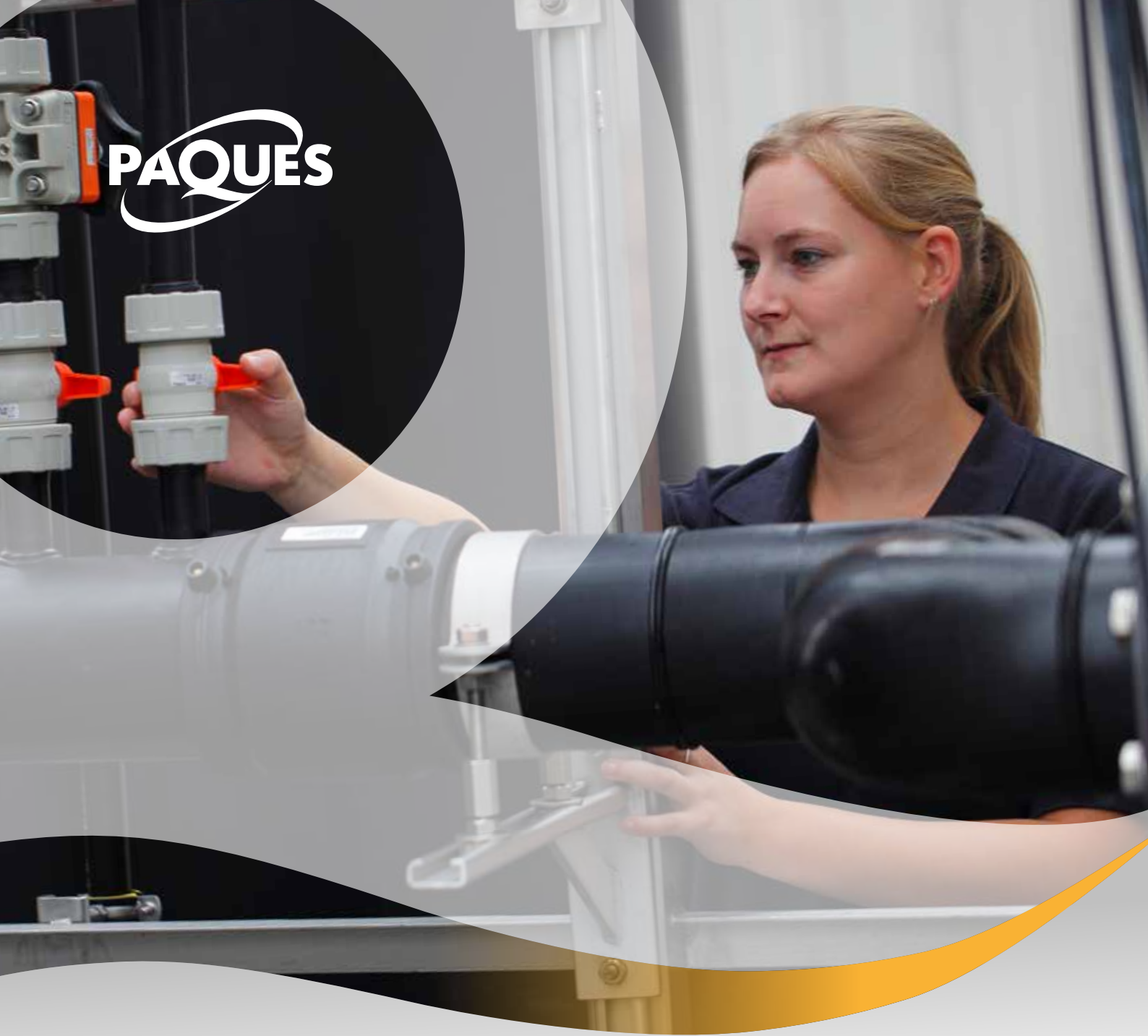


The PAQUES logo is displayed in white text on a black circular background. The word "PAQUES" is in a bold, sans-serif font, with a white swoosh underline that loops under the letters "A" and "Q".

PAQUES



**THIOPAQ<sup>®</sup>**

## Biogas desulphurisation

Deep hydrogen sulfide removal from biogas at high uptime enables industries to meet stringent gas quality requirements.

revitalizing resources

# Deep hydrogen sulfide removal

Biogas is an important renewable energy source. However, the gas originating from anaerobic digestion plants, anaerobic waste water treatment plants and landfills often contains hydrogen sulfide (H<sub>2</sub>S). Removal of H<sub>2</sub>S is required for reasons of health, safety, environment and corrosion of equipment such as gas engines, boilers and piping.

The THIOPAQ<sup>®</sup> was developed by Paques, in cooperation with universities, research institutes and customers. Fundamental and applied research into biological, physical and mechanical aspects of the system resulted in a cost-effective and reliable system. By continuous development Paques is able to provide every customer with a tailor made gas treatment that enables the customer to transport the gas into a local micro gas grid or to upgrade the gas to biomethane. The elemental sulphur, produced by the THIOPAQ<sup>®</sup> can be used as a high quality fertilizer.

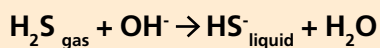
## About THIOPAQ<sup>®</sup>

- Proven technology, > 20 years operational experience
- 180 THIOPAQ<sup>®</sup> references worldwide
- Continuous innovation
- Deep H<sub>2</sub>S removal
- High uptime and reliable process
- No air or oxygen input in biogas
- Low total costs of ownership
- Production of high quality fertilizer
- Able to remove low H<sub>2</sub>S levels
- In-house manufacturing and quality control

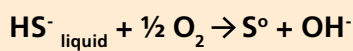
# THIOPAQ®

## Operation principle

The 'caustic' solution in the THIOPAQ® scrubber is continuously biologically regenerated. In the scrubber, the gas containing H<sub>2</sub>S is brought into contact with the washing water in counter currently. Absorption of H<sub>2</sub>S under slightly alkaline conditions (pH 8-9) enables a chemical reaction with hydroxide ions:



In the bioreactor the sulphide is oxidised into elemental sulphur by autotrophic colourless sulphur bacteria:



The hydroxide used in the scrubber is regenerated in the bioreactor. Since the washing water entering the scrubber at the top is sulphide-free, a high concentration difference between the liquid and gas phase makes it possible to obtain a very high H<sub>2</sub>S removal efficiency, exceeding 99.5%. Both the small bleed stream (consisting of sodium salts) and the produced sulphur is free of sulphide, so discharge is no problem.

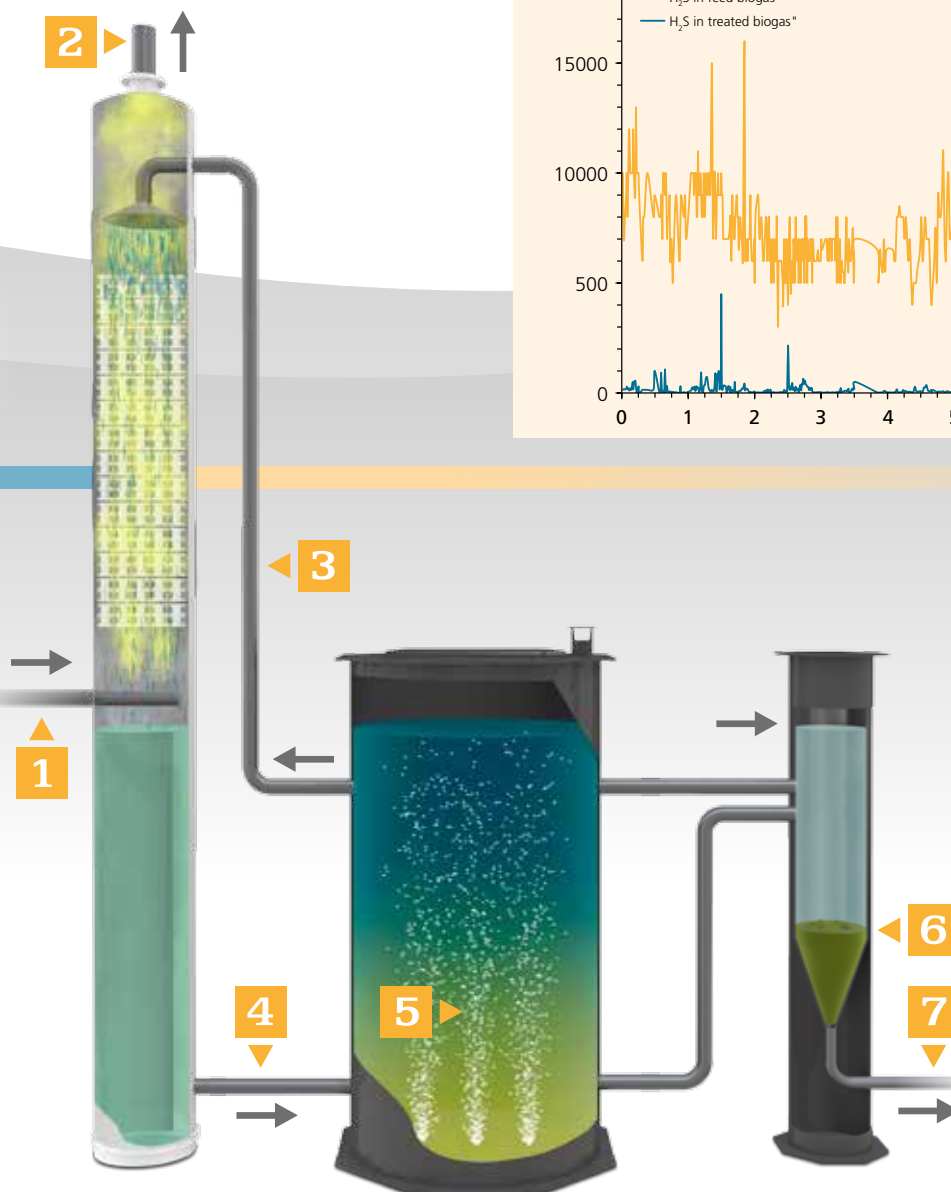
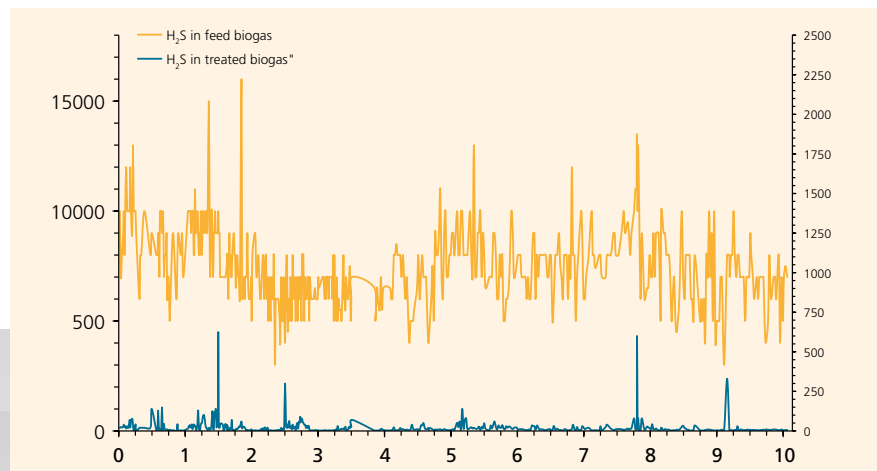
## Application

The THIOPAQ® scrubber can be applied to a wide range of biogas streams

containing H<sub>2</sub>S and can be combined with all biological anaerobic systems. After treatment in the THIOPAQ® scrubber, the biogas can be used in a gas engine or boiler or can be transported in a local micro gas grid. Upgrading to biomethane, which can be brought into the gas distribution network or use as fuel for vehicles is another possibility.

- Gas flows from 50 to 2,500 Nm<sup>3</sup>/h
- Sulphur load up to 600 kg S/day
- Custom made design for higher gas flows. References for > 10,000 Nm<sup>3</sup>/h and sulphur loads > 5 ton S/day

## THIOPAQ®: influent independent, stable performance



## THIOPAQ®, how it works

- 1 H<sub>2</sub>S-rich gas in
- 2 Purified gas out
- 3 Alkaline wash solution, (absorbs H<sub>2</sub>S from the gas)
- 4 Sulphide rich solution from scrubber into bioreactor
- 5 Air for sulphur oxidation reaction (sulphide to elemental sulphur)
- 6 Sulphur separated
- 7 Elemental sulphur

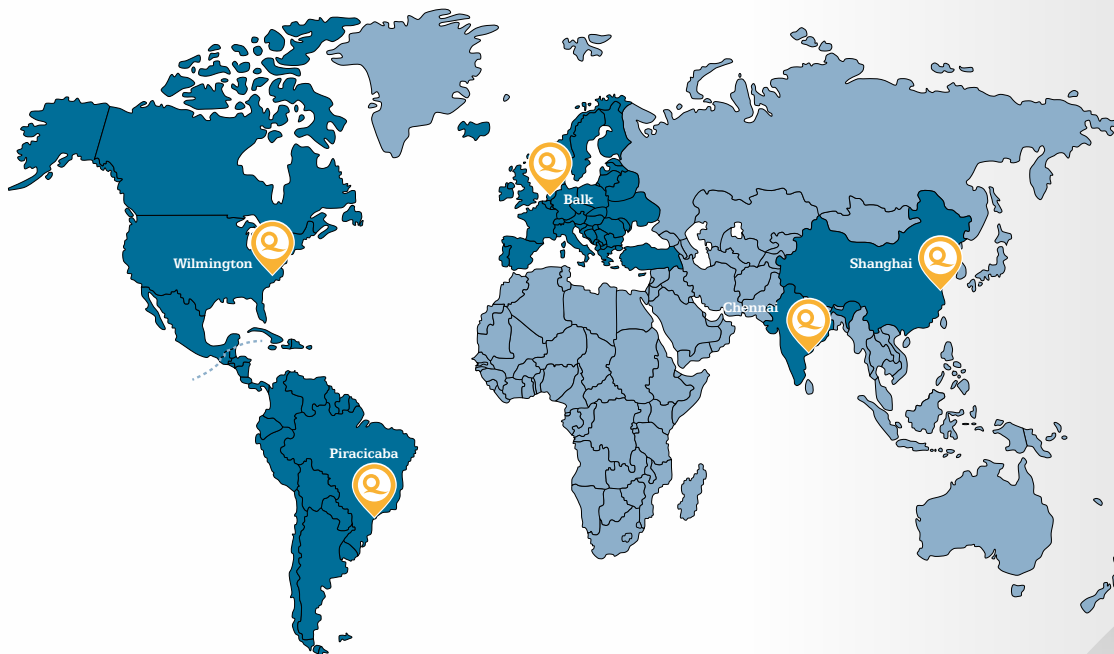


## Paques: leading in biological wastewater and gas treatment

Paques has over 30 years experience in helping industries and municipalities to reduce their water and carbon footprints and reclaim valuable resources. The cost-effective effluent purification systems produce energy from wastewater, whilst purifying the water and facilitating water reuse.

Since 1980, Paques realised more than 1800 references worldwide. Besides the headquarters in The Netherlands, Paques has subsidiaries and/ or production locations in China, Brazil, North America and India. In many other countries, the company is represented by licensed partners. This ensures local presence and the best service for clients worldwide.

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