THIOPAQ O&G DESULPHURISATION: THE POWER OF NATURE

Award-winning technology for the sulphur removal and sulphur recovery of hydrogen sulphide (H_2S)

Paqell.

At a glance

Customer driver: Growing development of sour natural gas resources at remote locations; natural gas, synthesis gas and refinery gas streams with unfavourable conditions and compositions for traditional desulphurisation; sulphur recovery technologies.

Solution: A biological gas desulphurisation process that integrates gas purification with sulphur recovery.

Value delivered: In excess of 99.9% of the H_2S can be removed. Moreover, the technology can help to cut capital expenditure and operating costs compared with conventional processes.

Proof point: Over 18 years of operating experience since first start-up in 1993.

THIOPAQ O&G technology was acclaimed in the prestigious ICHEME Innovation and Excellence Awards of 2007 by winning the Sellafield Award for Engineering Excellence.

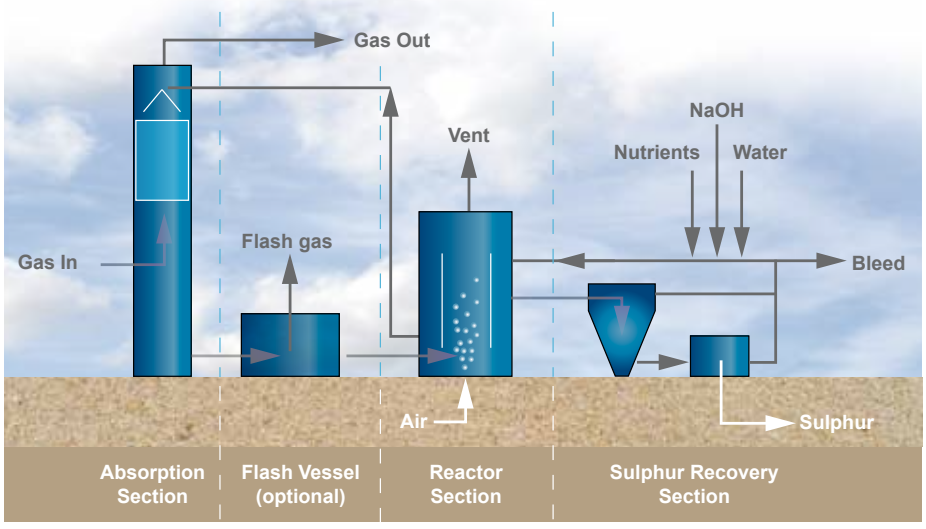
The THIOPAQ O&G process is an environmentally friendly desulphurisation process for removing H_2S and recovering it as elemental sulphur from sour gas streams. The unique aspect of the process is that it utilises naturally occurring bacteria to oxidise H_2S to elemental sulphur that can be used for fertiliser production, amongst other uses.

The process was originally marketed by Paques BV for the treatment of biogas, which is produced by the anaerobic digestion of waste water. Co-operation with Shell Global Solutions led to further development of the process for application at high pressure in oil and gas environments. It can be economically applied to projects recovering up to 150 t/d of sulphur.

For Oil & Gas applications, the process is licensed by Paqell BV, a joint-venture company of Shell Global Solutions International BV and Paques BV.

About the technology

- First commercial unit built for biogas desulphurisation in 1993 in the Netherlands; over 100 applications since then;
- First commercial THIOPAQ O&G unit for natural gas built in 2002;
- Since 2002, eight commercial reference units in the oil and gas industry have been commissioned. Seven units are at the start-up, construction or design phase.



THIOPAQ O&G technology is characterised by its simplicity, reliability and low cost of installation, operation and maintenance.

Case story

Illinois oilfield, USA
An independent oil and gas operator has an oilfield containing 234 production wells, each of which generates a small amount of very rich, very sour casing-head gas.

This was being flared, but to improve air quality, the operator installed seven field compressors and 64 km of gas-gathering pipeline. This collects nearly 1 MMscf/d of gas and delivers it to a new gas-processing plant that uses THIOPAQ O&G technology to remove H_2S from the gas and convert it to elemental sulphur.

The gas-gathering system and the gas-treating unit have achieved availability levels of over 99% with unmanned operation of the THIOPAQ O&G unit at night and during the weekends.

Process description

The process integrates gas purification with sulphur recovery in one unit. The feedgas is first scrubbed with a mildly alkaline sodium hydroxide solution. This solution absorbs the H_2S to form sodium bisulphide, and sweet gas exits the contactor.

Depending on the sour gas pressure, the bisulphide-rich solution is routed to a flash vessel or directly to the bioreactor, which operates at atmospheric pressure and ambient temperature, where a controlled amount of air is introduced (see Figure 1).
Naturally occurring bacteria (Thiobacillus spp.) consume the bisulphide ions and excrete elemental sulphur, which is separated from the circulating solution. The process produces hydroxide ions that effectively regenerate the caustic solution used in the absorption step, which reduces the consumption of chemicals.

The process can replace a complete train of H_2S removal and sulphur recovery installations, see Figure 2. Another option is to retain the amine unit (for example, when carbon dioxide removal is also required) and replace only the sulphur recovery unit, the tail-gas treating unit, the degasser and, possibly, the incinerator by a single THIOPAQ O&G unit.

Performance data

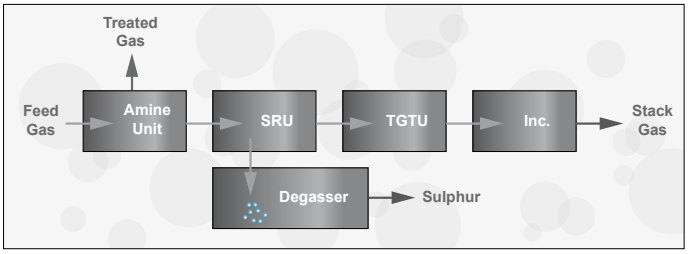
- Sulphur production: up to 150 t/d
- H_2S concentration in sour gas: up to 100%
- H_2S removal efficiency: >99.9%
- H_2S in treated gas (high pressure >4 bar): <4 ppmv
- H_2S in treated gas (low pressure <4 bar): <25 ppmv

Added value for your business

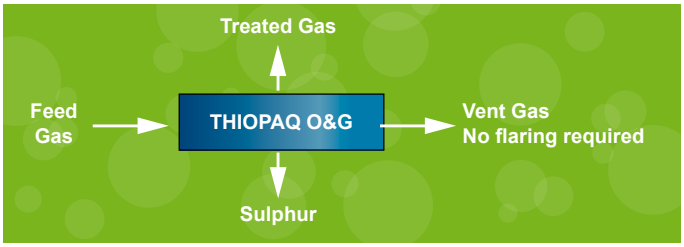
THIOPAQ O&G technology offers a series of benefits:

- **reduced operating costs.** The expensive chemicals required for liquid redox processes are not necessary; only sodium hydroxide and nutrients are required.
- **reduced capital expenditure.** The process operates at ambient temperature and does not require equipment such as burners and reboilers. The regeneration and sulphur recovery section always operates at ambient pressure and temperature.
- **ease of operation.** The biologically produced sulphur is hydrophilic. This feature eliminates plugging problems. THIOPAQ O&G requires minimal operator attendance.
- **safety.** An additional feature of the process is that there is no free H_2S (no acid gas) after the bio-reactor. No fired equipment or high pressure required.

Traditional Sour Gas Processing



Thiopaq O&G Process



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Paqell BV is a joint venture of Shell and Paques and owner of the THIOPAQ O&G Technology.