Get More from Your FCC

Praxair oxygen enrichment technology for the fluid catalytic cracker (FCC) unit can improve capacity by up to 35% while reducing emissions and increasing operational flexibility.

Praxair experts have decades of experience in FCC operations and employ in-depth techniques to analyze processes and identify where oxygen can improve performance. In addition, we have extensive project execution and operations experience, gained through over 20 refinery oxygen enrichment installations. This experience enables us to implement FCC improvements with minimal to no downtime and with an ever present focus on safety.

Increase Capacity

Capacity increases vary from site to site, but typically regenerator capacity can be improved by up to 30% when a velocity limit is encountered and by up to 35% when an air blower limit is reached. Since oxygen is injected downstream of the air blower, there is no noticeable impact on air blower operation and every increment of added oxygen increases the coke burn capability.

Praxair FCC Enrichment is able to overcome some of the traditional challenges to increasing FCC throughput, including limits on wet gas compression or flooding in the gas recovery section. Increasing the pressure of the reactor and regenerator allows the pressure of the gas recovery system or the inlet pressure of the wet gas compressor to be increased and is a low cost approach to dealing with these limits. The required higher air blower discharge pressure reduces the air blower capacity, while oxygen enrichment is a low capital cost approach for replacing this lost air blower capability.

Typical Impact of FCC Enrichment on Regenerator Capacity

![Graph showing the typical impact of FCC enrichment on regenerator capacity. The graph displays the percentage of improvement in coke burn rate and the percentage reduction in velocity against the percentage of oxygen. The data points indicate a positive correlation between the percentage of oxygen and the percentage of improvement.]
What is FCC Enrichment?
FCC regenerator coke combustion capacity can be limited by the air blower rate, superficial velocity, or velocity in critical components. Since nitrogen from air makes up a majority of the flue gas, enriching air with oxygen causes a substantial reduction in velocity.

Enrichment is achieved by inserting a sparger into the air line after the air blower. Sparger design and placement is critical to achieving adequate mixing. Oxygen is fed to the sparger through a sophisticated safety and control system.

Improve Operational Flexibility
Since FCC economics can vary weekly or seasonally, tuning the FCC operation with enrichment to maximize total revenue can be of great value. Oxygen enrichment can be quickly adjusted from zero to full rate to accommodate loss of air blower efficiency due to hot weather or changes in feed type, conversion, or charge rate.

Praxair has a proprietary FCC simulation program that can be used to quickly evaluate the benefits of using enrichment for different economic or operating scenarios.

Additional Benefits
The increased oxygen content of the air can improve operation of any downstream flue gas treating equipment due to lower velocities and can enhance SOx capture catalyst efficiency. In addition, the higher oxygen partial pressure can improve regenerated catalyst quality and reduce afterburn issues.

Low Capital with Minimal Downtime
Oxygen enrichment test programs and trials can often be conducted without the need to shut down the unit. In many cases testing only requires a hot tap of the existing unit combustion air line downstream of the air blower. In addition, Praxair oxygen injection systems have been safety tested through hundreds of application technologies.

We have extensive experience installing oxygen enrichment systems with over 20 FCC units currently in service. Our depth of experience and ongoing technology improvements combine to help customers find the right system to reach their operational and environmental goals.

Why Praxair
Praxair has more than 50 years of experience collaborating with refineries to improve refinery throughput and reduce emissions. This real-world expertise led us to be the first to apply oxygen technology to FCC and SRU units. We assist refineries worldwide to better use industrial gases to meet their productivity and environmental goals.

To find out what Praxair oxygen applications can do for you, visit us at www.praxair.com or call 1-800-PRAXAIR (716-879-4077 outside the U.S.).

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