With oxygen the chemistry is right

Oxygen optimises the production of sulphur and sulphuric acid

Oxygen optimises production and recycling

Production of sulphur – indispensable for many sectors

Today, sulphur is primarily used in the chemical and pharmaceutical industries, but it is also used in steel alloying. Sulphur also forms the basis for the production of sulphuric acid, dyes, insecticides and fertilisers.

CLAUS plant

Elemental sulphur is almost exclusively produced from oil and natural gas using synthetic processes. The most important process from a technical point of view is the CLAUS process. The first step involves splitting the sulphur compounds contained in the oil to form hydrogen sulphide (H_2S) and hydrocarbons in a process called hydrocracking. The "sour gas" that is separated by amine scrubbing is subsequently conveyed to the CLAUS process. In the CLAUS process, part of the H_2S gas is converted into sulphur dioxide (SO_2). This usually involves the use of atmospheric oxygen. H_2S is subsequently converted into sulphur.

Meeting new requirements with existing plants

Many plants have reached their capacity limit in recent years because of much stricter SO_2 emission limits and the simultaneously rising sulphur content in the crude oil being used. The consequence of this is costly investment in new plant and equipment – or the intelligent use of oxygen from Messer.

By using oxygen enrichment, the capacity of CLAUS plants can be increased by up to 60 %.

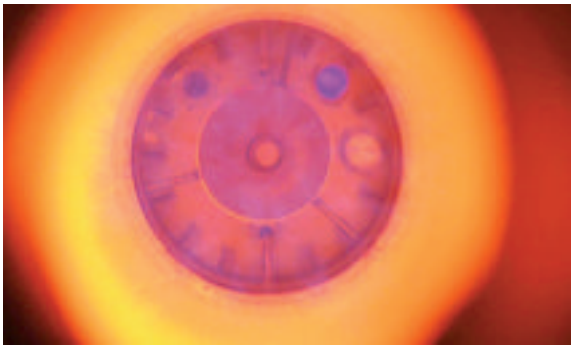
The process also boasts impressive cost advantages, with the modifications to existing plants only costing about one per cent of the investment costs associated with a new CLAUS plant. Another advantage is the complete conversion of ammonia and high-molecular hydrocarbons due to the increased combustion temperature (> 1350 °C). This is a big plus for the environment.

Your sulphur production advantages at a glance:

- Marked increase in CLAUS plant capacity
- Easy upgrading of existing plants
- No costly investment in new machinery and equipment
- Reduced environmental impact

CLAUS combustion chamber *Photo: Black & Veatch*

CLAUS combustion chamber in operation *Photo: Dumag*



The double-contact process is the most important industrial-scale method of producing sulphuric acid.

Production and recycling of sulphuric acid – targeted optimisation

With annual global production of approximately 200 million metric tons, sulphuric acid is the most important inorganic base chemical. Sulphuric acid is mainly produced by burning sulphur in air. In this process, the SO_2 that is produced during combustion is converted into SO_3 using vanadium pentoxide (V2O5) catalysts, and the sulphuric acid is produced in the double-contact process through 2-fold absorption of the SO_3-containing gas. Since the price and sales of sulphuric acid are subject to strong fluctuations, there is a growing desire for flexible methods of increasing the capacity of existing facilities.

Here, too, the use of industrial oxygen by Messer is an attractive alternative to cost-intensive plant expansions. This involves adjusting the combustion process to facilitate a higher SO_2 concentration. Through targeted injection, sufficient oxygen is supplied to ensure complete conversion into SO_3.

Photo: Outotec

A targeted O_2 supply increases the efficiency of cracking units. *Photo: Dumag*

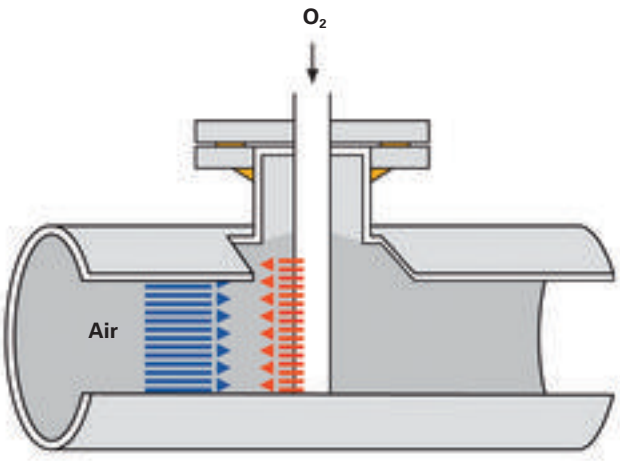
Sulphur in powder form

Waste sulphuric acid – clean with oxygen

Recycling waste sulphuric acid is an important contribution in terms of environmental impact reduction. Waste acids with a high concentration of non-volatile organic contaminants can only be recycled by thermal cracking. The costs of treatment depend on the process gas flow rate and its sulphur dioxide concentration.

It is possible to increase the efficiency of this process significantly with oxygen and know-how from Messer. By using oxygen as an oxidising agent, the nitrogen ballast in the air is replaced by process gas containing sulphur dioxide, resulting in a significant increase in sulphuric acid production and an equally significant drop in operating and energy costs.

Working together with operators of waste sulphuric acid cracking plants, Messer has developed safe and reliable methods of injecting oxygen into the various cracking reactors under production conditions. Oxygen can be used to increase the efficiency of any waste sulphuric acid recycling process that involves the use of thermal reactors (Grillo process, Lurgi/Stauffer process, fluidised bed reactors).



Oxygen mixer for combustion air enrichment

Your sulphuric acid production and recycling advantages at a glance:

- Increase in efficiency (de-bottlenecking) of existing plants
- Smaller design of new plants
- Smaller waste heat recovery units and flue gas conditioning systems
- Increased yields and turnover
- Lower energy costs
- Improved product quality

Are you thinking of optimising your existing plant and are considering the use of industrial gases?

We will be happy to help you implement your ideas. Please do not hesitate to contact us:

Dr. Nina van Gellecom
Specialist Chemistry Applications
Email: nina.vangellecom@messergroup.com

Joachim Rohovec
Senior Manager Chemistry, Paper&Environment
Email: joachim.rohovec@messergroup.com

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MESSER

Messer Group GmbH
Gahlingspfad 31
47803 Krefeld
www.messergroup.com