Maximizing Solids-Handling Performance of Wastewater Pumps

The rise in the use of disposable wipes and other non-dispersible debris is driving the need for more efficient handling of solids in pumps at municipal lift stations and wastewater treatment plant headworks.

Recent technology, like the Eradicator® Solids Management System from Gorman-Rupp Pumps, was specifically designed as a highly-effective solution to reduce pump clogs, jams and maintenance requirements in Waste Water Treatment Plants (WWTP) while increasing system uptime. With over 3,600 installations, the Eradicator System is now also widely relied upon for handling solids-laden wastewaters in food processing, pulp and paper, and many other manufacturing, commercial and industrial applications.

Today's new sewage is heavily laden with non-dispersible debris, such as reinforced paper towels, cleaning cloths, baby wipes, diaper liners, and feminine hygiene and cosmetic wipes – all of which is flushed down toilets, ultimately reaching pump stations and headworks at wastewater treatment plants relatively intact. These solids do not grind up in centrifugal pumps, instead, they pack in and wedge the pumps' impellers, clogging and jamming the pumps, as well as check valves and screens, and significantly increasing maintenance, repair and operational costs. Clean-out of pumps within influent municipal pump station wet wells have increased dramatically – in many municipalities daily clean-outs are required to keep the pumps operating. Wet well's confined spaces are frequently narrow and deep, restricting easy access and result in a considerable amount of increased maintenance time for repairs.

When pumping stringy solids and other clog-prone materials, the Eradicator® Solids Management System maximizes uptime by minimizing costly maintenance hours.

This problem is not limited to municipal wastewater treatment facilities. The growing volume of non-dispersible solids is just as much a serious and growing issue for commercial operations, such as healthcare facilities, multi-family developments, high-traffic convenience stores, and big box retailers. Many of these facilities maintain on-site pump lift stations, which are impacted by this non-dispersible debris. These commercial pump stations deal with a significant volume of plastic bags, product packaging, security tags and clothing that is flushed down restroom toilets as a result of theft. Consequently, these commercial pump stations frequently become severely impacted, necessitating a high volume of costly emergency repairs, and increased municipality fees when discharging such debris into municipal sewage lines.

In many industrial applications, including poultry processing plants and pulp and paper mills, Super T Series® pumps equipped with the Eradicator® Solids Management System keep feathers, rags, bags and debris from coagulating around the eye of the pump's impeller.

Options for Managing Solids

Both municipal WWTP operators and commercial facility managers have had limited options for solutions to handle this growing wastewater problem. Screening is typically recommended to protect pumps and other equipment from debris-laden influent sewage, including automated vertical-bar screen rakes. Screening systems, however, have limited effect with inhibiting these new solids from reaching pumps within the treatment plant.

Grinders, shredders and choppers have been installed prior to pumps to reduce the size of the solids. However, these options are confronted with space constraints in both municipal and commercial pump lift stations, as well as significant costs for this additional equipment.

Super T Series® Solids-Handling Pumps

Gorman-Rupp Pumps, an industry leader in manufactured pumps for municipal, sewage, industrial, mining, construction, and many other markets, has manufactured a line of centrifugal pumps ideally engineered for handling solids-laden liquids and slurries.

Available in discharge sizes of 3, 4, 6, 8 and 10 inches, the Super T Series® line of self-priming pumps delivers flows up to 3,400 gpm (214.5 liters per second) and heads to 148 feet (45 meters). Pumps 4 inches and larger are engineered to allow up to 3-inch diameter spherical solids to pass through any critical area, including the recirculation port. Pump-out vanes on the two-vane impeller shroud reduce foreign material buildup behind the impeller, and reduce pressure on the seal and bearings.

A double-floating, self-aligning, oil lubricated, mechanical cartridge seal with both a stationary and rotating face of silicon carbide, or tungsten titanium carbide, is specifically designed for abrasive and/or trash handling service.

G-R hard iron construction is offered as an option for Super T Series pumps, for abrasive applications. This durable material provides superior performance by extending the pump life to six times over standard

cast iron or ductile iron components. It has a measured hardness in excess of 400 BHN (Brinell) providing the best abrasive resistance for nearly all pumping applications.

The pumps' large volute design allows automatic re-priming in a completely open system without the need for suction or discharge check valves, even with the pump casing only partially filled with liquid and a completely dry suction line.

Because these pumps are self-priming, they can be mounted above the liquid being pumped. Should service or maintenance be required, it can easily be performed without disconnecting piping.

A very unique function of Super T Series pumps is their removable cover plate, which permits easy inspection and service of the pump's impeller, seal, wear plate and flap valve. Essentially, the entire rotating assembly can be removed without disturbing the pump volute or piping. Easy adjustment of the clearance between the impeller and the wear plate can be made. The working height of the seal assembly and impeller back clearance are not disturbed. A unique collar and adjusting screw allow for incremental adjustments of the wear plate clearance. Once adjustments have been made, the collar locks in place, maintaining the clearance setting, even if the cover plate is removed. This design feature doubles the life of the wear plate while maintaining peak operating efficiency. Pusher-bolt holes are provided to assist with removal and allow for quick and easy installation of a spare rotating assembly, resulting in more uptime.

The Super T Series is well-equipped to keep solids-laden fluids moving when other solutions have already become clogged or jammed.

Eradicator® Solids Management System

Building on the success of the Super T Series pumps, Gorman-Rupp recently introduced a further refinement for handling these new sewage solids. Designed to maximize the uptime of Super T Series pumps when confronted with heavily laden non-dispersible debris, these pumps can now be outfitted with the Eradicator® Solids Management System, both as original equipment and as an upgrade to Super T Series pumps already installed in the field.

The removable inspection cover of these RAS and WAS pumps in a small WWTP makes it easy to remove an obstruction should one occur.

The Eradicator further reduces clogging and expensive downtime, by more efficiently removing stringy solids. It consists of several components:

- A patented lightweight inspection cover for faster access to the impeller without affecting impeller-to-wear plate clearances. The lighter cover plate makes it easier and safer to perform routine inspections;
- The back cover plate incorporates an obstruction-free flow path. Combining the original 4 support posts into a two-point webbed plate design for increased durability, reduced clogging and increased efficiency;

- An aggressive self-cleaning wear plate with integral, laser-cut notches and grooves, together with a unique tooth design effectively allows debris to clear the eye of the impeller. The notches, grooves and tooth helps break up stringy materials and pass them through the pump without impacting performance or interrupting service.

Since the introduction of the Eradicator Solids Management System into Super T Series pumps, over 3,600 installations have been implemented. These installations are primarily in municipal WWTP pump stations, but have also been installed for handling solids-laden wastewaters in pulp and paper processing, and in food processing, for feather-laden and offal-laden process streams, and many other manufacturing, commercial and industrial applications.

The Super T Series pumps, equipped with the Eradicator Solids Management System, have delivered an effective solution for the handling of today's new sewage, in a way that is both easy to implement and cost-efficient to maintain.

About Gorman-Rupp Pumps

For more than 85 years Gorman-Rupp Pumps has manufactured pumps for municipal, sewage, industrial, mining, construction, petroleum, OEM, government, agriculture and fire markets.

The company's extensive line of pump products include self-priming centrifugal pumps, standard centrifugal pumps, end-suction centrifugal, submersible pumps, rotary gear pumps, engine-driven pumps, and priming assist pumps. In addition, Gorman-Rupp manufactures a complete line of state-of-the-art packaged lift stations and booster stations that include pumps, motors, controls, piping, accessories and enclosures.

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