

SLICING ACTION IN CHOPPER PUMPS

Why Slicing is Better Than Harsh Chopping

Chopper Pumps & Non Clogging

Chopper pumps are used extensively in heavy duty solids-laden water applications including municipal waste water, industrial sewage, food processing, agricultural byproduct, and raw untreated drainage run-off from metal, paper and chemical industries.

Chopper pumps increasing popularity can be attributed to the combination of increasing solids loading in water streams and decreasing water drain-off from residential, commercial and industrial sources. Chopper pumps solve the biggest challenge that municipalities and private waste water treatment operators face – Pump clogging.

Different Chopping Technologies

Several chopper solutions are available in the market. All solutions include two sets of blades or cutters moving against one another, and producing a cutting action on the solids to reduce their size.

The relative movement between the blades or cutters is achieved by usually securing one cutting surface (blade) to the pump

casing, and rotating the other cutting surface (blade) by either affixing it to the impeller or by making use of a hardened impeller. Number of cuts per minutes depend on each solution's design and RPM.

The design, position and relative movement of the cutting surfaces determine the effectiveness of chopping and the ability to reduce solid size. In almost all designs, the rotating cutting surface 'strikes' against the stationary cutting surface to produce chopping action. There are very few, if not only one, chopper pumps that are designed to 'slice' solids instead of chopping them.

The Barnes Siche chopper pump's patented design employs a stationary striker plate and a rotating slicing blade that tears and slices solids. Slicing and chopping actions are analogous to cutting with scissors and a knife.

Science Behind Chopping

The act of chopping consists of two surfaces hitting one another till one survives and the other doesn't. This creates a 'compressive explosive force'. At high speeds, such as a pump, the solid being chopped is typically pinched until it can com-

Figure 1

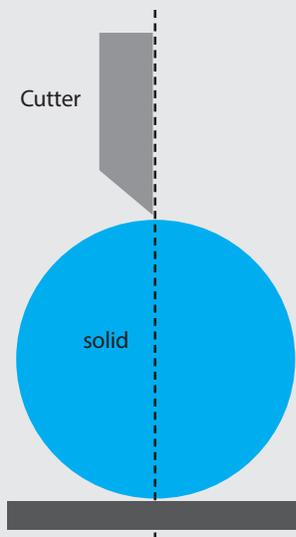
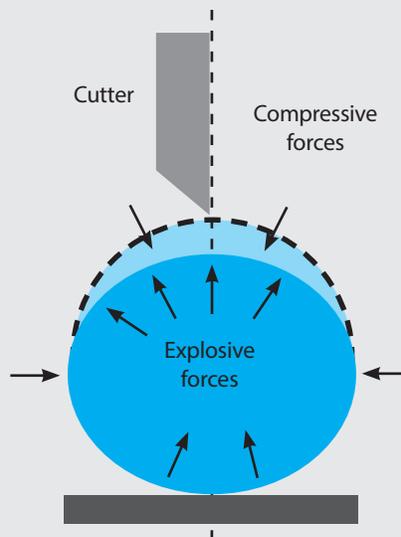


Figure 1: Chopping Action

In chopping action, the solid is hit by a cutter. The solid is pinched until it breaks from inside out.

Figure 2



within the solid to counter the compressive forces. When explosive forces become too high, the solid disintegrates into smaller pieces, sometimes even too small to clog downstream pumps and components.

Figure 2: Forces In Chopping Action

In chopping action, the solid is pinched by the cutter. This results in compressive forces on the solid. Equivalent explosive forces are generated

Figure 3

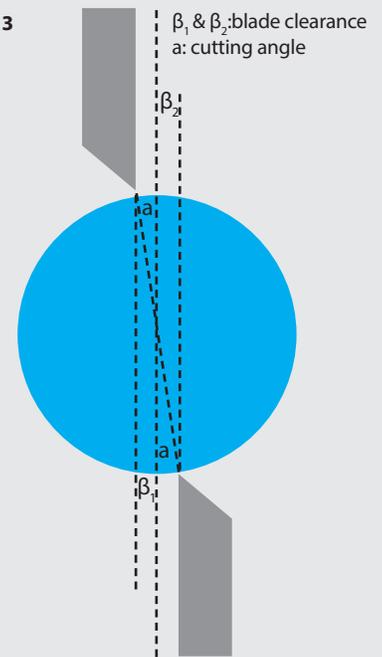


Figure 3: Forces In Slicing Action

In slicing action, the cutter blades slide through

the solid. The solid is reduced in size from outside in. Cutting force is distributed along the cutter surface at different times. As a result, slicing is less energy consuming and generates less stress on internal pump components. Solid size reduction is more controlled and uniform which provides superior non clogging capability, not just in the pump but in the entire system.

press no more, and the solid reacts by breaking apart from the inside out. The explosive forces can be high enough to disintegrate the solid into two finer pieces instead of actually chopping the solid from end to end.

Science Behind Slicing

The science behind slicing is much different. When a 'pair of scissors' cut a solid, the blades' surfaces slide down the solid, cutting it from the outside in a tearing motion. The cutting force needed to separate a solid in slicing

is less because it is distributed across the cutting surfaces at different times instead of all in one moment. The force of cutting a solid is distributed along the cutting surfaces as the solid slides between the cutting surfaces.

Impact On Pump Reliability

Internal components of a chopper pump handling solids laden water experience minimal stress when pumping water.

However, as the cutting surfaces come in contact with a solid, stress increases

till the solid is cut and leaves the edges of the cutting surfaces.

Chopping and slicing actions exhibit different levels of stress on a pump's components. The slicing action's sliding shear frictional force is relatively less compared to the chopping action's compressive explosive force.

As a result, the stress on impeller, seals and bearings are lesser in slicing action. When these wear parts are exposed to lower stress levels, they last longer and overall life cycle cost decreases.

Slicing In Barnes Sithe Chopper Pumps

Barnes Sithe chopper pump's rotating slicer blade and stationary striker plate have a two-curve swept design. Hence, there are four cutting surfaces, with each pair of cutting surfaces acting as a pair of scissors.

The two surfaces of the striker plate are designed to catch and hold the solid, while the two surfaces of the slicer blade spin against the striker plate surfaces. This relative movement between the plate and the blade pulls the solid away from the suction and slides it outward. The curved swept shape of the slicing blade creates the slicing action against the striker plate and cuts the solid.

In any solids handling pump, the process of clogging begins at the eye of the impeller. The Barnes Sithe chopper pump's outward slicing action directs solid to the cutting edges, slices it a little at a time as it slides until the entire solid is cut. This is how Barnes Sithe chopper pumps eliminate pump clogging.

Barnes Sithe Chopper Pumps

Sithe submersible chopper pumps are the newest Barnes solution to clogging in highly demanding municipal waste water applications. Sithe chopper pumps boast of superior non-clogging & solid size reduction capabilities, highest reliability, serviceability, higher efficiencies and low life cycle costs.

Sithe chopper pump's unique patented open center chopping mechanism slices even the most troublesome solids in waste stream like stringy material, wood, plastics, baseball, stuffed toys and organics. Sithe chopper pumps feature dual & tri voltage liquid cooled VFD ready motors, patented plug-n-play quick connect cords, class H motor magnet wire, silicon carbide mechanical seals, heavy duty bearings and large lifting bails.

Sithe chopper pumps are available in 3", 4", 6", 8", & 10" discharge sizes, from 3HP to 150HP, in standard and explosion proof models.



To learn more about Sithe chopper pumps, visit <http://www.sithechopper.cranepumps.com>