

## Sludge Cake Conveying Systems



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## Sludge Cake Conveying System 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. However, 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 1.5 meter 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) and STP stator run dry protection system.*

## 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 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, 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 to take 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 odor problems. All of these can be of major concern 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.*



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## 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 will require a separate auger 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.

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.

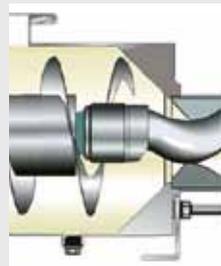
Characteristics/Capabilities	Piston Pump System	Belt/Screw Conveyor System	NETZSCH Sludge Cake System
High/Continuous Flows	-	-	+
Minimum Space Requirements	+	-	+
Low Maintenance Costs	-	-	+
Low Noise	-	+	+
Odor Control	+	-	+
Ease of Cleaning	-	-	+
Low Investment Cost	-	+	+

## NEMO® – BF/SF Sludge Cake Progressing Cavity Pumps

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 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.

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

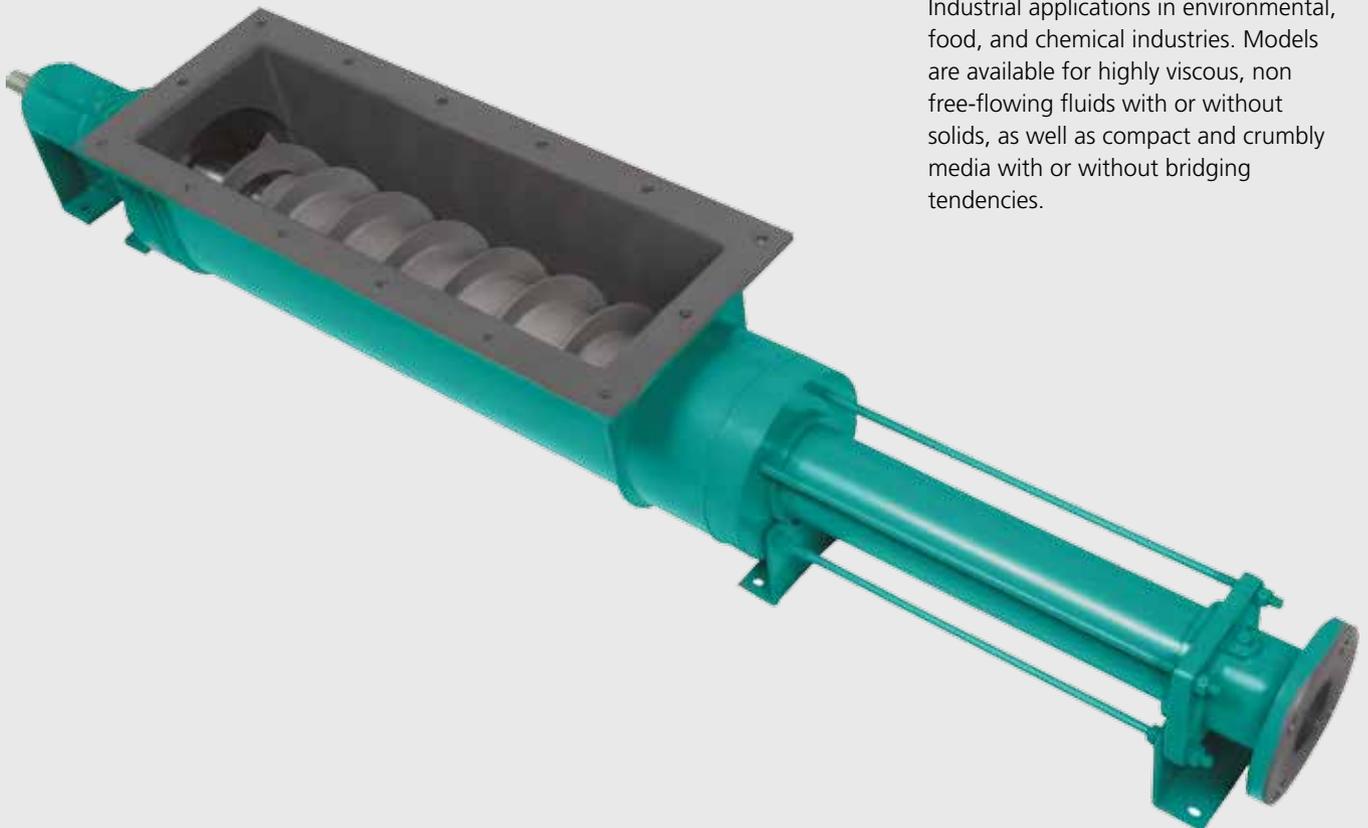


### Advantages

- Flow rates up to 400 US gpm (90 m<sup>3</sup>/hr)
- Pressures over 1000 psi (70 bar)
- Handles highly viscous, compacted and crumbly sludge cake with up to 50% Solids content not prone to bridging
- Energy efficient
- Low odor
- Low noise

### Range of Applications

Industrial applications in environmental, food, and chemical industries. Models are available for highly viscous, non free-flowing fluids with or without solids, as well as compact and crumbly media with or without bridging tendencies.

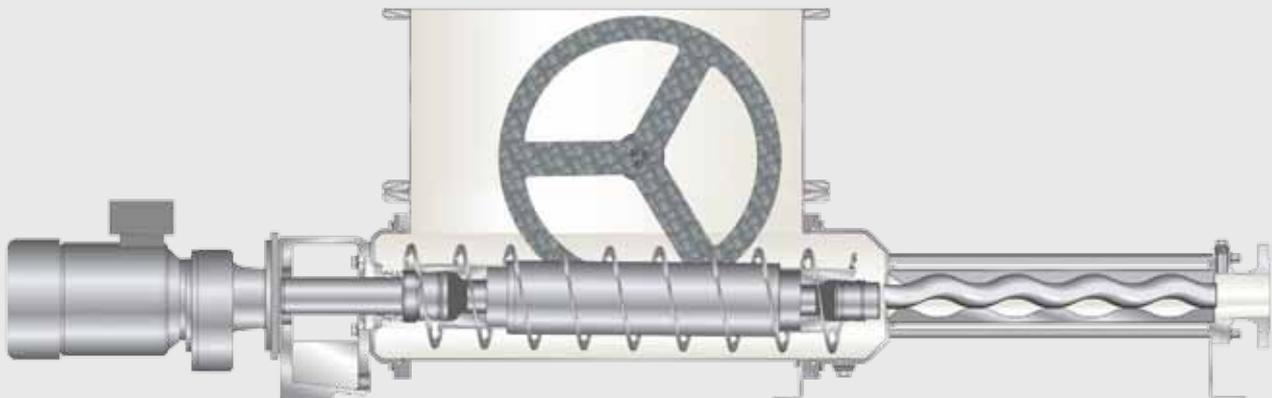


# NEMO® – BF/SF Design

Our design – your benefit: low life cycle costs

## NEMO® BF/SF Design with aBP-Module®

a - Asynchronous  
B - Bridge  
P - Preventing

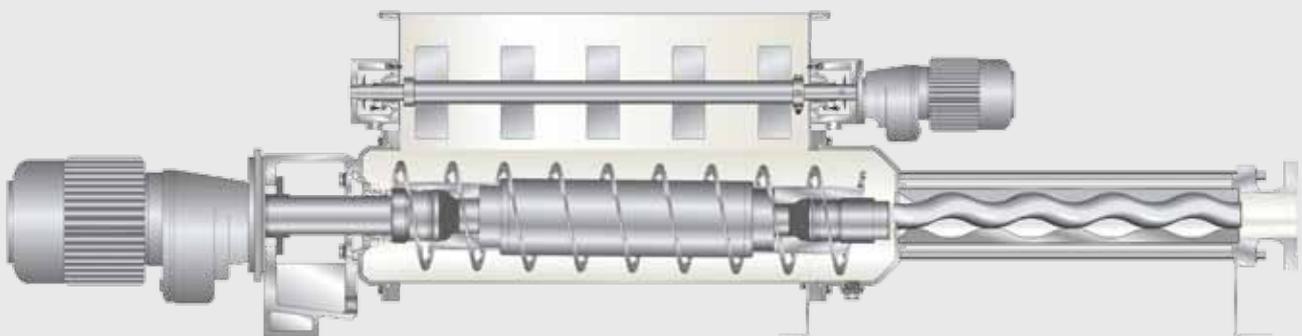


## Description

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.

*Budget selections, specifications, performance curves, and PDF/CAD drawings are all available upon request.*

NEMO® BP/SP Design  
in block construction design  
with directly flanged drive

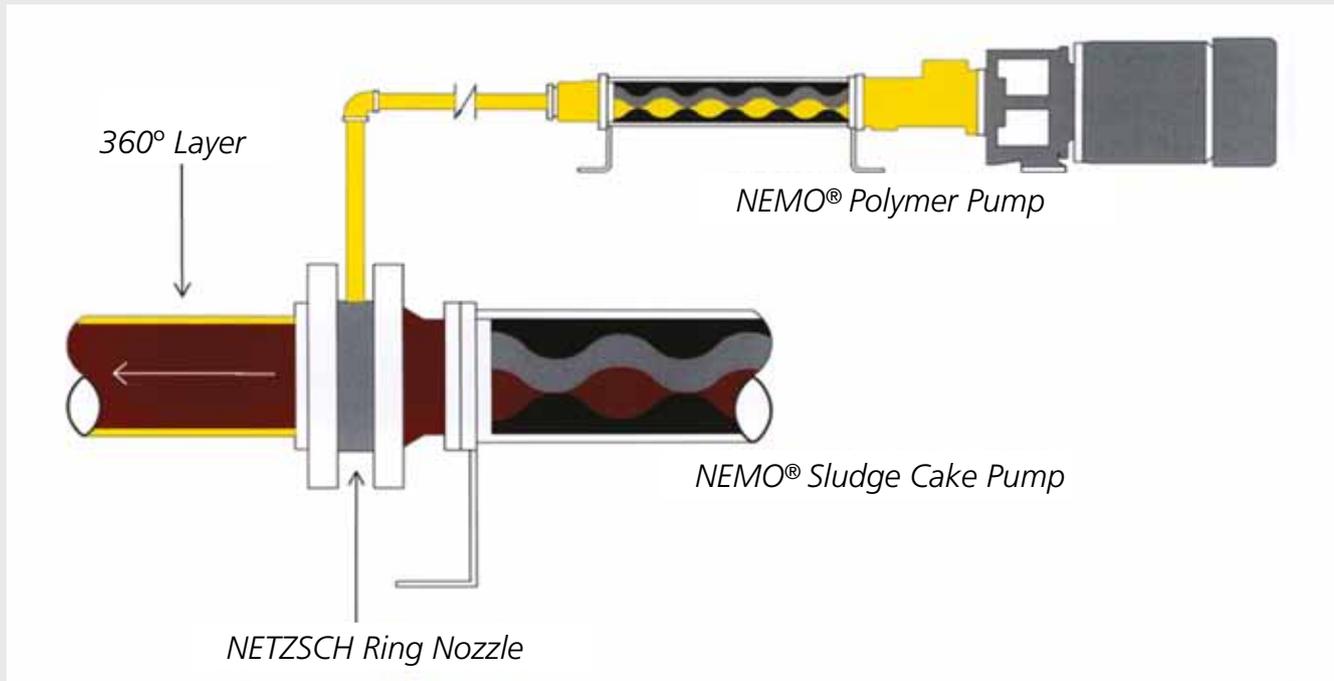


### Description

Housing with integrated bridge breaker, 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.

*Budget selections, specifications, performance curves, and PDF/CAD drawings are all available upon request.*

# NEMO® – BF/SF Sludge Cake Pumps with FLR System - 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 lifetime of your entire system. Pressures over 1000 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 around the entire pipe surface. This layer, whether water or polymer, reduces friction loss within the pipeline and allows for pressure reductions of up to 50%.

## Advantages

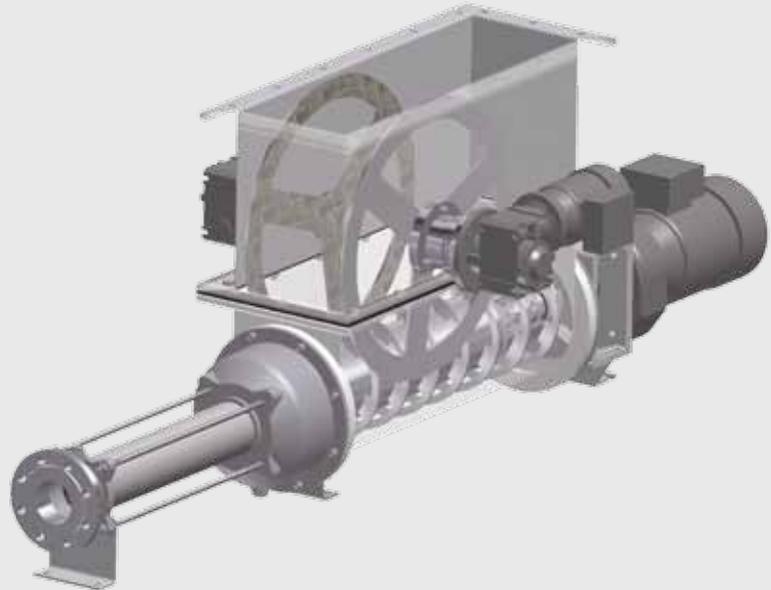
- Use of low schedule piping
- Use of smaller electrical components (motor, VFD, control panel)
- Reduced overall pump length
- Longer service life of parts
- Lower energy requirements

## NEMO® – BF/SF Sludge Cake Pumps Options and Accessories

### aBP-Module® (optional)

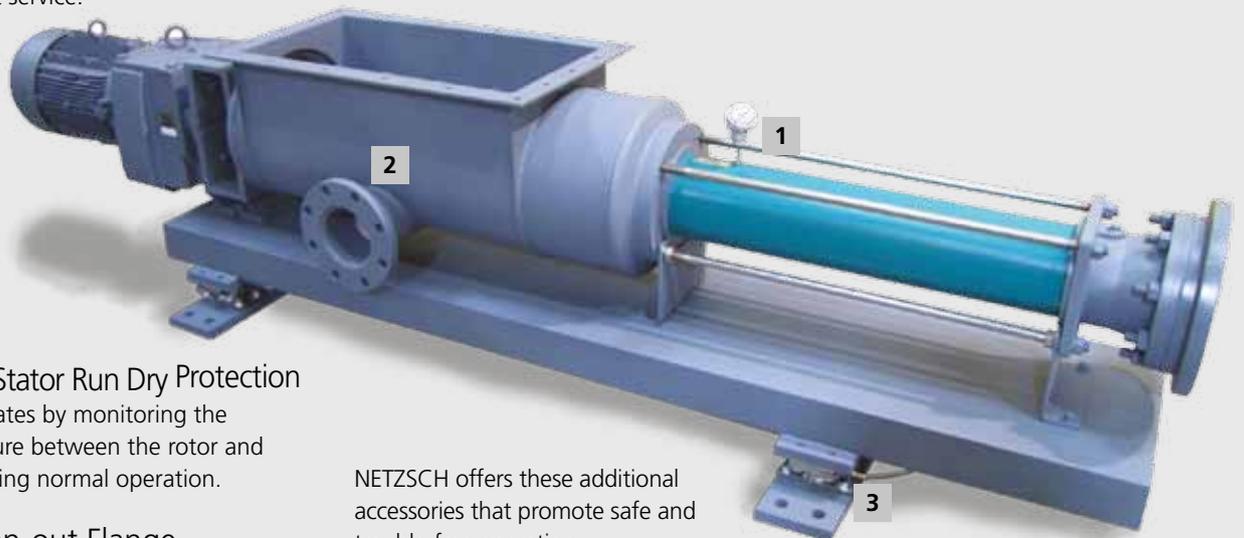
With the addition of an aBP-Module, the NEMO® Sludge Cake Pump becomes the solution for even the stickiest most bridge prone sludge.

- 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, consistent 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 Dosing
- Control Panels

# NEMO® – BF/SF 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 m<sup>3</sup>/hr) at 360 psi (25 bar) discharge pressure.



NEMO® Sludge cake pump being utilized 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 m<sup>3</sup>/hr) at 30 psi (2 bar) discharge pressure.



NEMO® Sludge cake pump with NETZSCH FLR System injecting 0.5 gpm (.11 m<sup>3</sup>/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 m<sup>3</sup>/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 m<sup>3</sup>/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 m<sup>3</sup>/hr).



NEMO® Sludge cake pump with 2 meter hopper design underneath a belt filter press conveying sludge 120 ft (37 m) to the drying plant. Solids content approximately 20%, flow-rate of 26 gpm (6 m<sup>3</sup>/hr) at 120 psi (8 bar) discharge pressure.

The NETZSCH Group is an owner-managed, internationally operating technology company headquartered in Germany.

The three Business Units – Analyzing & Testing, Grinding & Dispersing and Pumps & Systems – provide tailored solutions for highest-level needs. Over 2,500 employees at 130 sales and production centers in 23 countries across the globe guarantee that expert service is never far from our customers.

The NETZSCH Business Unit Pumps & Systems offers NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, screw pumps, macerators/grinders, dosing systems and equipment custom built and challenging solutions for different applications on a global base.

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