



Photo: Ben Vulkers



# BIOPAQ<sup>®</sup> AFR

## Anaerobic industrial effluent treatment

Anaerobic Flotation Reactor technology is especially developed for conversion of solids, especially fats or proteins, into biogas

revitalizing resources

# Converts fats and proteins into energy-rich biogas

The BIOPAQ® Anaerobic Flotation Reactor (AFR) is specifically designed for the treatment of wastewater containing high concentrations of fats, oil and grease (FOG) and other biodegradable compounds such as proteins and starches. The BIOPAQ® AFR will reliably and efficiently convert these organic compounds, typically present in the range from 5-70 g/l of COD (with a max of 14 g/l of FOG) in e.g. the meat and dairy and food manufacturing industry. The COD is converted into valuable biogas, while producing a high quality treated effluent.

Biomass retention using the biogas flotation unit prevents biomass loss and permits the decoupling of hydraulic retention time (HRT) from solids retention time (SRT). This allows HRT 's from 1-8 days with a SRT >50 days. At loading rates from 2-8 kg COD/m<sup>3</sup>/day and a high concentration of well mixed flocculent biomass, the BIOPAQ® AFR combines the high efficiency and compact footprint of a high-rate reactor with the stability and biogas production of an anaerobic CSTR.



BIOPAQ® AFR is one of the members of the BIOPAQ® family of anaerobic reactors developed by Paques, in cooperation with universities, research institutes and customers. Fundamental and applied research into biological, physical and mechanical aspects of the system, together with over 40 years of experience and over 1,500 successful anaerobic installations, enables Paques to provide every customer with a tailor made wastewater treatment system that exceeds the client's expectations.

## About BIOPAQ® AFR

- Proven technology, > 10 years operational experience
- Maximum biogas production from COD, FOG and proteins
- High flocculent biomass concentration
- Efficient biomass retention
- Low HRT, High SRT
- Loading rates 2-8 kg COD/m<sup>3</sup>/d
- Compact footprint
- No pre-treatment required
- Low sludge production
- Outstanding effluent quality
- Tailor made solutions
- Worldwide availability
- A complete range of standardised concepts
- Low maintenance, no rotating equipment inside tanks

# BIOPAQ® AFR

## Working principle

Industrial wastewater is pumped to the Bioreactor (1) through the Influent Distribution System (2) where it is thoroughly mixed with the reactor's anaerobic biomass to achieve optimal contact between biomass and organic compounds to be degraded.

The Bioreactor is hydraulically mixed by continuously pumping (3) the reactor contents to the influent distribution system and to the nozzles (4) in the upper part of the reactor. This exceptionally efficient mixing system ensures maximum conversion of the organic compounds, including fats and proteins, into valuable methane or biogas.

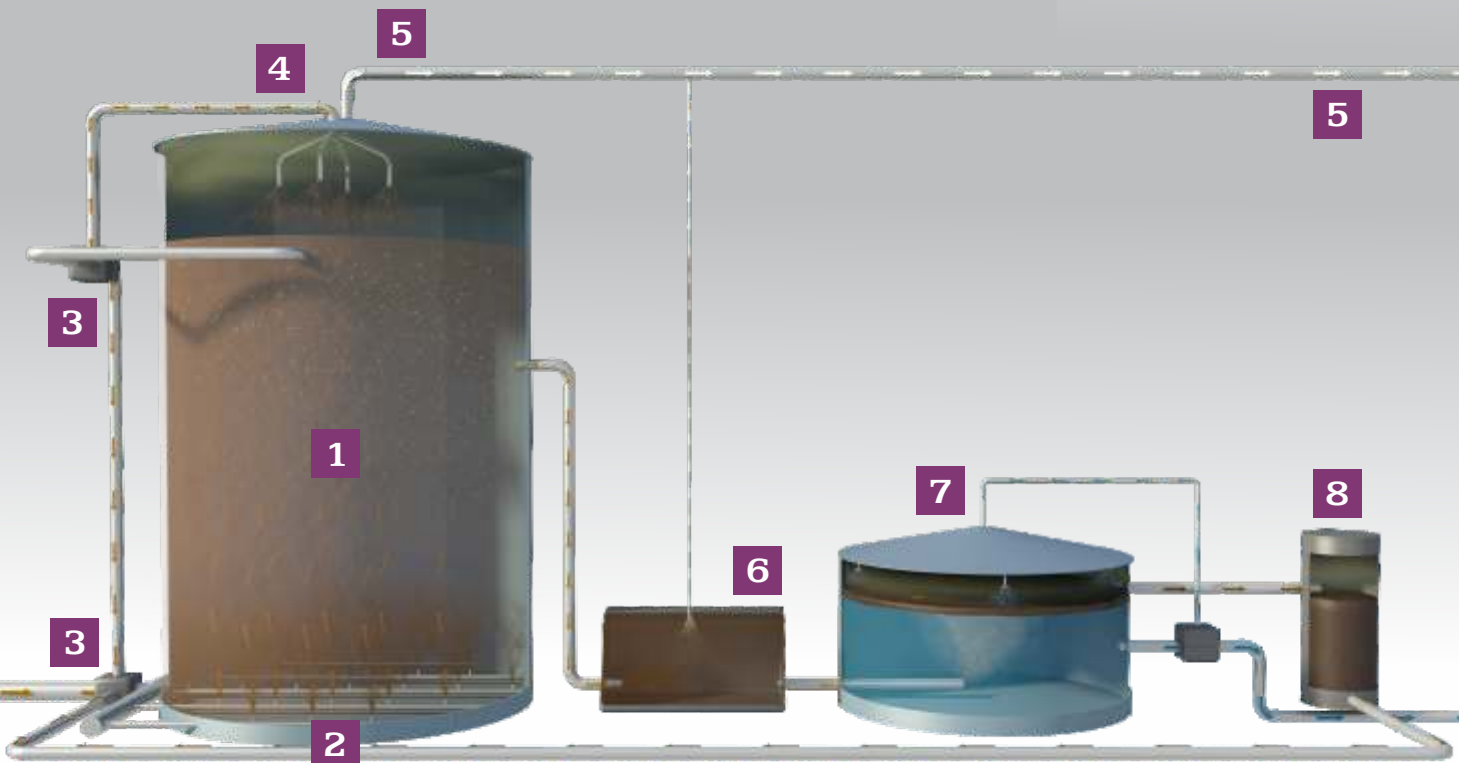
The biogas is collected in the head-space where it leaves the reactor (5) to be used as green energy in boilers, gas engines or upgraded to pipeline quality Renewable Natural Gas (RNG).

Following anaerobic digestion in the Bioreactor, the biomass solids are separated from the treated water through the Dissolved Biogas Flotation (DBF) process. In the DBF process, the effluent is continuously pumped into a Biogas Dissolving Unit (6), operating at 3-5 bar, in which biogas is pumped and dissolved in the solution. This pressurized stream is then released in center of the Flotation Tank (7) at the bottom. Returning the stream to nearly atmospheric pressure causes the biogas to come out of solution and form small bubbles that attach to the biomass flocs. As the flow travels towards the tank's periphery, the flocs float to the surface where they compress into a flotation layer that is collected in a trough and flows towards the Biomass Recycling Tank (8). From this tank the biomass is pumped back to the Bioreactor. The treated water below the flotation layer leaves the flotation tank by means of a pump or valve and can be discharged or post treated.

## BIOPAQ® AFR, how it works

- 1 Bioreactor
- 2 Influent Distribution System
- 3 Reactor Mixing Pumps
- 4 Mixing Nozzles
- 5 Biogas Outlet
- 6 Biogas Dissolving Unit
- 7 Flotation Tank
- 8 Biomass Recycling Tank

**Biogas flotation is the solution to retain biomass**







## Paques: leading in biological wastewater and gas treatment

For more than 40 years, Paques has been the world's leading company in the field of development and construction of cost-effective purification systems for water, wastewater and gases, based on innovative biotechnology. With over 3,000 reference installations worldwide, Paques has helped companies and municipalities succeed at to one of the major challenges of today: to reduce their water and carbon footprints and reclaim valuable resources.

The biogas produced by wastewater treatment plants can be used as green energy in boilers or gas engines. Beyond our headquarters in The Netherlands, Paques has subsidiaries and/or production locations in Brazil, China, India, Malaysia, Thailand and the United States. In many other countries, Paques is represented by licensed partners. This ensures our local presence and the best service for our clients worldwide.

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