THE LINDE GROUP

Oxidations in the fluidised bed. Process intensification by oxygen enrichment.

Introduction

Fluidised bed processes play an important role in the production of basic chemicals and petrochemicals. They are also often used in oxidative production steps. The predominant oxidant is process air.

The O_2 content of the process air can be raised by simple injection of gaseous O_2. In most cases, such a process intensification by O_2 enrichment can be achieved with only minor effort.

Benefits

The production capacity can be increased significantly by oxygen enrichment of the process air – typically by 10 to 25 %.

This can result from the following frequently achieved effects:
- → Higher throughput
- → Increased conversion

In addition to an enhanced flexibility in operation – e. g. blower limitations can be eliminated in many cases –, the waste gas quantity can be reduced by lowering the total process air volume. This can lead to further benefits:
- → Energy savings during waste gas treatment (reduced CO_2 emissions)
- → Less discharge of catalyst and/or solids
- → Reduced abrasion of catalyst and/or solids

Applications

Fluidised solids – whether as catalyst or reaction participant – play a role in organic as well as inorganic air oxidation processes, e. g.:
- → Sulphuric acid recycling[1)]
- → n-butane oxidation to maleic anhydride[2)]
- → Ethylene oxychlorination[1)]
- → Ammoxidation of propene[1)]
- → FCC; i. e. regeneration step during “Fluid Catalytic Cracking”[1)]

The O_2 enrichment

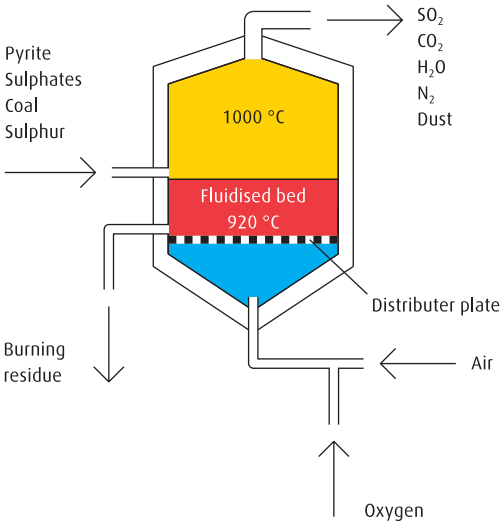
[1)] has been applied many times on an industrial scale

[2)] has been experimentally tested

Example

“Inorganic fluidised bed”

During the roasting of sulphured ore in the fluidised bed, the capacity can be increased by over 20 % through the injection of O_2 enriched air (see graphic of an industrial application below).

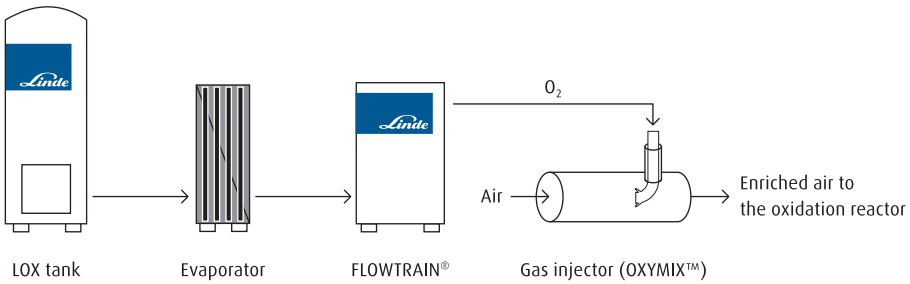


Technical solution

The implementation of an O_2 enrichment system requires the following hardware:

- Oxygen source: on-site production plant or liquid storage tank
- Measurement and control system (FLOWTRAIN®*) for metering and emergency cutout
- Oxygen injector (OXYMIX™*): injects gaseous oxygen into the process air

The following assembly based upon the supply with liquid oxygen (LOX) is often used in field tests with O_2 enrichment:



Range of services

Linde offers the following services for the implementation of an O_2 enrichment system:

- Cooperation in a feasibility study regarding the benefits of the additional oxygen supply
- Support in the setup, performance and evaluation of tests on a pilot or industrial scale
- Assistance in the evaluation of safety aspects as well as in the development of the technical solution
- Supply of tailor-made hardware according to high safety standards (e. g. OXYMIX™*, FLOWTRAIN®*, measurement and control technology)
- Optimal design of O_2 supply concept and reliable O_2 delivery

Service and know-how

Linde's long-time experience with gases and procedural issues is the basis for an efficient and individual project handling. Efficient and approved process simulation programs and substance databases ensure optimum design, safe plant operation and economic use of technical oxygen.

*Descriptive data sheets on the marked Linde products are also available.

Linde AG
Linde Gas Division, Linde Gas Headquarters, Seitnerstrasse 70, 82049 Pullach, Germany
Phone +49.89.74 46-0, Fax +49.89.74 46-12 30, www.linde-gas.com

43489001 0208 – 1.1 L&P Subject to change.