

NETZSCH

Proven Excellence.



Sludge Cake Conveying Systems

Pumps & Systems

OPTIMIZATION OF WASTEWATER TREATMENT PROCESS

Sludge Cake Conveying Systems

Overview

Sludge or biosolids is the primary by-product of municipal wastewater treatment facilities. It is the material that settles at the bottom of basins and tanks during the wastewater treatment process. Through composting, land application, land filling or incineration, sludge can be of value. Yet, due to the pathogens and unpleasant odors associated with this residual, additional treatment is usually required to prepare it for final disposal.

Dewatering is preferred

Dewatering is a typical process step which concentrates solids to prepare sludge for additional handling. Depending on the extent of dewatering, three forms of sludge can be produced for additional treatment and or disposal. The predominant form, sludge cake, is characterized by dry

solids content from 20% to 50%, depending on the dewatering system used. While all forms of sludge require additional handling for proper disposal, sludge cake handling is dependent upon more specialized conveying systems due to the high pressure or force required to move this dry form of waste.



NEMO® Sludge Cake Pump with customized 4.27 ft / 1.5 m hopper pumping 20 - 22% dewatered sludge from a belt filter press to a drying plant 110 ft. (34 m) away. Pump employs dual aBP-Module® (Asynchronous Bridge Preventing Module), STP stator dry running protection system and the Friction Loss Reduction System (FLR - see page 8 and 9).

Open and Closed Systems

There are two main systems employed to move sludge cake; they are open systems and closed systems. Typical open systems are conveyor belts, augers or chains that carry the discharged sludge cake to storage hoppers, truck loading facilities, or secondary onsite disposal or treatment processes like incineration.

Closed systems, however, employ pumps to convey sludge cake through sections of pipe to those same secondary equipment or processes.

While open conveyor systems are commonly used to move sludge

from filter presses, they do have potential problems associated with them. These problems include the large foot print required due to the incline limitations, inability to free up floor space, high maintenance costs, exposure to the elements, the contamination hazard of all surfaces and surrounding areas, unacceptable odors and higher noise levels.

Additionally, housekeeping man hours due to overloaded pans and resulting spillage, unplanned maintenance man hours due to ripped pans, chains that jump the track as well as breakage of chains,

belts or other wear points are other problems that must be taken into account.

Closed systems offer benefits for better management of the sludge handling process. These systems require a smaller foot print since pumps can move sludge cake through inclined or vertical pipes for more compact pipe routes.

Sludge can also be transferred over longer distances with minimal spillage which greatly reduces housekeeping hours and odors. These can especially be major concerns if residential areas are nearby.

In the foreground is the new, closed conveying system with vertical piping discharging into a storage tank. Immediately behind it is the open auger system that has been discontinued.



NEMO® Sludge Cake

PROGRESSING CAVITY PUMP DESIGNS

Pumps to Consider

There are two types of pumps to consider when planning a closed system, a hydraulic piston pump or a progressing cavity pump.

A hydraulic piston pump requires a separate screw feeder mechanism to feed the pump. A NETZSCH progressing cavity pump, however, has an integral auger which saves space and costs. This is the major reason why a NETZSCH progressing cavity pump can cost a fraction of the price of a piston pump option.

Along with this, the design of a piston pump is more complex with many more wearing parts. A NETZSCH progressing cavity pump has fewer parts which will mean much less in maintenance and service costs over time. Additionally, a piston pump creates high pulsation while the NETZSCH Pump works continuously with almost no pulsation.

Operation with organic waste

For many decades rotating positive displacement pumps have been used as conveying systems for all kinds of fluids in wastewater treatment. Due to their inherent characteristics these pumps guarantee a reliable, safe and efficient process. For applications like this, NEMO® Progressing Cavity pumps are available. NETZSCH NEMO® BF/SF positive displacement pumps are designed for conveying dewatered

System Comparison			
Characteristics / Capabilities	Piston Pump System	Belt / Screw Conveyor System	NETZSCH Sludge Cake System
High / Continuous Flows	-	-	+
Minimum Space Requirements	+	-	+
Low Maintenance Costs	-	-	+
Pulsation	-	n/a	+
Low Noise	-	+	+
Odor Control	+	-	+
Ease of Cleaning	-	-	+
Low Investment Cost	-	+	+
Outside Temperature Resistance	+	-	+

sludge easily from your filter press or centrifuge. The enlarged housing has a fully customizable rectangular hopper and force feed chamber for easier entry of the product into the rotor and stator. The coupling rod incorporates a patented, positioned feed screw that extends over the joints and is always positioned opposite the open cavity of the stator. Therefore, the sludge cake is pushed directly into the open cavity in the shortest possible route. This improves the chamber filling by up to 50% as compared to other pumps with random positioning of the screw.

Advantages

- Flow rates up to 400 US gpm (90 m³/hr)
- Pressures over 1,000 psi (70 bar)
- Handles highly viscous, compacted and crumbly sludge cake with up to 40% (other organics and inorganics up to 80%)
- Energy efficient
- Low odor
- Low noise

NEMO® BF/SF Design

in block design with open hopper
and force feed chamber
or as NEMO® SF with
bearing housing design



Description

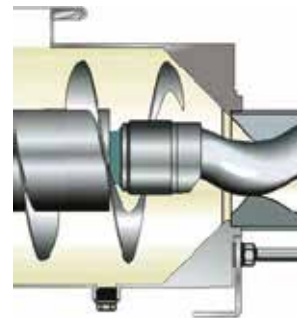
Housing with enlarged, rectangular feed hopper and with removable, cone-shaped force-feed chamber. Coupling rod with patented, positioned auger for optimal product feeding into the conveying elements.

Performance

Flow rates up to 880 gpm / 200 m³/h at pressures up to 720 psi / 48 bar.

Fields of application

Industrial applications for high consistency fluids in wastewater plants, the food industry, mining, chemical industry for highly viscous, compacted and crumbly product. For product that tend to bridge, the pump is fitted with the optional aBP-Module®. Typically used for dewatered sludge up to 35% DS.



Coupling rod with patented, positioned feed screw to eliminate dead space within the housing and to increase efficiency.

NEMO® BF/SF optional aBP-Module® bridge breaking design

block design with directly
flanged drive or as
NEMO® SF with bearing
housing design



aBP-Module®

a - Asynchronous

B - Bridge

P - Preventing

Description

Housing with removable, enlarged rectangular hopper and tapered force feed chamber as well as coupling rod with patented, positioned feeding screw for optimal transfer of the medium to the rotor and stator. Hopper dimensions can be adjusted to fit specific applications. With the addition of the aBP-Module®, the pump can easily handle medium with bridging tendencies.

Performance

Flow rates up to 880 gpm / 200 m³/h at pressures up to 720 psi / 48 bar. NEMO® BF/SF with aBP-Module® available from size NM 045 to NM 090.

Fields of application

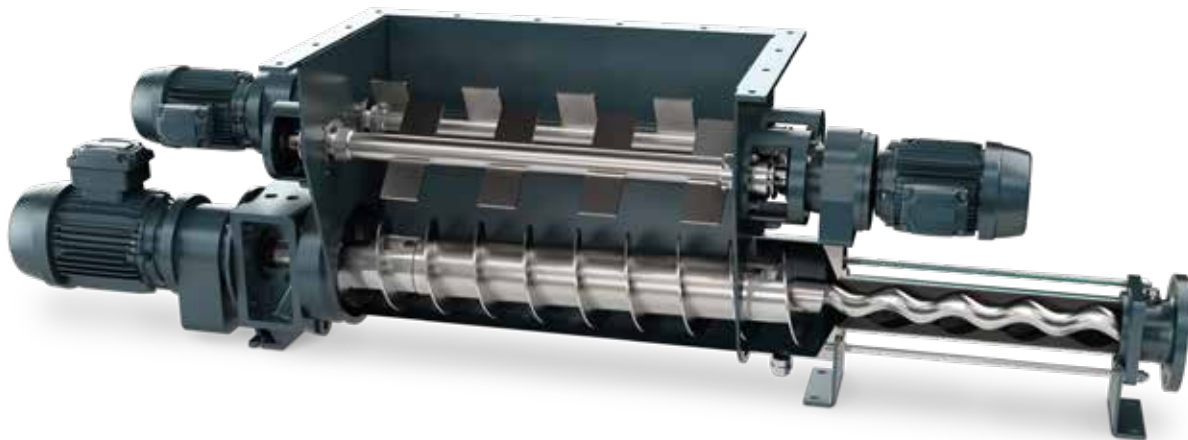
Industrial applications in environmental technology, the food industry and the chemical industry for highly viscous, compacted and crumbly media. For media that tends to bridge, the pump is fitted with the optional aBP-Module®.

The aBP-Module® consists of a top hopper with two inner spoked wheels. The spoked wheels are located close to the hopper walls, creating the effect of "moving hopper walls" producing a shearing effect in the medium. The speed difference of the spoked wheels, which is independently adjustable, creates the required shearing effect, to consistently prevent bridge building inside the hopper. The structured surface of the spoked wheels assist in product agitation.

Budget selections, specifications, performance curves, and PDF/CAD drawings are all available upon request. Contact us at: sales.npa@netzsch.com

NEMO® BP/SP with bridge breaking design

block design with directly
flanged drive or as
NEMO® SP with bearing
housing design optional



Description

Housing with integrated bridge breaker dispersion paddles, mixing additions, enlarged rectangular hopper and tapered force feed chamber as well as coupling rod with patented, positioned feeding screw for optimal transfer of the medium to the rotor and stator.

Performance

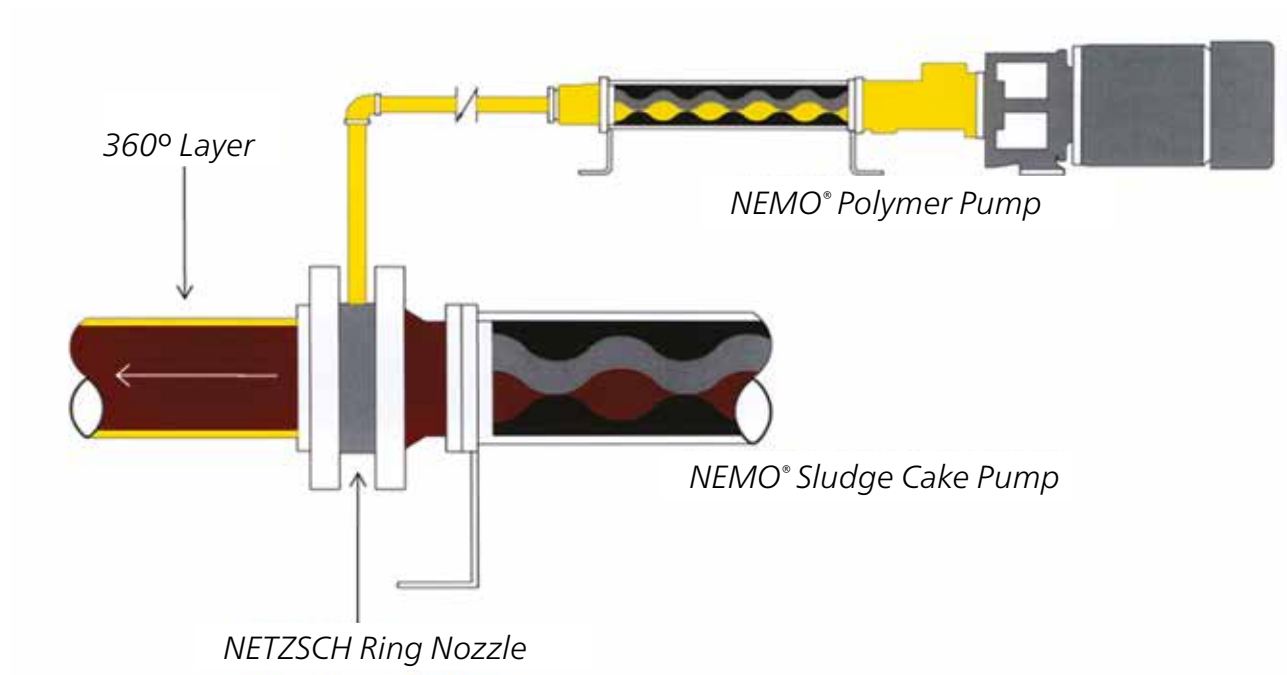
Flow rates up to 880 gpm / 200 m³/h at pressures up to 720 psi / 48 bar.
NEMO® BP/SP available from size NM 090.

Fields of application

Industrial applications in environmental technology, the food industry and the chemical industry for compacted, lumpy and crumbly media that tends to bridge.

Budget selections, specifications, performance curves, and PDF/CAD drawings are all available upon request. Contact us at: sales.npa@netzsch.com

NEMO® Sludge Cake Pumps with FLR (Friction Loss Reduction) System



The NETZSCH Friction Loss Reduction System can help you to achieve considerable reductions in pressure, cutting back on operating costs and improving the overall lifetime of your entire system. Pressures over 1,000 psi (70 bar) are easily handled by the NEMO® Sludge Cake Pump when paired with the NETZSCH FLR System. Within the NETZSCH FLR System

is the NETZSCH Ring Nozzle, which provides a continuous 360° even layer of fluid around the entire interior pipe surface. This layer, whether water or polymer, reduces friction loss within the pipeline and allows for pressure reductions of up to 50%.

Advantages

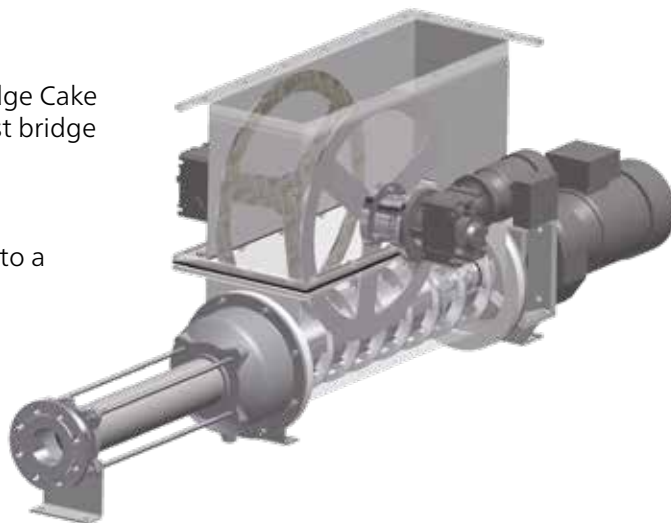
- Use of low schedule piping
- Use of smaller electrical components (motor, VFD, control panel)
- Reduced overall pump length
- Longer service life of parts
- Lower energy requirements

NEMO® Sludge Cake Pumps Options and Accessories

aBP-Module® (optional)

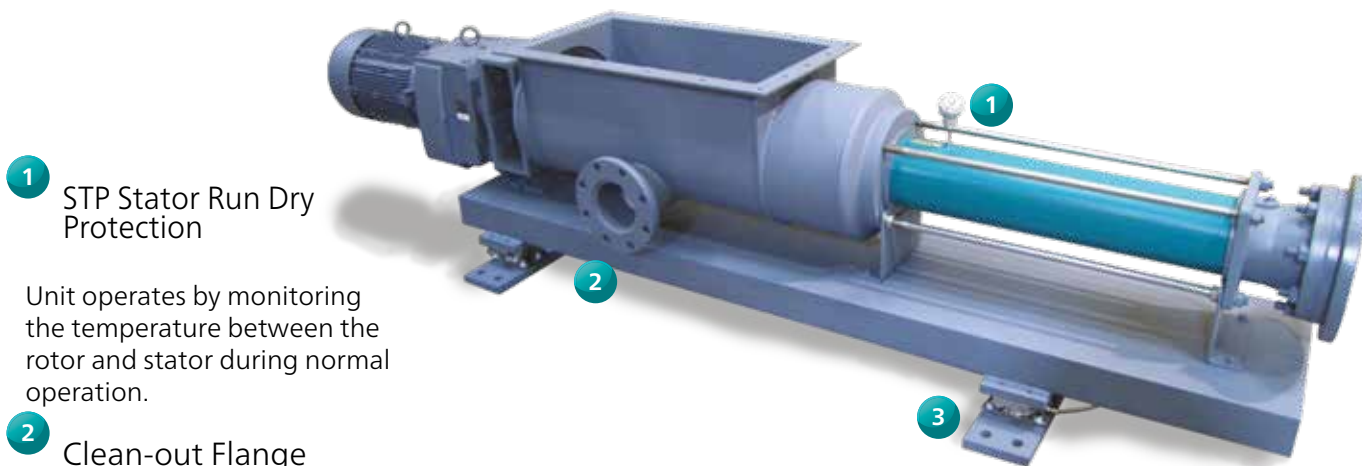
With the addition of an aBP-Module, the NEMO® Sludge Cake Pump becomes the solution for even the stickiest most bridge prone sludge.

- Retrofitted without need for modification of pump
- Safe measuring and controlling of fill quantity due to a shaft-less center
- Adjustable wheel speed dependent upon consistency of pumped media
- Safe operation
- Service friendly
- Low energy requirements



Accessories

NEMO® Sludge Cake Pumps can be equipped with accessories that protect your installation and provide reliable, constant service.



1 STP Stator Run Dry Protection

Unit operates by monitoring the temperature between the rotor and stator during normal operation.

2 Clean-out Flange

Provides easy access to flush out the pump interior and piping.

3 Load Cells

Monitors the weight of pump and adjusts the pump speed (in conjunction with the VFD) as the level in the hopper varies.

NETZSCH offers these additional accessories that promote safe and trouble-free operation:

- NEMO® overpressure protection system
- Hopper level sensors
- Electronic counters with proximity sensors for metering
- Control panels

NEMO® Sludge Cake Pumps

RELIABLE AND VERSATILE

Experience You Can Count On



NEMO® Sludge Cake Pump with bridge breaker conveying dewatered sludge immediately overhead via a long radius elbow 270 ft. (80 m) to incinerator. Solids content approximately 25%–32%, flow-rate of 8–60 gpm (2–14 m³/hr) at 360 psi (25 bar) discharge pressure.



NEMO® Sludge Cake Pump being used underneath a centrifuge to convey dewatered sludge over 137 ft (42 m) to transport truck. Solids content approximately 18%, flow rate of 2–3 gpm (.45–.7 m³/hr) at 30 psi (2 bar) discharge pressure.



NEMO® Sludge Cake Pump with NETZSCH FLR System injecting 0.5 gpm (.11 m³/hr) of water into the pipeline to reduce pressures by about 50%. Dewatered sludge is conveyed over 75 ft (23 m) at 15–20 gpm (3.5–4.5 m³/hr). Additional flanges added to the hopper for cleaning of the pipeline and pump.



NETZSCH FLR System being used in conjunction with NEMO® Sludge Cake Pump to convey dewatered sludge over 900 ft (275 m) for transport. With the introduction of only 0.7 gpm (.16 m³/hr) of polymer into the sludge, pressures are reduced from 450 psi to 150 psi (31 bar to 10 bar) for safe and easy long distance transfer within the pipeline. Sludge cake solids content approximately 23% being pumped at 20 gpm (4.5 m³/hr).



NEMO® Sludge Cake Pump with a 2 meter hopper design underneath a belt filter press conveying sludge 120 ft (37 m) to the drying plant. Solids content is approximately 20%, flow-rate of 26 gpm (6 m³/hr) at 120 psi (8 bar) discharge pressure.



The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. More than 4,000 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

The NETZSCH Business Unit Pumps & Systems offers NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, NOTOS® screw pumps, PERIPRO™ peristaltic pumps, macerators/grinders, metering technology and equipment custom built for challenging solutions for different applications globally.

Proven Excellence.

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