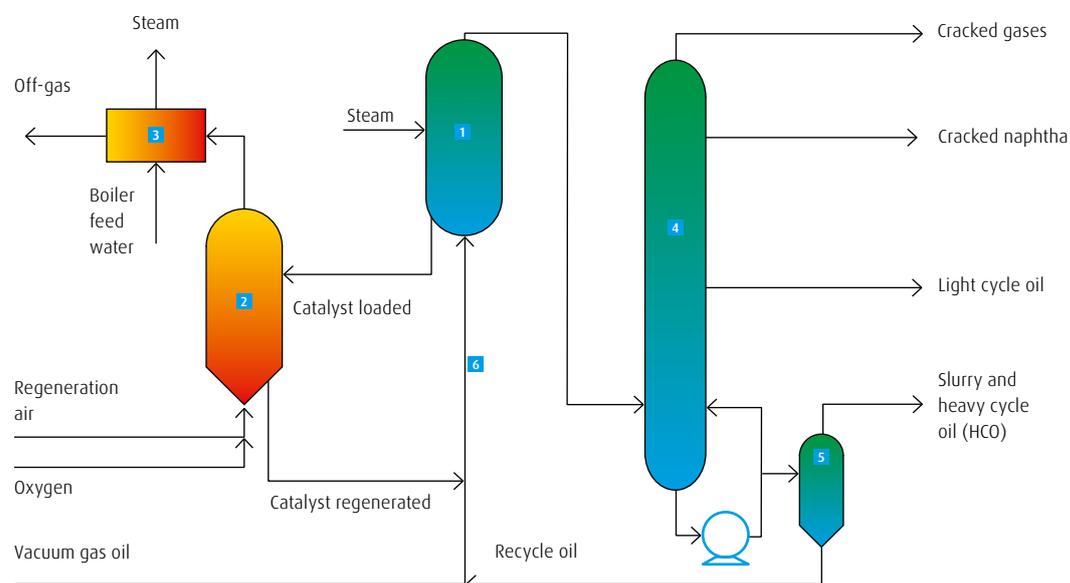




Improving the performance of FCC units by oxygen enrichment.

Diagram of an FCC unit



1 FCC-Reactor, 2 Regenerator, 3 Boiler, 4 Fractionation, 5 Recycle oil, 6 Riser

Background

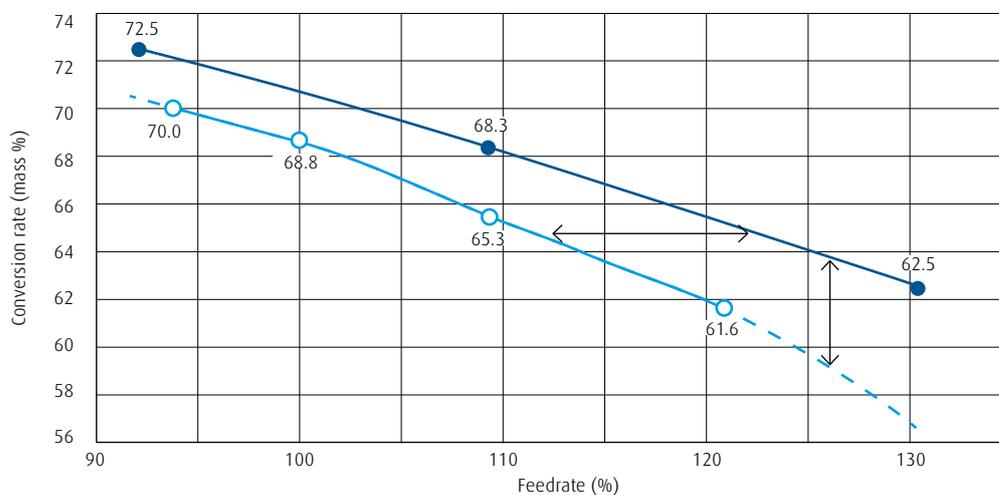
FCC units (fluid catalytic cracking units) are used to convert vacuum gas oil, often mixed with residues from atmospheric distillation, vacuum distillation and visbreaking, into high value hydrocarbon fractions. The products are a gas fraction (primarily C₃/C₄), a liquid fraction (primarily gasoline) and coke as a solid. The coke on the catalyst is burnt off during regeneration, and provides the necessary heat of reaction.

Advantages of oxygen enrichment

Oxygen enrichment in the regenerator results in higher plant efficiency due to:

- Increased plant capacity
- More flexibility in the selection of feedstock, especially to enable use of heavier feedstock with a higher tendency to form coke
- Increased conversion ratio and gasoline yield
- Resolved air blower constraints
- Reduced CO in the regenerator off-gas
- Less abrasion of the catalyst and less erosion of the cyclones due to reduced gas velocity, resulting in less downtimes and repairs

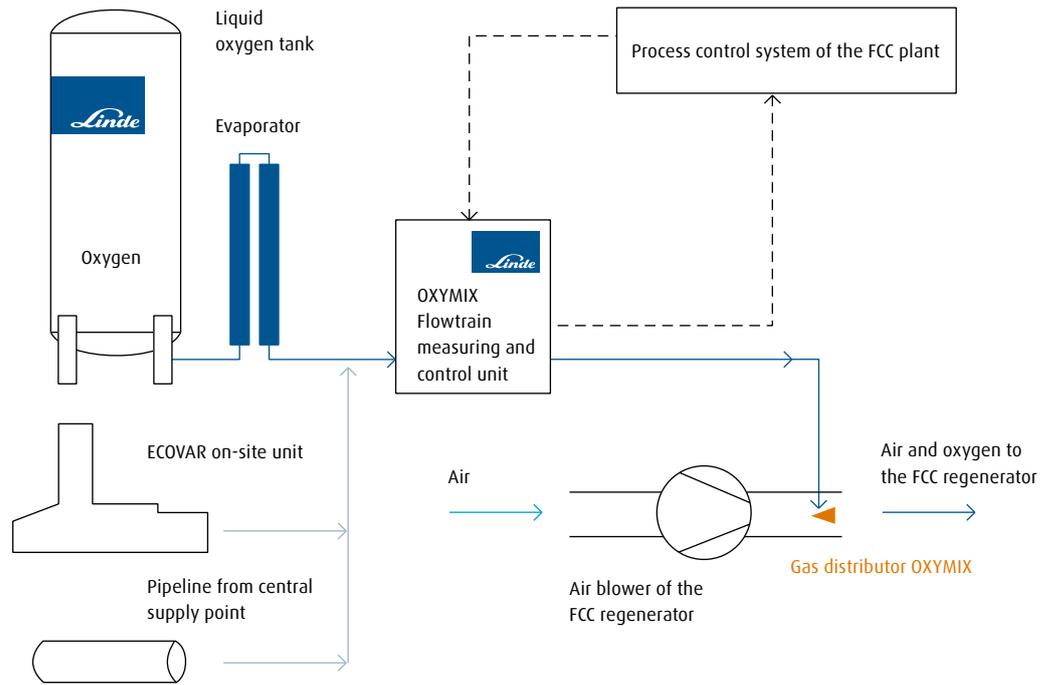
Test results from a lab unit



● Conversion rate at 27% by vol. O₂, ○ Conversion rate at 21% by vol. O₂

↔ Increase in Load ⇕ Increase in conversion

Diagram of oxygen enrichment in an FCC unit



Application

The oxygen content in the regenerator air is raised to a maximum of 28 % by volume, but usually stays below 25 %. Depending on the oxygen demand and infrastructure of the refinery, the oxygen can be supplied:

- By a liquid supply system
- By an ECOVAR® on-site unit
- By pipeline from an ASU

Liquefied oxygen supply is used when the oxygen demand varies strongly. An on-site unit is economical if oxygen is required continuously at throughputs of 2,000 Nm³/h and more. It delivers oxygen at a purity of 90 to 94 % by volume.

Service offer

- Integration of the specially designed oxygen distributor OXYMIX® into the air pipeline
- Integration of the oxygen supply system into the process control and safety system of the FCC unit by way of a OXYMIX Flowtrain measuring and control unit
- Execution of tests with the customer's oils and residues in an FCC test unit
- Analysis of the composition of the products
- Performance of profitability calculations
- Investigation of the optimum oxygen supply
- Installation of the equipment for oxygen supply and start-up
- Supply of oxygen

Linde AG

Gases Division, Seitnerstrasse 70, 82049 Pullach, Germany
 Phone +49 89 7446-0, Fax +49 89 7446-1230, www/linde-gas.com/refineries