

SOLIDS HANDLING TECHNOLOGIES

CHOOSING BETWEEN GRINDERS, CHOPPERS, & NON-CLOG

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EVOLVING WASTE STREAM

The modern waste stream is continuously increasing in solids content. In recent years, wastewater professionals have witnessed unprecedented growth in flushable wipes being deposited and accumulating in the waste stream. The consumer and industrial wipes market was estimated around \$2.1 billion in 2018 and is expected to grow to \$3–5 billion by 2023. These wipes are used for a variety of things ranging from personal hygiene to disinfection of the home and workspace.

According to EPA, US public water consumption has steadily decreased since 1995 due in part to the growth of high efficiency plumbing fixtures. Since 2011, low-flow toilets have been required in new homes, this new technology requires only 1.6 gallons per flush compared to conventional toilets requiring 3.5 gallons. The reduction in water consumed by these modern fixtures have caused a denser waste stream due to a higher solid to liquid ratio.

Increased nonwovens paired with decreased water use is not the only factor weighing on America's waste stream. As stated by the ASCE Status Report on America's Infrastructure in 2020, "It is expected that more than 56 million new users will be connected to centralized treatment systems over the next two decades...an estimated \$271 billion is needed (in infrastructure investment) to meet current and future demands." This startling data point exposes the infrastructure and capacity issues the nation may be facing as population increases and rural customers are connected to public systems.



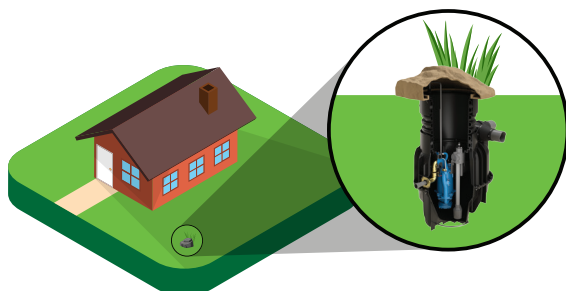
Flushable wipes do not break down in the wastestream

The changing waste stream impacts all facets of the waste water collection and treatment networks, from pump to valves to screens. In order to adequately perform in these new challenging environments the technology of the products in these networks must continuously improve and adapt.

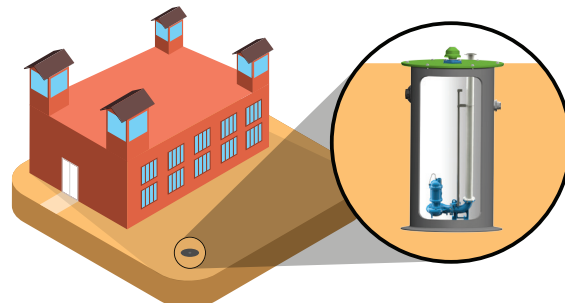
SELECTING THE RIGHT TYPE OF SOLIDS HANDLING PUMPS

There are a variety of pump solutions available to effectively handle and reduce solids in the modern waste stream. Pump selection is dependent on application and required performance parameters. Grinders, Non-Clog and Chopper pumps are the best equipped pump solutions to handle the high solids content of today's waste stream, each applicable in different environments and applications.

GRINDER PUMP



CHOPPER & NON-CLOG



Applications for grinder vs. chopper and non-clog pumps

GRINDER PUMPS

Typical Applications:

High horse power grinder pumps are the solution for solids handling applications that require high head and low flow. Both large and small grinders are most typically found in private residential or light industrial/commercial lift stations. However, some grinders are specifically designed to be capable of high head and high flow, which can be important in commercial and municipal lift stations serving multiple houses or businesses.



RAZOR Grinder pumps are the ideal 2 HP pump for light commercial and residential solids handling

Performance:

Grinder pumps have a common head range between 150 and 250 ft. with flow ranges between 110 and 155 gpm. Typical grinder discharge sizing is between 1.25" and 3" with a horsepower range of 2–15. Grinder pumps are the most efficient solids handling pump operating in the 10–15% efficiency range.

Grinding Technology:

There are two main types of grinding mechanisms; axial and radial. Radial cutters are a more traditional style featuring a sharp shredder ring with several channels around the radius. Inside the shredder ring is an angled spinning blade. As items enter the pump, the blade paired with the sharp channels in the shredder ring cut down any item passing through the components. Radial cutters can be more susceptible to clogging or jamming on items such as wipes or other flushables, especially if the pump stops running while in the process of cutting a solid and then tries to restart. Radial cutting technology is commonly used with higher horse power pumps, higher horse power pumps have more torque making them less prone to jamming.

Axial cutters can act similar to a cheese grater with a spinning blade attached to the bottom suction plate. The cutter plate is mounted to the bottom of the pump with the blade spinning beneath it. This prevents anything from entering the pump without being cut into small pieces first.



RAZOR Grinder was designed with innovative axial cutting technology

Configurations:

In a typical grinder application, you will find two different basin configurations, either a pump on a stand or a pump on rails. Rails are the more traditional installation and allow for grinder pumps to be easily pulled in and out of a basin with a fitting that locks into a metal rail in order to slide down the basin and into place. A pump on a stand simply sits at the bottom of the basin and either has a flexible discharge hose or hard PVC piping that connects it to the basin discharge.

These installations always require a check valve and shut off valve to ensure the station can be isolated from the pressurized line it is hooked up to. Basins (sometimes referred to as wet wells) are either HDPE, fiberglass or in rare cases, concrete. Many grinder pumps feature a level control, which notifies the pump to turn on or off when the liquid in the wet well reaches a certain level. These are most commonly float switches but could also be in the form of a pressure switch.

Maintenance & Service Considerations:

Most grinder pumps require maintenance due to clogging when they are faced with solids that they are not equipped to grind to a passable size. Grinder pumps are designed to be repaired, meaning around 10 years the pump may need a new cutting mechanism and after the 25 year mark, a new motor may be needed. Typically, level controls, the cutting mechanism, or buildup of debris inside the volute tend to be common failure points.



RAZOR Grinder is offered in numerous configurations

CHOPPER

Typical Applications:

Chopper pumps are the best choice for highly demanding waste water applications in the collection systems market. They feature superior solid size reduction, high reliability, ease of servicing, ability to upgrade and low life cycle cost.

Chopper pumps are engineered to perform in some of the toughest applications including: municipal waste water, raw sewage, influent/effluent removal, RAS/WAS sludge, abrasive waste water, agriculture, dairy & food processing, marine, commercial waste water and industrial waste water. Chopper pumps can also be installed into niche applications such as schools, prisons and processing plants.



SITHE chopper pumps easily chop and pass solids like plastic bottles, wipes, mop heads, rags, and literally any solid in the waste stream.

Performance:

Most chopper pumps feature a head range of 60 to 200 ft. with a common flow of 475 to 5000 gpm. Chopper pumps are available between 3 and 250 horsepower. Chopper Pumps can have discharge as small as 3" and up to 16". The efficiency of a chopper pump is nearly equivalent to the corresponding non-clog. At best efficiency, choppers range from 40% to 80%.

Chopping Technology:

There are multiple solutions available to the market, most solutions involve two sets of blade or cutters moving against one another producing a cutting action to reduce solids size. The movement between the blades is usually achieved by securing one surface to the pump casing and rotating the other cutting surface by attaching it to the impeller. The act of chopping consists of two surfaces hitting each other until one survives, creating a compressive explosive force. At high speeds the solid being chopped is typically pinched until it can compress no more, and the solid breaks apart from the inside out. The explosive force can be high enough to disintegrate the solid into two finer pieces instead of chopping the solid from end to end.

The act of slicing is much different, it can be compared to a pair of scissors. When a pair of scissors cut a solid, the blades' surfaces slide down the solid cutting from the

outside in a tearing motion. This action requires less force due to the distribution across the cutting surface at different times, as opposed to all in one moment. The force of cutting a solid is distributed along the cutting surfaces as the solid slides between the cutting surfaces.



SITHE chopper pumps solve clogging with an innovative, unique, first-of-its-kind, patented chopping technology

Configurations:

There are less installation configuration options for chopper pumps when compared to grinders and non-clogs. Chopper pumps will typically be either on a base elbow rail system or a stand, and will almost exclusively be installed in a concrete wet well.

Maintenance & Service Considerations:

It is recommended that minimal maintenance is performed on submersible chopper pumps to extend their life span. Choppers are fairly simple to repair with seal kits and impellers being the most susceptible to maintenance needs. It is common for the cutting mechanism to need repair over time as the sharp edges begin to dull. The lifespan of a chopper pump is dependent on the application it is installed in. A Chopper pump will typically not require repair until 7–10 years in the field. The most common failure in solids handling pumps is clogging. It is rare to see clogging in a chopper pump, however if the cutting blades become dull it may occur. Clogging often leads to the motor overheating, seal failures and bearing failures, however depending on the application you may see these issues on their own.

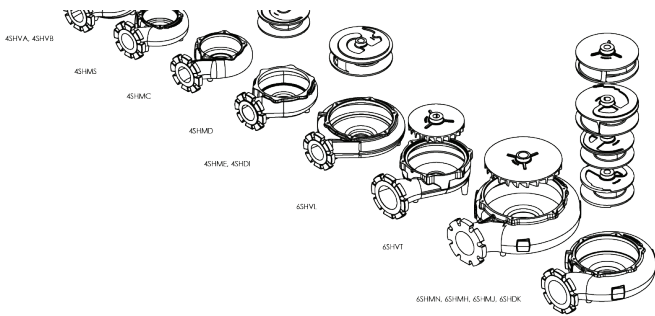


SITHE chopper pump being lowered into it's stations

NON-CLOG

Typical Applications:

Non-clog pumps are commonly found in applications involving sewage, effluent, wastewater processing and solids laden media.



With numerous sizes and configurations, Barnes Solids Handling pump series are commonly found in applications involving sewage, effluent, wastewater processing and solids laden media.

Performance:

Non clog pumps cover a large head range from 110 to 400 feet and have a flow range from 70 to 5500 gpm. Non-clogs have the largest horsepower range of all solids handling pumps being available from 2 hp to 536 hp as well as discharge options. The efficiency of a non-clog pump correlates with its corresponding chopper pump. However, certain non-clog impellers have better efficiency than others. Mono vane and dual vane non clog pumps feature a 40% to 80% efficiency range, while vortex non-clogs have a maximum efficiency of about 40%.

Technology:

Non-clog pumps generally feature a recessed impeller to allow solids equal to the width of the discharge of the pump to pass through the impeller. Unlike grinders and choppers, non-clogs do not perform any solids size reduction, they solely focus on transporting solids in waste water. These pumps feature multiple impeller styles, each aiming to solve the overarching problem of clogging.

Configurations:

Non- clog pumps are less flexible than grinders when it comes to installation configurations. Non-clogs can be on a base elbow rail system, stand or leg kit. They are most commonly found in concrete wet wells or something similar, however you could find the smaller models in pre-packed systems with fiberglass basins.

Maintenance & Service Considerations:

It is recommended that maintenance on submersible non-clogs is minimal to extend the life span. When repairs are necessary, non-clogs are fairly simple to repair. The most common repair part is the seal kit or the impeller. The typical lifespan of a non-clog is dependent on the application they are installed into but on average these products perform 7–10 years before requiring repair. The most common failure point of a non-clog is clogging. When an item is too large or not flexible enough to pass through the non-clog impeller it can lead to blockages and create clogs. Clogging often leads to motor overheating, seal failures and bearing failures.

PUMP TECHNOLOGY FOR EVERY APPLICATION

The modern waste stream is continuously changing in composition. One factor contributing to the changing waste stream is the solids content of waste water with a large contributor being nonwoven wipes. Water conservation regulations continue to increase as new technology becomes available. The solids content of waste water and water conservation efforts are not the only factors plaguing the waste water system, aging infrastructure and the investment necessary to overhaul this are a looming problem. While Grinders, Non-Clogs and Choppers all belong to the solids handling category of pumps, each has their own specific niche application within the waste stream and understanding their best specific uses is critical in order to efficiently manage the changing waste stream.

	HP	DISCHARGE SIZE	HEAD	FLOW
GRINDER	2-15	1.25-3	160-240	110-155
NON-CLOG	2-530	3-13	110-400	70-5500
CHOPPER	3-250	3-16	60-200	475-5000