

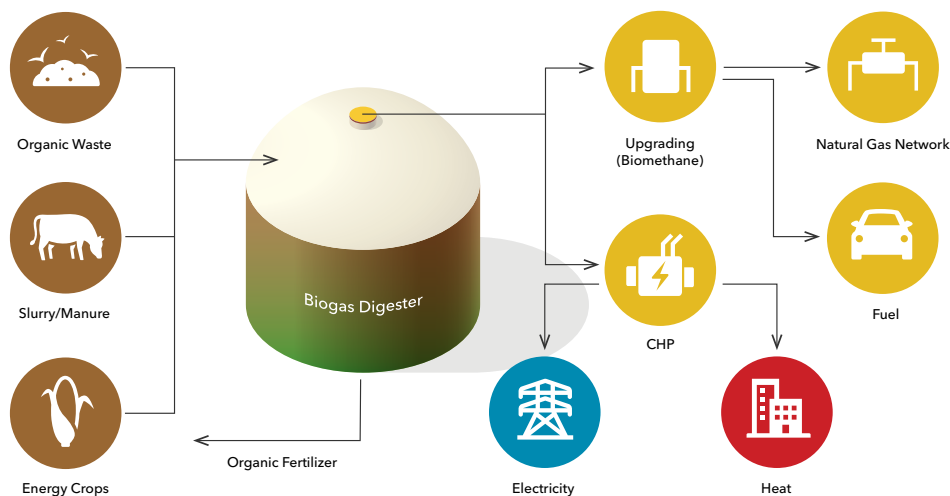


Biogas Production with Xylem

Converting waste streams from agricultural and food production, as well as effluents from industrial and municipal wastewater treatment plants, into biogas is good for the environment, and when done efficiently, enhances bottom line.

Whether processing manure, silage, wastes from food processing, or even recovery of food residual from restaurants or residential homes, waste streams are rich in energy potential. Biogas production turns these waste streams into assets, creating renewable sustainable energy sources at both local and national levels, while reducing gas emissions linked to climate change.

Anaerobic digestion is a natural process, and relatively simple in concept. However, producing biogas efficiently requires effective pumping and mixing of often difficult substrates.



Waste to energy - secure the process and optimize efficiency with reliable Xylem brands.

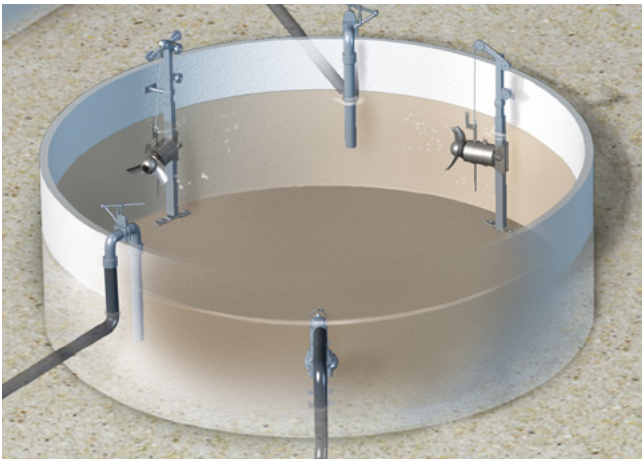
The substrates for biogas production must be kept moving in the fermentation process, as well as in storage. Tank contents must be mixed to prevent both floating and settling of the substrates, to maintain a homogeneous blend. These substrates are often a combination of fibrous, low density material and heavier materials, two extremes that need to be maintained in suspension. Pumps must be capable of passing and/or chopping substrates without clogging, for a reliable, consistent feed.



Don't waste energy to release energy - know your mixing thrust to power ratio.

There is more to efficient mixing than power consumption (horsepower or kW) per volume. Efficient mixing is about the thrust generated per unit power consumed (N/kW). Xylem has a complete line of mixers with superior thrust to power ratios, for every tank configuration and every substrate blend. Mix and match mixer models, for a configuration tailored for your precise needs.

To maximize mixing, position the mixers for optimum bulk flow. Depth and angle of installation should be customized for the tank configuration and substrate characteristics. Fully submersible mixers, with depth and angle adjustment, offer the most flexible configurations for the highest energy efficiency.



Pre-digester tanks

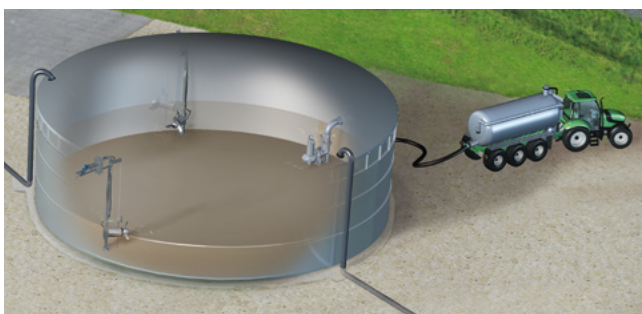
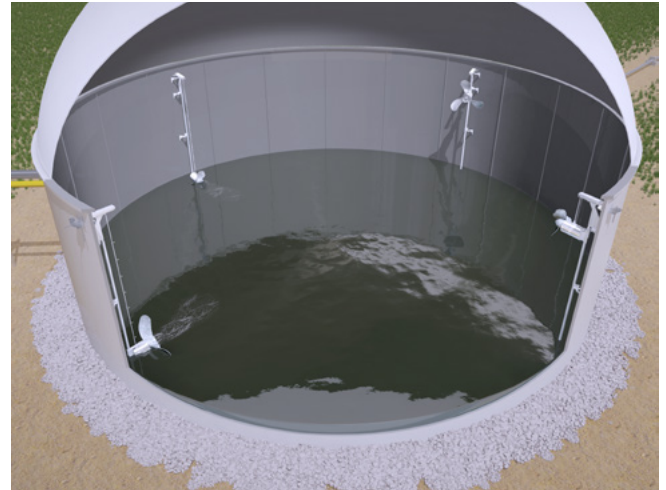
Mixing duty:

- Blend substrates into a homogeneous feedstock
- Distribute solids evenly

Digester and post-digester

Mixing duty:

- Provide homogeneous substrate as food for biogas producing bacteria
- Prevent crust and foam formation
- Maintain stable and optimum temperature throughout the digester
- Blend the entire tank contents
- Release biogas bubbles at all depths of the digester, pushing them to the surface for collection
- Prevent sedimentation



Final storage

Mixing duty:

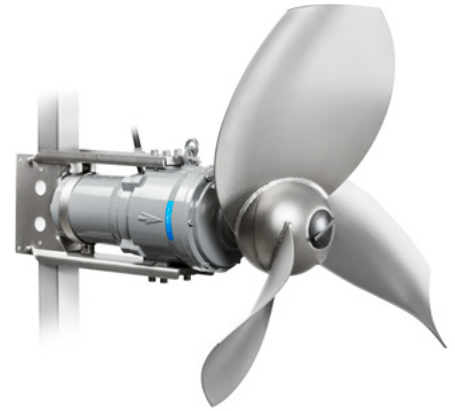
- Provide a homogeneous blend of fermented substrate for field application
- Re-suspend settled solids prior to pump out

Each tank and every process require the right mixing system to keep the substrates moving and maximize energy production.

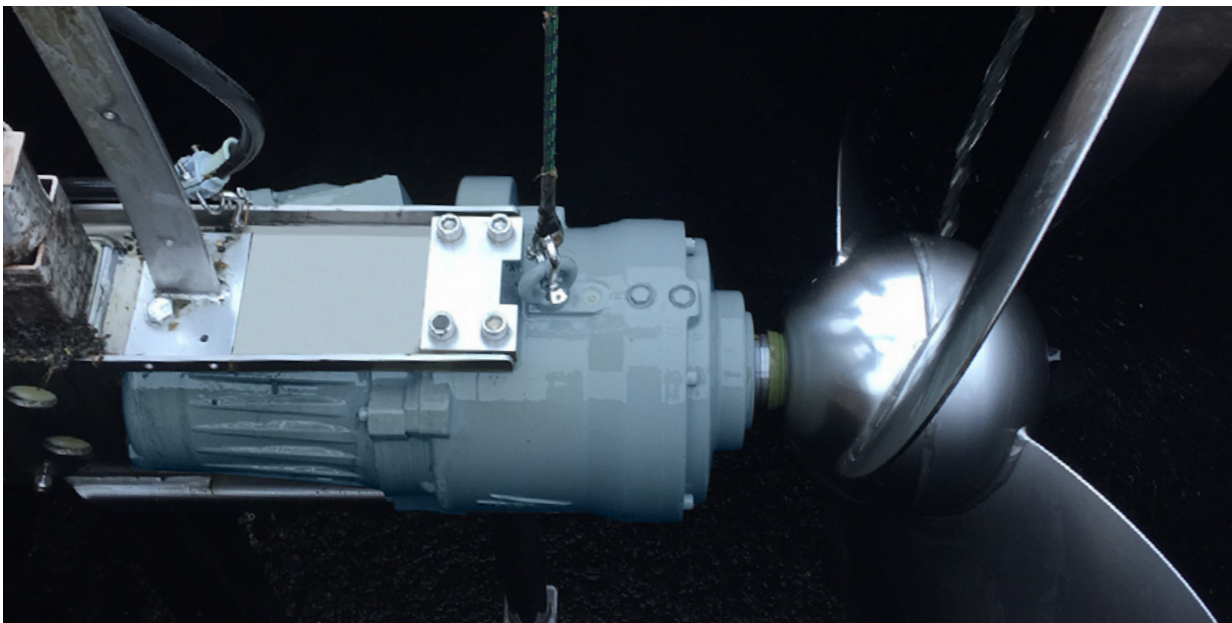
Flygt 4400 Geared Mixers Series

The Flygt 4460 mixer combines superior hydraulic design with large diameter propellers and low speeds for optimized thrust and maximized biogas production profitability by generating required bulk flow with minimum energy consumption.

- Low energy costs due to high efficiency in biogas media
- Maximum robustness when dealing with corrosive and abrasive liquids due to duplex steel propellers
- Clog-free operation even with fibrous substrates
- Easy installation and service
- Extended system lifetime thanks to reduced level of vibration
- Propeller sizes tailored to fit standard roof openings
- Flygt motors and heavy-duty gearboxes guarantee reliability and non-stop performance



Flygt 4460	Rated output power 50Hz / 60Hz	Propeller diameter	Thrust 50Hz/60Hz	Installation
Mid-size	7.5kW/11hp	1.25m /49"	2860N/2940N	Biogas Support System (BIS-1)
	12kW /18.8hp	1.25m/49"	3650N/3550N	
		1.0m/39"	2800N/ -	
Low speed	5.7kW/8.4hp	2.5m/98"	3850N/4000N	Tripod guide bar



Flygt 4600 Compact Mixers Series

The Flygt 4600 compact mixers series has multiple applications within a biogas production facility, from small reception pits to large digesters/fermenters and storage tanks. Flygt compact mixers are powerful and clog-free, robust to handle solids and provide excellent bulk flow velocities. They are perfect for preventing crust formation at liquid surface.

- Designed to meet specific tank geometries and treatment objectives
- Optimized efficiency thanks to propeller shape and available propeller angles
- Propeller material options to meet biogas application demands: stainless steel 316, Duplex, Hard-iron™ and stainless steel 304
- Clog-free operation even with liquid containing fibrous material
- Robust design with reliability you expect from the Flygt brand



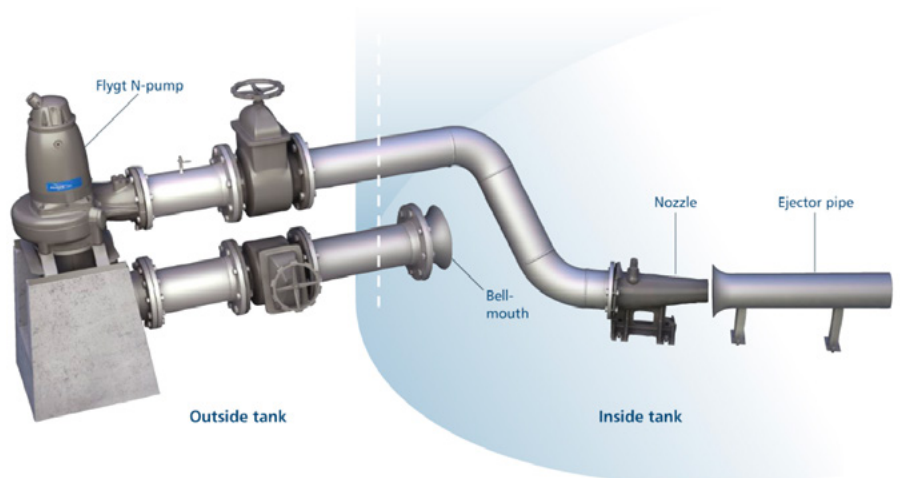
Flygt 4600 series compact mixers, version 310/390	Rated output power 50Hz/60Hz	Propeller	Max. thrust, without jet ring 50Hz/60Hz	Installation
Flygt 4650 Flygt 4660	5.5kW/8.3hp 10kW/15hp	580mm 23"	1540N/1560N 2400N/2600N	Biogas Support System (BIS-1)
Flygt 4670 Flygt 4680	13kW/20hp 25kW/40hp	766mm 30"	3060N/3070N 4630N/5340N	

Flygt Jet Mixers - with N-pump technology

To round out the biogas mixer selection, Xylem offers a line of jet mixers.

Flygt jet mixers combine the energy efficient, non-clog Flygt N-type pump with an innovative ejector design.

- Located outside of the tank
- Easy maintenance access
- Safe working environment
- Low installation costs
- Possibility of handling solids thanks to large discharge nozzle and ejector pipe
- Increased mixing efficiency thanks to innovative ejector pipe design



Secure biogas production with BIS-1 Biogas Support System.

The BIS-1 Biogas Support System was engineered to support critical functions for optimal biogas digestion operation including the ability to:

- Move the mixer up and down on the guide bar without opening the digester roof or hatch
- Rotate the mixer +/- 45 degrees in the horizontal plane without opening the digester roof or hatch
- Simply lift the mixer out of the digester without emptying the tank

This adjustable feature allows the operator to raise the mixer to break up a crust, or lower it to suspend settling solids.

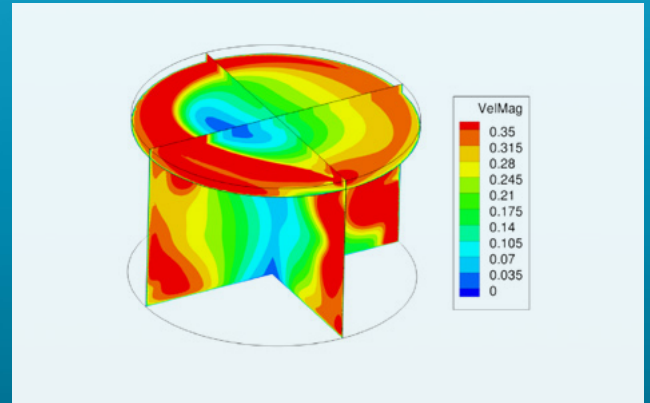
Both Flygt mid-size mixers and Flygt compact mixers can be installed with the BIS-1 guide bar for vertical and angular adjustability. These mixers can be combined and matched for optimal digester operation.



Let us help you select the most cost effective solution for your biogas mixing needs.

Each project is unique. Your mixing requirements depend upon your substrates, tank geometries and throughput. Xylem mixing experts have decades of experience in mixing of all types of substrates under all operating conditions. Keeping the digester uniformly blended requires understanding of the density gradients of the different digester feed substrates.

Xylem application experts understand the differences between silage, manure, food waste, and palm oil residuals, and how combining waste streams impacts substrate characteristics. They understand that mixing 30% to 40% dry matter content, and low density feedstock, often requires high turbulence to pull the light weight dry matter down into the liquid layer. Substrates with only 3% to 4% dry matter are much easier to handle, and might call for jet mixing instead.



CFD results showing Velocity magnitude [m/s] at the liquid surface (biogas digester)

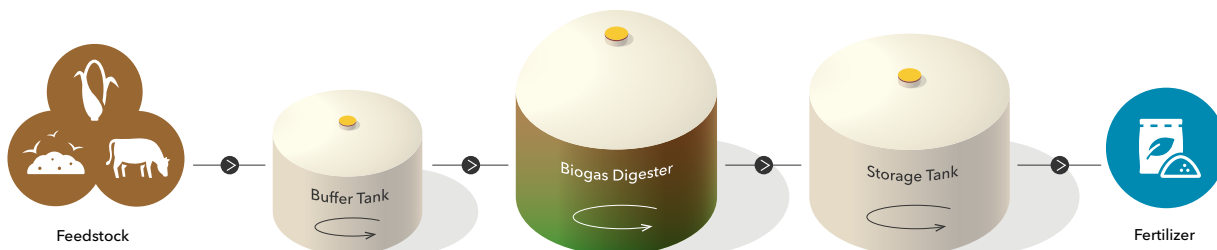
Xylem's 'know how', combined with the most advanced computer modeling (CFD) and an extensive data base, can help you determine the right combination of mixers for your biogas facility. Whether you are looking at a new design, or to optimize an existing operation, we can help you explore options and determine the most cost effective solution to achieve your biogas production goals.

Cost effective, energy efficient, reliable, sustainable - that's the Xylem promise.



What about transport between tanks? Xylem keeps substrates moving.

Xylem pumps keep substrates moving between tanks as well. Whether you are moving high dry solids, calling for a progressive cavity pump, fibrous liquid substrates needing non-clog or chopper pumps, or drainage from various structures, we have a pump to meet your requirements.



Flygt pumps move tough substrates between tanks.

For lower solids content substrates, the N Series non-clog and F Series chopper pumps offer reliable service at exceptional energy efficiency.

Flygt N and F Series Pumps.

Non-clog by design, the N-impeller provides a patented hydraulic system that is self-cleaning combined with a sustained energy efficiency above 80 percent. Change out the N Series insert ring for a chopper ring and you have just upgraded your N Pump to a F Series chopper pump. Built for heavy duty applications, the F Series has the added benefit of chopping fibrous substrates into smaller pieces, making subsequent mixing and digestion more efficient.

Depending upon the substrate and dry solids content, Flygt submersible pumps may be suitable for almost all applications in a biogas production facility. Optional dry installation provides an easy maintenance access.

Flygt N and F pumps can be used to transfer liquids from the reception pit to the collection tank, from collection tank to digester, from digester to final storage tank and from final storage tank to spreader truck. Combine a N or F pump with a submersible mixer and achieve homogeneous media for easy handling.

Flygt D Series Pumps.

Flygt D Series offers a number of pumps capable of handling solids up to 4 percent. Made with stainless steel 316, these pumps are perfect for lighter solid duty, such as transferring site drainage to collection pits. D Series pumps operate on a vortex principle, for low-maintenance, trouble-free operation.

Progressive cavity (PC) pumps move substrates with high dry solids content effectively and reliably.

Xylem's Flygt Compact C Range progressive cavity pump is capable of moving substrates with a dry solids content of up to 15 percent. Designed for small spaces, the Compact C can deliver flow rates up to 200 m³/hr (880 gpm) and pressures up to 24 bars (348 psi).

The Widethroat W Range progressive cavity pump can handle substrates with up to 40 percent dry solids content, with a maximum capacity of 215 m³/hr (946 gpm), at pressures up to 48 bars (696 psi). It is ideal for transferring high solids content substrates like silage.



Handling thin liquids with Lowara pumps.

Whether you need to transfer wastewater, run off water, condensate or hot water, Lowara pumps offer a smart and economical solution for the required duty.

The Lowara wastewater pump range is made for long time non-clog operation. The range consists of stainless steel pumps, grinder pumps with a state of the art cutter system, and robust cast iron self-cleaning non clog pumps. The Lowara dewatering pump range in stainless steel is designed for portable or fixed installation and suitable for clean or light contaminated water.





Mixing and pumping, Xylem keeps it moving after the sale.

Reliability and low life-cycle costs

Built for energy efficiency, low maintenance and outstanding performance, the complete line of mixers and pumps assure that your biogas production will be safe, efficient and profitable.

Years of trouble-free operation

Every Flygt mixer or pump is backed by our global network of service partners and local service centers. Our quick, professional teams will keep you moving with quality maintenance services and genuine Flygt spare parts.

Managing efficiency and preventing failure within biogas production using real-time analysis of BMP & FOS/TAC.

Analytical Instrumentation for Biogas.

The need for analysis of the feedstock and monitoring of the biogas process are crucial for a smooth and efficient digester operation. Xylem provides proven analytical instrumentation for the measurement of specific biogas parameters with its brands WTW and SI Analytics.

SI Analytics TitroLine® 5000 auto-titrator.

The most important measurement within the process itself is the FOS/TAC or alkalinity ratio; an ongoing indicator of the bio-fermenters stability based on Volatile Fatty Acids content (FOS) and buffer capacity (TAC) that prevents acidification in the reactor. The SI Analytics TitroLine 5000 auto-titrator, with built in FOS/TAC method and burette, provides daily analysis of how the fermentation plant is performing. Daily monitoring is the key to preventing plant underperformance due to an imbalance of feedstock load. In a worst case scenario, this imbalance may cause a whole process restart, which translates to great loss of time and biogas production.



OxiTop Control respirometry.

Another method of optimising the performance of a biogas plant is by monitoring the bio-methane potential (BMP) of the variant feedstock samples under similar conditions to that of the fermenter (pH, temperature, pressure) over a period of 21 to 28 days using an OxiTop IDS respiratory system. Such monitoring emulates the fermentation process and as such provides data for process control. Uniquely, the OxiTop® IDS/B measuring heads are specifically designed for the biogas industry due to their ability to withstand corrosion caused by hydrogen sulphide.

pHotoFlex TURB.

Instruments such as the WTW pHotoFlex TURB handheld photometer can not only provide an array of photometric data such as COD and ammonia for waterways and pond analysis, but they also have the ability to measure pH/ORP and turbidity on a single meter. With this universal performance, this meter supports cost-effective but precise analysis of optical and electrochemical parameters.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com



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