

Environmental & Energy Processes, Markets and Applications



Business Field Environmental & Energy Products and Components

Water is life – Intelligent solution concepts for clean results

Within the business unit PUMPS the business field Environmental & Energy is, throughout the world, specialized in sewage treatment and digester gas technology. We offer various pumping systems for all process stages, i.e. the ideal solution.

Business Field Environmental & Energy

- waste water treatment
- agriculture
- construction industry
- mining and smelting works
- renewable energies
- electroplating,
- ship building
- waste water and drinking water purification, etc



How fortunate to be able to choose ■

For centuries rotating positive displacement pumps have been used as pumping systems for all kinds of fluids in wastewater treatment. Due to their inherent characteristics these pumps guarantee a reliable, safe and efficient process. For such applications NEMO® Progressing Cavity Pumps and NETZSCH TORNADO® Rotary Lobe Pumps are available.

Always the right product. ■

For each individual case of application, the technically most suitable pump is chosen. Your advantages are pump types and series, which are optimally matched to your specific application, reliable and market driven. The NEMO® and TORNADO® pumps are complemented by the NETZSCH Grinding Systems.

We are where you are ■

With more than 1,300 employees at four development and production sites as well as 20 sales offices, a cooperation partner (in Japan) and another 200 NETZSCH representatives we are close to you wherever you are.

NEMO[®] Progressing Cavity Pumps

Standard pumps
Hopper pumps
Immersible pumps
Custom-built pumps

TORNADO[®] Rotary Lobe Pumps

Standard pumps
Custom-built pumps

NETZSCH M.Ovas[®] Macerator

Cutting plate macerator

NETZSCH Accessories

Protection devices
Pressure relief valves
Controls
Trailers
Tools

Your medium We are ready for anything. ■

- Activated sludge
- Auxiliary Flocculents
- Bio-mass
- Centrate
- Clay sludge
- Combined sewage
- Compacted sludge
- Conditioned sludge
- Crude sewage
- Dewatered sludge
- Digested sludge
- Excess sludge
- Faecal substances
- Ferric Chloride
- Flotation sludge
- Fresh sludge
- Grease and oil emulsions
- Gypsums suspension
- Hygienic sludge
- Industrial wastes
- Leachate
- Lime milk
- Liquid manure
- Lubricant
- Metallic hydroxide sludge
- Peat sludge
- Pit water
- Polymer
- Polymer solution
- Primary sludge
- Refinery sludge
- Returned sludge
- River sludge
- Secondary sludge
- Sewage sludge
- Sludge cakes
- Stabilised sludge
- Surplus activated sludge
- Thickened sludge
- Thin sludge
- Wastewater

Range of Applications and Performance Data in Waste Water Technology

NEMO® Progressing Cavity Pumps

Large Range of Capacities and Pressures

- Flow rates up to 2,200 gpm or 500 m³/h
 - Pressures up to 700 psi / 48 bar
-

Special Features

- continuous, almost pulsation-free pumping independent of pressure and viscosity
 - high dosing accuracy even at low rotational speed
 - high suction and pressure capability, no valves
 - reversible direction of flow
 - stator inlet with taper for optimal entry of the fluid into the pumping chamber
 - patented, positioned feeding screw for viscous products with high dry solids contents
 - For compact sludges with a tendency for bridge building, the hopper of the NEMO® pump is additionally equipped with the aBP-Module™ (up to installation size NM090) or an integrated bridge breaker (from installation size NM090 upwards)
 - low life cycle cost due to high operational reliability and simple service requirements
-

Advantages

- variable, modular system
- robust and compact block design also available with bearing housing
- the most suitable joint for every application
- four rotor/stator geometries and an extensive range of materials
- the most suitable joint for every application
- mechanical seal as standard, other seals optional

TORNADO® Rotary Lobe Pumps

Large Range of Capacities and Pressures

- Flow rates up to 4,400 gpm or 1,000 m³/h
 - Pressures up to 90 psi / 6 bar
-

Special Features

- high efficiency, space saving
 - continuous, almost pulsation-free pumping
 - high solids handling capability even with small pump sizes
 - flow rate proportional to speed
 - reversible direction of flow
 - high suction capability and resistant to dry-running
 - use of special geometries to avoid wrapping
 - low life cycle cost due to high operational reliability and simple service requirements
-

Advantages

- variable, modular system
- robust and space saving design
- three lobe geometries
- highly abrasion resistant and replaceable protection plates on both faces of the housing
- adjustable housing for long service life
- standard mechanical seal, will accept any DIN 24960 seal
- the patented timing gear, together with separate seals for pump and drive housings prevent any product leakage

NETZSCH Grinding Systems

Large Range of Capacities and Pressures

- depending on design up to 1,300 gpm / 300 m³/h with solids content up to 15 %
-

Special Features

- the self adjusting cutter head ensures optimal cutting performance
 - inline version: product inlet and outlet ports are the same level
 - heavy duty bearings to withstand large loads
-

Advantages

- dependent on the application two different designs are available
- cutters made from wear resistant, hardened steel
- hard faced mechanical seal with an oil reservoir
- flanged drive housing
- reliable protection for the NEMO® progressing cavity pumps and TORNADO® rotary lobe pumps

Flow chart of a Waste Water Treatment Plant

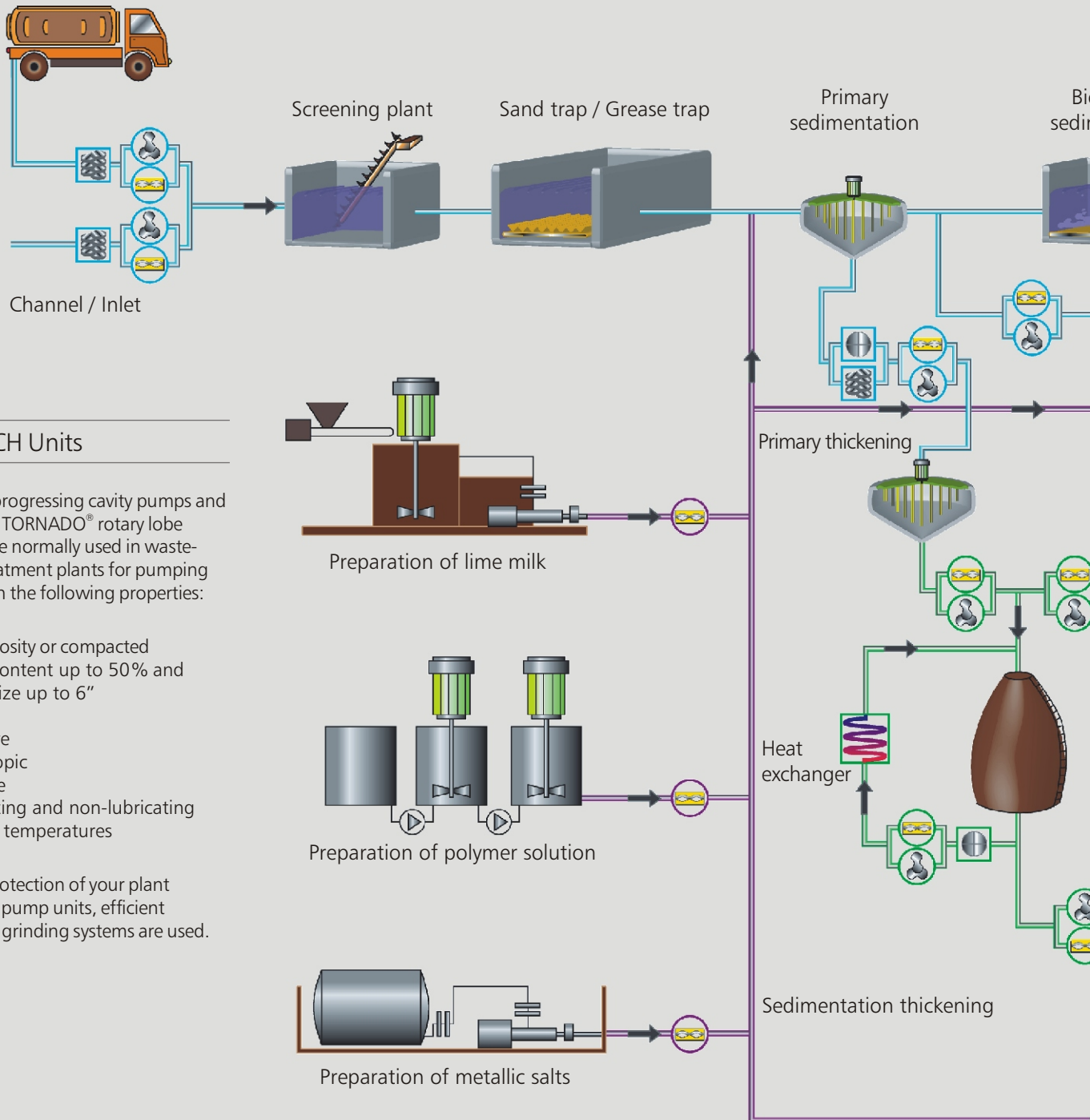
Application points of



NEMO® Progressing Cavity Pumps



TORNADO® Rotary Lobe Pumps



NETZSCH Units

NEMO® progressing cavity pumps and NETZSCH TORNADO® rotary lobe pumps are normally used in waste-water treatment plants for pumping fluids with the following properties:

- low viscosity or compacted
- solids content up to 50% and solids size up to 6"
- fibrous
- adhesive
- thixotropic
- abrasive
- lubricating and non-lubricating
- varying temperatures

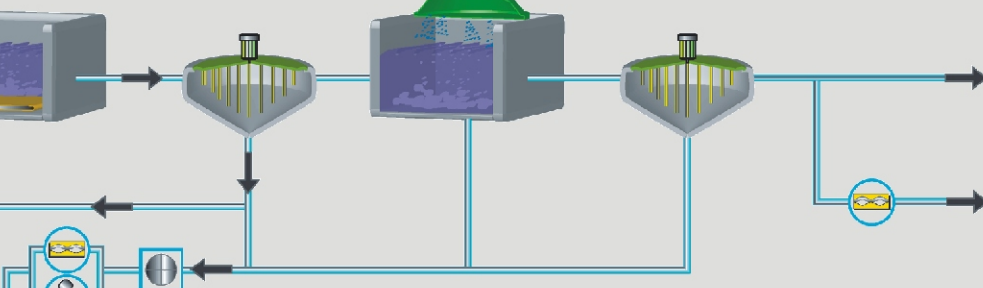
For the protection of your plant including pump units, efficient NETZSCH grinding systems are used.

pumps

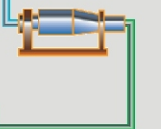


NETZSCH M-OVAS®

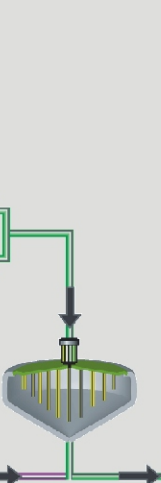
Biological
aeration Secondary
sedimentation 3rd purification
stage Final
sedimentation Outlet to water course



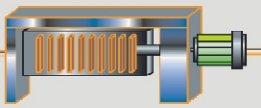
Secondary
Excess
sludge
thickening



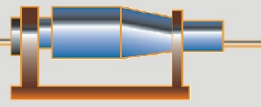
Digestion tank



Filter press



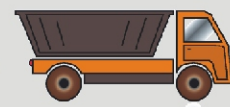
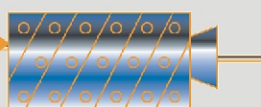
Centrifuge



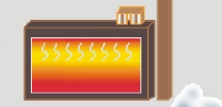
Belt filter press



other systems



Transport



Drying plant



Incineration plant

We speak your language

The flow chart on page 5 / 6 shows the individual process stages of wastewater treatment in municipal and industrial sewage plants, from the inlet to the discharge following the sludge treatment.

Process stages of wastewater treatment

Apart from sand, the wastewater contains coarse floating contaminants, digestible material, sludge forming suspended solids, dissolved organic matter and bacteria.

Mechanical waste treatment

During mechanical waste treatment solid particles are separated, heavy impurities are held back by screens or prepared for pumping by efficient NETZSCH grinding systems. The mineral parts in the wastewater are caught in the sand trap and the sludge is discharged into the preliminary clarification tank. This sludge is pumped to the static pre-thickening. When the mechanically cleaned wastewater has passed through the preliminary clarification zone the biological advanced waste treatment starts.

Biological treatment processes

During this stage the decomposition of carbon compounds as well as the elimination of nitrogen and phosphorus takes place. Bacteria are added to the organic pollutants and then the introduction or exclusion of oxygen separates them into solids (sludge particles), water, carbon dioxide and elementary nitrogen.

Thereafter, the wastewater flows into further clarification tanks from where part of the activated sludge from biological treatment is pumped back to the activated sludge tank.

Pre-thickening process

Excess sludge is brought over to the mechanical pre-thickening process. The addition of polymer causes a reduction in volume. In a hermetically sealed septic tank, at a temperature of approx. 98.6 °F, about 70 % to 80 % of the thickened sludge is reduced to 45 % to 50 % of its volume within approx. three weeks. The digester gas, methane, carbon dioxide as well as small quantities of nitrogen, oxygen and hydrogen sulfide produced during this process is utilized as energy for heating or generating power.

Sludge tower digestion tank

For the continuous feeding and agitating of the sludge in the septic tanks a NEMO® progressing cavity pump is used. The displaced digested sludge is pumped to a thickening tank for solids/water separation.

Mechanical sludge drainage

For further dewatering the digested sludge is mechanically treated by the addition of polymer or lime. In general, centrifuges, decanters, belt and filter presses are used to generate sludges with a dry solids content of approx. 30 % - 40 %.

NEMO® cake pump system

With a specifically designed NEMO® cake pump system the crumbly, compacted sludges are pumped for transportation to dumping grounds, thermal treatment or combustion in order to generate energy.

Typical Range of Applications

Thickened sludge



By static or mechanical thickening methods a first reduction in the volume of the sludge is achieved. The objective is to reach a dry solids content of 6% - 11% in the pumped fluid. Depending on the consistency, the fluids have low to high viscosity and may be pumped over long distances. Multistage NEMO® progressing cavity pumps are capable of pumping against high pressures. Even fluctuating process conditions are handled without problems.

Thin sludge



This sludge is the most common sludge in a wastewater treatment plant. The dry solids content is approx. 1% to 4%. According to the stage of the process the sludge contains varying quantities of organic and inorganic solids. Depending on the process, pumps with long serviceable lives are required which provide high flow rates at low pressures. Both NEMO® progressing cavity pumps and TORNADO® rotary lobe pumps are eminently suitable. The NEMO® progressing cavity pump stands out above all for its high performance based on L or P geometries. Another advantage is a long service life due to an extended seal line and a reduced sliding velocity of the rotor.

Dewatered sludge



Dewatering of the sludge with the addition of conditioning additives into centrifuges, decanters or filter presses generates a further reduction of volume between 65% and 80%. The result is a crumbly, compacted, non-flowing product. Due to these features force feeding of the fluid within the pump is required. Furthermore, bridge-building has to be avoided. In general, NEMO® progressing cavity pumps with rectangular hoppers and feeding screws are used for this application. The special features of these pumps are the positioned, patented feeding screws for optimal transfer into the pumping chambers. By compact sludges with a tendency to bridge-building, the hopper of the NEMO® pump is additionally equipped with the aBP-Module™ (up to installation size NM090) or an integrated bridge breaker (from installation size NM090 upwards).

Flotation Sludge



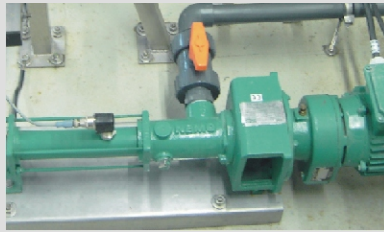
Flotation sludge and sludge foam are floating sludge fractions building up on the surface of the secondary sedimentation tank. This undesirable effect will necessitate the pumping away of the flotation sludge in the form of an air-fluid mixture. The ideal device for this application is the NEMO® progressing cavity pump which can reliably and continuously pump fluids containing a high gas content.

Bio-mass



Bio-mass is a renewable raw material source for the future. The inhomogeneous, organic substance occurs in anything between liquid and solid form. With the help of micro organisms gaseous methane and carbon dioxide are reclaimed. Depending on the process, the bio-mass has to be continuously agitated in the reactor. In this case you need pump systems capable of easily coping with high flow rates and large particle sizes within the dry solids content. Both NEMO® progressing cavity pumps and TORNADO® rotary lobe pumps are used for this application. However, due to the completely free passage of particle sizes up to 2.75". TORNADO® rotary lobe pumps are usually preferred. Another advantage of this pump is its compact, space saving design.

Auxiliary Flocculents



Flocculents are added to the sludge before dewatering. They stimulate the formation of big flocs of suspended solids contained in the sludge, thus, contributing to improved dewatering results. In general, flocculents are dosed as polymeric solutions or dispersions. Their viscosity - together with the necessity for exact dosing - requires for pumps with certain capabilities, capabilities which NEMO® progressing cavity pumps provide.

Lime milk



By lime milk we understand an inorganic suspension consisting of lime hydrate and water. Alternatively, lime milk can be produced by slaking unhydrated lime with water. Lime milk is used as a conditioning substance for dewatering sludges. Geometry and structure of the calcium hydroxide (lime) is dependent on its origin and the method of processing. The medium is very abrasive. For long serviceable life, NEMO® progressing cavity pumps are made from high quality rotor/stator materials. Most suitable is the wear-free NEMO CERATEC® ceramic rotor in connection with an extremely wear resistant polyurethane stator.

Process Monitoring and Accessories

NETZSCH Protection Units ensure the operating reliability of the pump and the plant and minimizing downtime.

Range of Applications and Performance Data in Biogas Technology

NEMO® Progressing Cavity Pumps

Large Range of Capacities and Pressures

- Flow rates up to 2,200 gpm or 500 m³/h
 - Pressures up to 700 psi/ 48 bar
-

Special Features

- continuous, almost pulsation-free pumping independent of pressure and viscosity
 - high dosing accuracy even at low rotational speed
 - high suction and pressure capability (-13 psi up to +696 psi), no valves
 - reversible direction of flow
 - stator inlet with taper for optimal entry of the fluid into the pumping chamber
 - patented, positioned feeding screw for viscous products with high dry solids contents
 - maximum blending and delivery of the bio substrates with the specifically designed NEMO® B Max®
 - low life cycle cost due to high operational reliability and simple service requirements
-

Advantages

- variable, modular system
- robust and compact block design also available with bearing housing
- four rotor/stator geometries and an extensive range of materials
- the most suitable joint for every application
- adjustment of hopper dimensions to specific applications is possible.

TORNADO® Rotary Lobe Pumps

Large Range of Capacities and Pressures

- Flow rates up to 4,400 gpm or 1,000 m³/h
 - Pressures up to 90 psi 6 bar
-

Special Features

- high efficiency, space saving
 - continuous, almost pulsation-free pumping
 - high solids handling capability even with small pump sizes
 - flow rate proportional to speed
 - reversible direction of flow
 - high suction capability and resistant to dry-running
 - use of special geometries to avoid wrapping
 - low life cycle cost due to high operational reliability and simple service requirements
-

Advantages

- variable, modular system
- robust and space saving design
- three lobe geometries
- highly abrasion resistant and replaceable protection plates on both faces of the housing
- adjustable housing for long service life
- standard mechanical seal, will accept any DIN 24960 seal
- the patented timing gear, together with separate seals for pump and drive housings prevent ingress of any product leakage

NETZSCH Grinding Systems

Large Range of Capacities and Pressures

- depending on design up to 1,300 gpm / 300 m³/h with solids content up to 15 %
-

Special Features

- the self adjusting cutter head ensures optimal cutting performance
 - inline version: product inlet and outlet ports are the same level
 - heavy duty bearings to withstand large loads
-

Advantages

- dependent on the application two different designs are available
- cutters made from wear resistant, hardened steel
- hard faced mechanical seal with an oil reservoir
- flanged drive housing
- reliable protection for the NEMO® progressing cavity pumps and TORNADO® rotary lobe pumps

Flow chart of a Biogas Plant

Application points of



NEMO® Progressing Cavity Pumps



NETZSCH Units

NEMO® progressing cavity pumps and NETZSCH TORNADO® rotary lobe pumps are normally used in biogas plants for pumping fluids with the following properties:

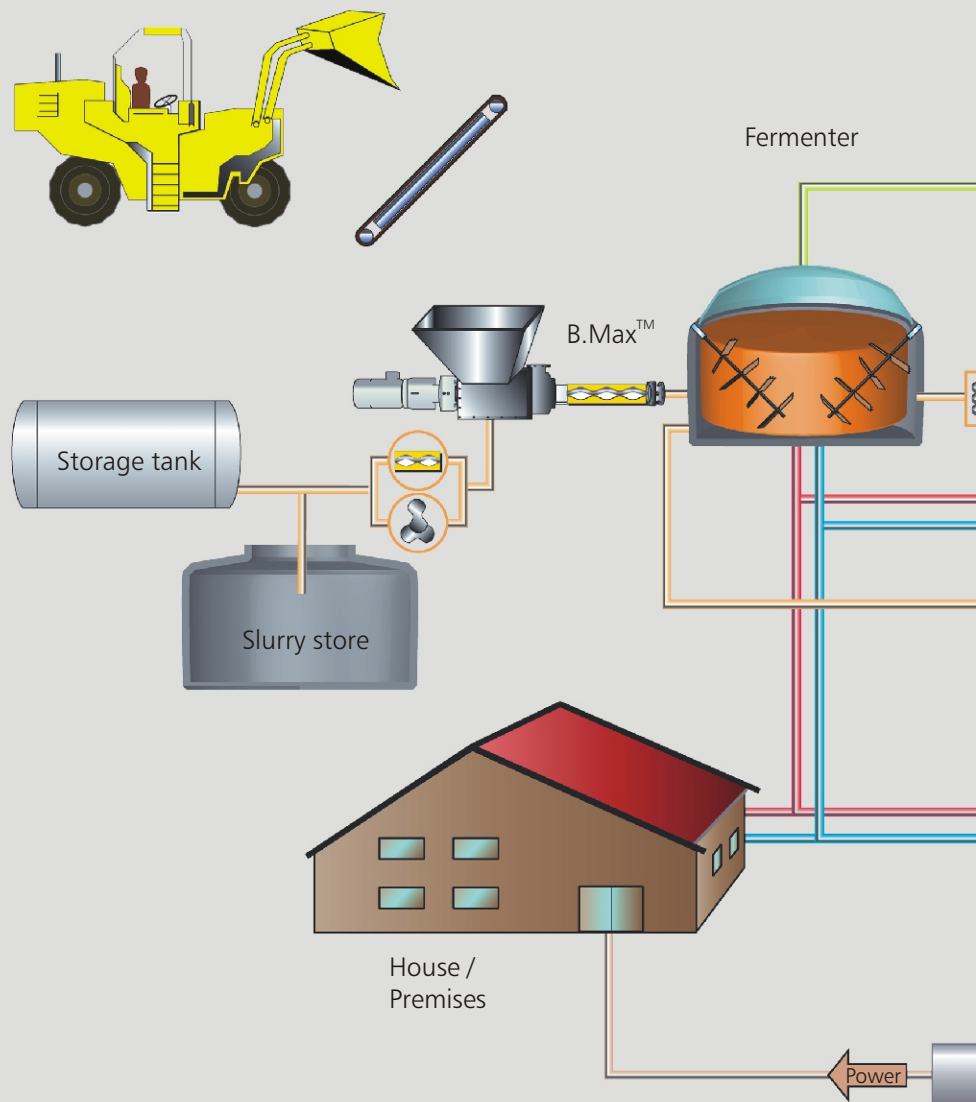
- low viscosity or compacted
- solids content up to 50% and solids size up to 6"
- fibrous
- adhesive
- thixotropic and dilatant
- abrasive
- non-lubricating and lubricating
- varying temperatures
- shear sensitive
- aggressive (pH 0 - 14)

For the protection of your plant including pump units, efficient NETZSCH grinding systems are used.

NEMO® B.Max®

The NEMO® B.Max® is particularly suitable for the following media:

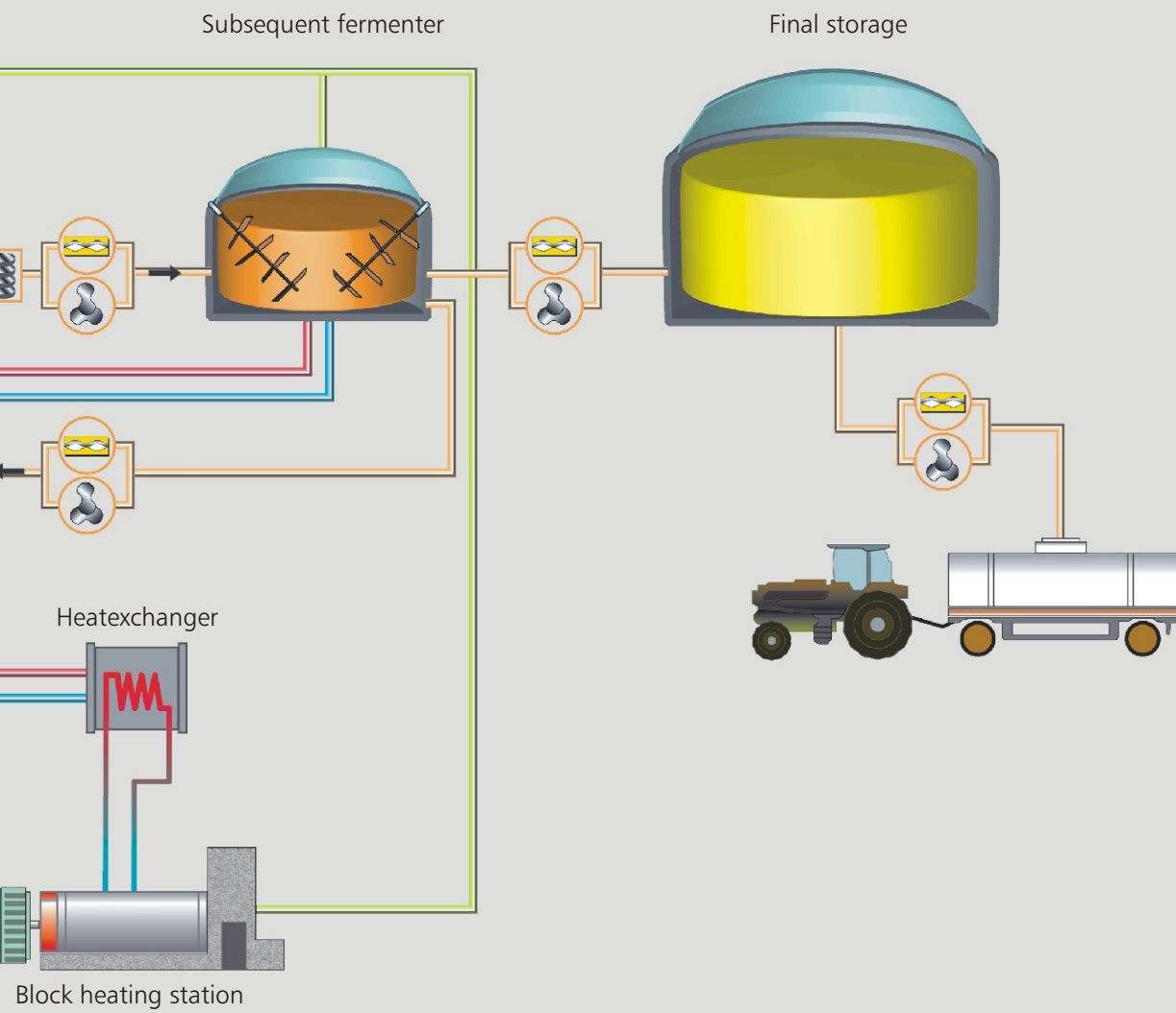
- Fermented renewable energies
- Liquid manure
- Process Water
- Ground biowaste and leftovers
- Pretreated slaughter waste
- Co-substrate
- Thickened substrate
- Distillers grains with solubles



TORNADO® Rotary Lobe Pump



NETZSCH Macerators



We speak your language

Today's trend is the increasing use of the fermentation of organic matter for the economical production of energy. For the production of biogas, different processes are possible. Biogas plants belong, together with solarplants and waterpower plants, to the regenerative electricity producers (= CO₂-neutral). Among these, biogas is one of the most multi-functional energy sources. Electricity, heat, fuel and mains gas can be produced from biogas. The "energy" for the biogas comes from renewable energies or organic waste which, with the help of bacteria, is transformed under the exclusion of air in large part into methane.

Renewable Energy Plants

At the beginning of the process the fermenters are loaded with the substrate. The substrate is homogenized with the process water in the B.Max[®]. The fermentation proceeds, at a concentration of anhydrous mass of approx. 5 - 15 %, in four biological phases. These are the hydrolysis phase, acidification phase, acetic acid phase and the methane creation phase. Through use of an upstream grinder, a higher yield of gas can be achieved. Afterwards the pre-fermented substrate is delivered into the subsequent fermenter.

Biowaste Plants

The bio-waste with solid contents is delivered to a separate receiving station. In the receiving area the bio mass is sorted and ground. Subsequently, the ground waste is forwarded to the flotation process. During flotation, water is added to the organic waste until it turns into pumpable suspension (pulp). In this stage, a trap removes solids such as parts of metal, stones and glass. Afterwards the suspension is pumped into the hydrolysis tanks. At a temperature of approx. 158 °F, the organic waste is sanitized.

Methane fermentation

After treatment in the hydrolysis container the biological waste suspension is transferred into the methane fermentation tank. There, bacteria turn the acids into acetic acid, methane und CO₂. For this transformation a tight pH-value of about 6,8 bis 7,3 must be ensured. The acids generated in the hydrolysis are disintegrated to approx. 85%.

Production of Electricity

The now generated methane will be supplied to a block heating station for the production of electricity or heat. The remaining biomass, still containing a residue of organic material, will be further dewatered, the extracted substrates are used agriculturally or will be finally composted.

Grinding System TORNADO®

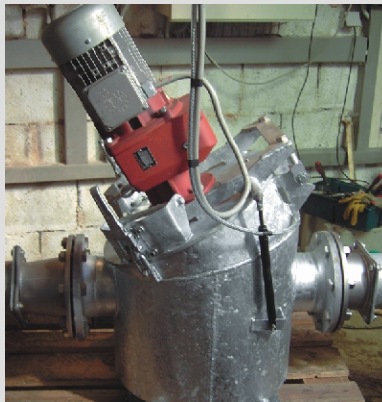
The right model for every application

NETZSCH grinding systems are used to effectively protect your complete installation including the pumping equipment. They ensure that oversize solids are reliably reduced to a pumpable size therefore safely avoiding the danger of blockages.



NETZSCH M-Ovas® Macerator

The special shape of the housing directs solid particles in the waste water towards the cutting plate, where they are held and chopped by the rotating blades. These units are suitable for a flow of up to 1,300 gpm / 300 m³/h for sludge containing up to 7% dry solids and are characterized by their ease of maintenance.



TORNADO® Industrial Rotary Lobe Pump

NETZSCH TORNADO® Industrial Rotary Lobe pumps are very versatile stand-alone equipment. They are used primarily in environmental technology and the chemical industry for continuous and gentle pumping of almost any substance while dosing in proportion to rotation speed. Their low space requirements and high power density are some of their most important advantages.



Your benefit

- trained personnel for handling NETZSCH pumps
- avoid mistakes with installation and commissioning
- save costs by preventive maintenance and professional repairs
- save time when analyzing damage and restarting pumps
- optimize your stock of NETZSCH Genuine Spare Parts

For more information, visit

www.netzsch.com

or contact your local Distributor.

NETZSCH customers are entitled to the best service – We see to that!

To us, NETZSCH service is of equal importance as the quality of our pumps.

From planning via process monitoring

Consulting, service and quality are our strengths. When buying the pump you have decided on a quality product from NETZSCH for a good reason.

In order to maintain the capacity and quality of your pump, we will support you in all matters, even after the delivery of the pump.

Skilled sales and service staff located near your site are at your disposal around the clock.

Process reliability

NETZSCH service together with quality and genuine parts ensure reliable operation of the pump in your plant. The experience from more than 500,000 pumps installed is the basis for this.

Availability

Five production sites guarantee immediate supply of parts in all regions of the world.

Quality

Strict quality standards, tests and the certification according to ISO 9001 guarantee all parts are of a consistent quality to the highest degree.

Registered Trademarks TM and ®

- The heart of your process
- NETZSCH, NEMO
- NEMO PUMPEN
- NEMO CERATEC
- iFD-Stator, NEMOLAST
- SBBPF, EPBPF, SM, NE, NM
- TORNADO, M-Ovas, aBP-Module
- M.Champ, C.Pro, B.Max
- pMT-Pilot, N-Ipos, N-Elor
- NEMOCOAT