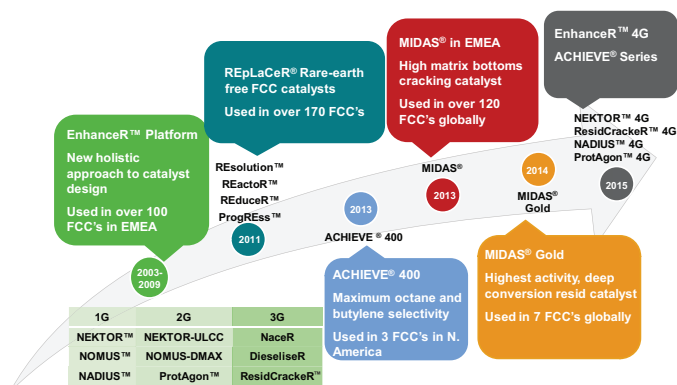


Fig. 4. ResidCracker™ 4G catalysts result from Grace's innovation in FCC catalyst technology.

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