Choose the Right Pump for Any Job

While a pump's function is simple — moving liquid from one place to another — selecting a pump may not be so easy. The key to years of success with a pump purchase lies in determining what the pump will be utilized for and where. Can the same type of pump be used for emptying a backyard pool as well as clearing muddy water from a job site? Should it? What if the liquid needs to be moved very quickly?

Pump capabilities vary from specialized to highly versatile and from average output rates to high-pressure discharges. Some work well for moving debris-filled water while others will clog under the same conditions. Some can pump water uphill, which may not be effectively done with another model. Choosing the right pump for the job will ensure success every time, and learning the differences in pump models will go a long way in making that a simple decision.

Determining the right pump for the job

All pumps operate in the same general way: Liquid is transferred from a low-pressure location to a high-pressure location through the use of force. But, how much force is needed? What type of water will be moved? Where will it need to be moved? Think about the answers to all of these questions when looking to purchase a pump.

First of all, consider the type of water that needs to be moved. Relatively clean water will flow well through any type of pump, but water with debris will not. A pump that is not designed to move solids may cost less, but it will likely clog and break if any type of debris-filled water is channeled through it.

Secondly, consider the locations that water will be moved to and from. When moving water uphill, prospective pump buyers should calculate the total dynamic head to know if a particular pump can handle the job. The total head takes the height that the liquid needs to be moved into account, along with the resistance the liquid will encounter while traveling through the pipe or hose.

To calculate total head, begin with measuring the static lift, which is the height from the lowest level of the water to the ground level of the pump. Next, measure static height – the distance from the pump level to the highest point to which the liquid will need to be moved. Finally, the amount of friction loss is calculated in, taking into account the amount of resistance there will be through a particular diameter and length of pipe between the pump and the discharge outlet.

Pipe friction tables list various flow rates for pipes of different size and quality to help determine friction head. For instance, a pump discharging 350 gallons per minute through a two-inch diameter hose might have a friction loss of 0.75 psi per linear foot. Although determining the total dynamic head is anything but a simple calculation, knowing the numbers that need to be plugged into the equation will provide a guide for choosing the type and size of pump needed for a particular situation.

The third factor that needs to be considered when determining the best pump for the job involves the depth of the area from which the water is being pumped. According to specific gravity, water can be pumped from no more than 26 feet down when at sea level due to the affects of atmospheric pressure. This depth lessens as altitude increases. For every 1,000 feet above sea level that a centrifugal pump might be operated at, subtract about two feet from the depth of 26 feet.

Choosing a pump

All pumps use force to move liquid. This level of force, as well as the source of the force – compression or physical lift – sets each pump model apart from the rest. Having a clear idea of the types of applications for which a pump will be used will enable prospective buyers to narrow the choices to the best fit for their situation.

Centrifugal pumps offer a basic, inexpensive way for moving clean water, such as emptying a swimming pool. While other pumps also will work for these applications, the centrifugal pump does it least expensively.

Centrifugal pumps operate by using centrifugal force, the principle of which is force moving objects away from the center of a system in a circular motion, with pressure increasing as it rotates. An impeller causes this centrifugal force within the pump as the vanes on the circular impeller disk sling water around. Each rotation of the impeller increases velocity, causing the liquid moving into the volute, which houses the impeller, to be collected. Within the volute, velocity is reduced and its energy converted to pressure energy, causing the fluid to be forced quickly from the pump.

To compare, think of swinging a rock from the end of a string in a circular motion. The velocity increases with each

swing, and the rock moves out quickly from the center once the string is released. Centrifugal pumps operate in much the same way.

Two types of centrifugal pumps offer varying outputs. A high-pressure pump moves water with twice as much pressure as a standard centrifugal pump. High-pressure pumps also can move water a considerable distance or uphill, but, like a standard centrifugal pump, they should not move water containing debris unless an appropriately sized strainer has been installed.

When considering the difference between the two centrifugal pumps, think of running water through a garden hose in comparison to water discharging from a standard centrifugal pump. Holding a thumb over the end of the hose causes the water to shoot out with greater force, much like the high-pressure centrifugal pump.

This difference makes high-pressure pumps particularly useful as a watering pump, rather than a dewatering pump, and it is especially practical to use for spraying applications or cleaning with a higher pressure.

When water containing debris needs to be moved, a semi-trash pump or trash pump should be used. The impeller in a semi-trash pump has thicker vanes than those in a standard centrifugal pump, enabling it to accommodate larger debris.

Built like a semi-trash pump, trash pumps offer a stronger model capable of handling larger solids. The impeller vanes run deeper yet, allowing for the largest solid-handling capacity. This makes trash pumps especially suited for pumping muddy or sandy water or water with debris up to several inches in diameter. Construction sites that need to move water that might contain abrasive materials frequently use trash pumps. The heavy-duty pump housing makes a trash pump a versatile piece for almost any situation.

For a pump that offers even more versatility for those with varying applications, consider a diaphragm pump. It can handle almost any pump application with ease, but comes with a price tag to match its capabilities. For this reason, pump users typically look at diaphragm pumps as an option only when it is the only tool that can effectively handle a job.

Rather than using a rotating impeller within the pump to move water, diaphragm pumps have two chambers that operate much like an internal combustion engine. As the volume increases in one chamber, the pressure decreases in the other, drawing in fluid. When the pressure in the second chamber increases, the fluid is forced out and the process repeats.

Diaphragm pumps take on virtually anything – sludge, slurries, abrasives, and any trash or solid material that will fit through the pump.

In sharp contrast to the diaphragm pump's versatility, the submersible pump handles very specialized applications. The pump's hermetically sealed motor is closely coupled with the pump body, and the entire assembly can be submerged up to about 25 feet into liquid. Mechanical seals prevent the liquid from entering the motor as it is being pumped up through a connected pipe or flexible hose.

Applications well suited for submersible pump use include pumping slurry, draining areas and pumping sewage, as well as general industrial pumping.

When flooded with options for pumps — from centrifugal to trash to diaphragm — it's good to know which will get the job done best. Making the wrong choice and using a pump in a situation that it was not designed to handle can cause undue wear and possibly break the pump's components.

Understanding pump types, features and options makes choosing the right pump for the job a much simpler task. Completing that task will bring years of successful use for the pump applications needed most.