

Typical Pump Types Used in Romtec Utilities Pump Stations

Romtec Utilities
Technical White Paper

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Figure 1: A Standard Submersible Centrifugal Pump

Introduction:

Romtec Utilities designs pump and lift stations with any type of pump technology required by the customer, but there are several pump types that are typically used. Each pump technology and manufacturer offers specific benefits to particular pumping scenarios. Below are some of the most common types of pumps used by Romtec Utilities and a description of frequently specified applications for each pump type.

Submersible Solids-Handling Pumps

Romtec Utilities uses more of this pump type than any other. These pumps sit in the bottom of a wet well or sump and are submerged in the water. They can handle a very wide range of flows but typically they are used between 50 gpm and 5000

gpm. There are several reasons this pump type is so widely used such as their affordability, ruggedness, diversity, and availability from reliable manufacturers.

Submersible solids-handling pumps are almost always the most cost-effective pump solution on a pump station project. This is mainly because they are easy to install and easy to maintain. Split case and vertical suction pumps require more mounting hardware and have longer shafts that can torque during operation. Submersible pump are simple lowered into the well on guide rails. This process makes installation and maintenance much easier.

These pumps are rugged and designed to withstand constant exposure to wastewater. The solids-handling capabilities of these pump means that clogging will occur infrequently. Many municipal codes specify that centrifugal pumps should handle at least a 2-inch solid, but typically these pumps are supplied to pass 3-inch solids (a little larger than a tennis ball). In addition to solids-handling, these pumps are not damaged by grit and small solids.

The diversity of these pumps makes them ideal for wastewater or stormwater pump stations. They can handle a wide range of head conditions and can deliver an impressive range of flow rates. About 75% of all the municipal wastewater and stormwater pumps in use are of the submersible solids-handling variety. The popularity of these pump is directly related to broad spectrum of situation where they can be used, making this type of pump a great pump for design standardization.

Almost every major pump manufacturer has a variety of submersible solids-handling pump available. Frequently, public works departments and utility districts develop an affinity with a particular pump manufacturer. Changing to a more niche pump technology might require a brand that is new to a customer. Typically, submersible solids-handling pumps will be available from a brand that is known to the customer.

Submersible Pumps that Macerate – Grinders, Cutters/Slicers, Choppers

These types of pumps are fairly popular because they are also submersible and they can handle large solids. They do not carry the same range of use as the submersible solids-handling pumps, but in certain situations they work very well. Each of these technologies macerates solids, but each does it differently. Typically, choosing a macerating pump should depend on the flow and head conditions of the lift station.

- **Grinder Pumps**

This type of macerating pump functions in low flow high head situations. This is because grinder pumps grind all the suspended solids in the water into slurry. The slurry is much more viscous than water, decreasing the flow rate while increasing the pressure. Grinder pumps can only operate by grinding. If the impeller stops grinding, the pump will not be able to function without maintenance. Grinder pumps function well in standard wastewater with relatively easy-to-pump sewage conditions.

- **Cutter & Slicer Pumps**

A cutter or slicer pump macerates with a cutting edge on the inside of the intake eyelet that reduces a solid to a passable size. Cutter pumps can pump with relatively high flow rates and varying head capabilities depending on the manufacturer. Cutter and slicer pumps are great for wastewater pump stations because they can handle solids and higher flow rates. This style of macerating pump keeps on pumping even if the cutter or slicer fails.

- **Chopper Pumps**

This type of macerating pump utilizes a chopping blade on the outside of the pump intake. Any large solids that get sucked in by the pump are chopped into passable sizes before entering the pump volute. Chopper pumps are very robust. Even if the chopping mechanism fails, the pump will continue to function as a standard submersible solids handling pump. This pump type is well-suited for wastewater, stormwater, and industrial pumping scenarios where the lift station must operate while handling difficult solids from a prison, hospital, or stadium.

“Dry Pit” Pumps

In many lift stations the pumps are not located in the water such as with a submersible pump. Often times, the pumps are in a separate “dry pit” that is adjacent to the wet well. Historically, this wastewater configuration has been in use for a long time. The idea behind this configuration is to locate the pumps at essentially the same elevation as a “pick-up” line that extends from the pump in

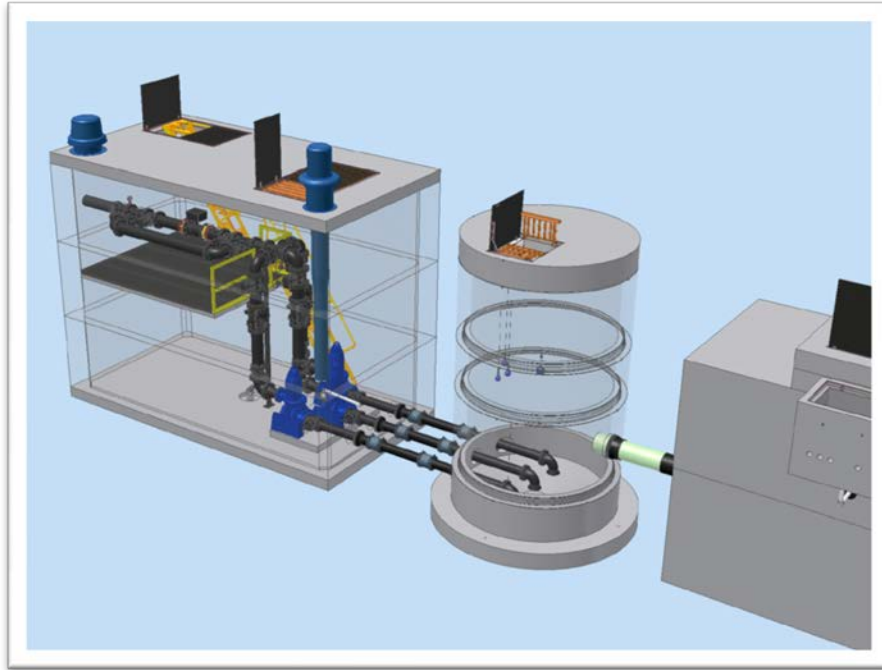


Figure 2: A Typical Wet-Dry Configuration

the “dry pit” into the “wet pit.” In this configuration, also called a wet-dry system, the pumps are kept dry. This provides a wide variety of centrifugal pumps and a wide variety of possible motors available.

It is also possible and practical to use submersible pumps configured with external suction piping in a wet-dry configuration. Some say this is the best configuration because the pumps and motors will not be damaged if the dry pit ever floods.

Romtec Utilities designs and supplies pump stations with virtually every type of dry pit pumps from small to large and from dry to submersible. Romtec Utilities is involved with using this type of pump on repair/retrofit projects as well as the design and construction of new wet-dry pump stations of all shapes and sizes.

Self-Priming and Vacuum Assist Pumps

Self-priming pumps are very useful in many applications because they do not need to be installed in a pump station system to operate. Other pump types used by Romtec Utilities require permanent components such as mounting brackets for submersibles, dry pits for wet-dry, and a constant well depth for top-mounted pumps. Self-priming pumps can drop a suction line into almost any well, basin, pond, or other water source and operate.

The most common limitation for this type of pump is well depth. These pumps rely on atmospheric pressure to create suction. There is a substantial drop-off of atmospheric pressure relative to physical elevation, so pumping in Denver is different than pumping at sea-level with wet-prime self-priming pumps. However, it is a typical assumption that these pumps can operate with a maximum suction depth of about 20-feet.

- **Wet-Prime Self-Priming Pumps**

Historically this style of pumps goes back to the beginning of pumping water. The “old school” wet-prime self-priming centrifugal pumps are used in above-grade installations for sewer, construction, industrial, agricultural, mining, food-processing, petrochemical and other applications. These pumps are always above-grade and often skid-mounted or portable. They are known for their ability to handle high flow pumping at low to very high head conditions.

Wet-prime self priming pumps withhold water in the volute when they are not in operation. This water needs to be manually applied during the first operation or if the pump is drained. The pump begins priming by pumping at a low speed which pumps water and air. The water stays in the pump volute as a design feature causing only air to be passed. Water eventually reaches the impeller and the pump begins operation as a standard centrifugal pump.

- **Vacuum Assist Dry-Prime Pumps**

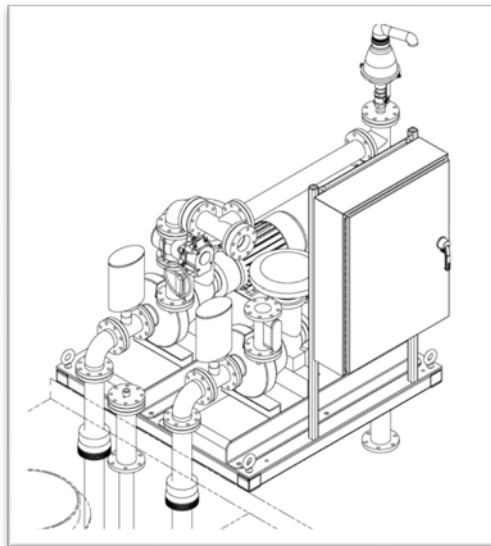


Figure 3: Skid-Mounted Vacuum Assist Dry-Prime Pumps

This type of above-grade centrifugal pump is essentially the “new and improved” way to build a self-priming pump. These pumps are very reliable and, like their wet-prime counterparts, are often times skid-mounted or portable and can operate with high flow high head conditions. Like wet-prime, vacuum assist dry-prime pumps are also limited to wet well depths of about 20-feet.

These pumps utilize a diaphragm pump to create suction in the inlet line by pumping air out. When the water reaches the pump, a float closes the diaphragm pump intake and triggers the diaphragm pump to stop. The centrifugal pump then starts and pumps the water in a standard fashion. These pumps prime much faster than other self-priming technologies.

Turbine Pumps



**Figure 4: A
Vertical Turbine
Pump**

The most common pump for deep well and clean water applications is the vertical turbine pump. These pumps can handle from low to very high flow and they can handle head conditions from low to extremely high. Turbine pumps are very efficient and reliable. There are many turbine pumps manufactured in the USA which have readily available parts and services.

The use of turbine pumps is expanding in the pump station world. As the cleanup of stormwater and process water improves, more and more turbine pumps are being used in a widening range of applications. One such growing application is in groundwater collection systems. This is actually a type of stormwater that is collected and screened for creating potable water or for drought protection in agricultural areas. Turbine pumps allow a high volume of groundwater to be pumped to treatment from a retention pond or collection basin.

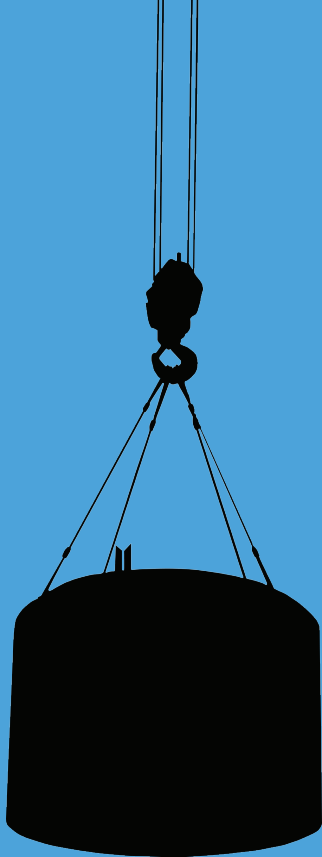
If there are any disadvantages to turbine pumps they will likely fall into one of these categories.

- The water being pumped must be relatively clean and free from solids.
- The pump motors and mechanical components are typically above-grade.
- They “lift out” vertically with suction piping and require a certain level of overhead clearance pull the pump hardware out.

Romtec Utilities uses turbine pumps on a regular basis and recommends using them specifically in clean water or relatively clean water applications, such as groundwater collection or prescreened stormwater.

Conclusion

Although there are many other types of pump technologies that Romtec Utilities can supply, the majority of new pump and lift station systems will typically include one of the pump types discussed above. This is because these pumps are field tested, are available from known and experienced manufacturers, and have a long history of serving the pump station industry. These benefits are the type of advantages that Romtec Utilities provides with its package lift station systems.



About Romtec Utilities

Romtec Utilities, Inc. designs, manufactures, supplies, and installs site specific packaged pump stations. Our pump stations include detailed drawings and specifications in the CSI format with all structural, mechanical, communication, and electrical plans. Our documentation also includes a complete bill of materials, a well-defined scope of work and services, and a complete system warranty. Our complete packaged systems serve commercial, municipal, state, federal, agricultural, and industrial applications for virtually any type of water-pumping system.

Romtec Utilities, Inc. began operation in 2000 in Roseburg, Oregon. The US economic conditions at that time fostered the growth of a booming housing market, and Romtec Utilities did a lot of business working with developers and public agencies who needed packaged lift stations. Romtec Utilities distinguished itself by offering quality designs, fast lead times, and an ability to get projects approved and installed quickly.

In the wake of the 2008 Financial Crisis, the market changed and so did Romtec Utilities. Romtec Utilities made a rigorous evaluation of its product offering to become more cost competitive. We also placed more emphasis on working with industrial clients with a broad range of applications.

In the following years, Romtec Utilities underwent dramatic changes that have ultimately made us a better company. We expanded our interests to include more stormwater, more wastewater, and more industrial water applications. We improved our vendor relationships to provide our customers with more products and capabilities at lower prices. We developed an efficient and precise documentation process to foster fast and clear communications, and we strengthened our field services and repair capabilities.

We have completed hundreds of projects across the United States and have supplied packages for international installations. Contact us for assistance. We love to talk about pumping systems of every type, shape, and size!



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