Reduce FCC Emissions and Increase Operational Flexibility

Praxair has a practical, low-capital technology for refiners looking for a new approach to improving operational flexibility and reducing emissions. Our proprietary CONOx control system can improve flexibility by providing options to modify the operation of the FCC unit to meet environmental limits or improve profitability.

Our refining specialists have collaborated with refiners for decades and have intimate knowledge of FCC units. 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.

Reducing Emissions

Through the use of CONOx technology, CO levels are significantly reduced and NOx emissions can be reduced up to 60%. Higher levels of NOx reduction are possible when the system is used in conjunction with other low capital control methods like SNCR or NOx additives.

**Full Burn Regenerator**

In a full burn regenerator the CO levels downstream of the CONOx system are a function of temperature and mixing and we can get down to 50 ppm CO at 1400°F. Praxair uses CFD modeling to optimize mixing. While dependent on many factors, full burn FCC regenerators using CONOx can achieve 60% NOx reduction or NOx levels as low as 20 ppm in the flue gas, results dependent on operating conditions in the FCC.

**CONOx System Impact on FCC CO Concentration**

*Inlet temperature = 1,200 to 1,250°F*

*Inlet CO levels*
- 4000 ppmv CO
- 550 ppmv CO
- 100 ppmv CO

*Dry basis*
Partial Burn Regenerator
In partial burn units CONOx technology will destroy NOx precursors (ammonia and HCN) that convert to NOx in the CO boiler. Using Praxair technology, NOx leaving the CO boiler can typically be reduced by up to 60%. The regenerator can also be operated deeper in partial burn to achieve rate or yield benefits while maintaining or reducing NOx leaving the CO boiler.

Engineering modeling is used to predict the level of NOx precursor destruction and resulting stack NOx. Praxair’s proprietary model was developed using experimental data and uses inputs from individual refinery FCC operations to predict how CONOx technology will impact emissions. This tool is useful for gauging performance prior to installation and evaluating various performance scenarios.

How it Works
Praxair’s CONOx technology utilizes a specialized lance to inject oxygen into the off-gas duct between the regenerator and the CO boiler or heat recovery boiler. The key to the technology is a high velocity jet of heated oxygen that rapidly mixes with process gases. Due to the extraordinary jet mixing characteristics, CONOx technology is significantly more efficient than a standard oxygen jet.

The quick mixing and free radical reactions will effectively oxidize CO in the flue gas duct at temperatures less than 1400°F. The CONOx process does not create NOx because these temperatures are not high enough.

Improving Operational Flexibility
Operators are able to improve yields by taking advantage of lower regenerator temperatures or by increasing charge rates through the elimination of regenerator or CO boiler constraints. In addition, the CONOx system can reduce or even eliminate the need for CO boiler supplemental firing.

Other benefits can include lower velocity and reduced combustion promoter use. Operational synergies can exist where oxygen enrichment is already in use.

Low Capital with Minimal Downtime
Praxair designs each CONOx system with the necessary controls to provide a high level of safety. Typically the major components required for a CONOx installation are a control system and a CONOx lance. The CONOx lance is designed to allow installation while the unit is in operation.

Choose Praxair
Praxair has over 50 years of experience collaborating with leading refiners and was the first company to apply oxygen technologies to both the FCC and SRU. CONOx is just the latest example of how Praxair’s dedicated team is working to provide refiners with practical approaches to real industry issues.

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.).