GROUNDWATER
BRINGING IT TO THE SURFACE— PUMPS ARE PART OF YOUR WATER TREATMENT SYSTEM

by John D. Wenzel, Jr.

Summary: The importance of pumps to the water system can never be overstated. This intro to pumps literally maps water from the ground up, giving a better understanding of these often under-appreciated and continually underestimated apparatus.

The water treatment industry offers many opportunities and challenges. And, to be success ful, we must be receptive to our custom ers' needs. We have to continue to strive to offer a broad range of products and to be innovative in our marketing techniques. We also have to know some thing about the domestic water pump.

Wait a second, you might be saying, I sell or install water treatment equipment. I don't need to know anything about the household pump! Well, you could be wrong. The water supply, via the pump, defines the quantity and pressure of the water to your water treatment equipment and the rest of the house. What happens if your pressure drops after it passes through your iron filter? Does your pump supply enough water to effectively backwash the unit?

So, your customer complains about the lack of pressure immediately after you have installed the "perfect system. " Can the pump help you and your customer overcome the pressure drop in the equipment? If you have a basic understanding of pumps and water systems, you might just answer your customer's question before it becomes 1 problem.

Now that you've brought it up

Water for private systems can be classified as either surface water or ground water. Surface water occurs on the surface of the earth in the form of lakes, ponds, rivers and streams. Groundwater on the other hand is found in mineral formations below the surface of the earth, in subsurface fresh water pockets found at different depths from several feet to thousands of feet down. These fresh water pockets are called aquifers. Aquifers can be found variety of mineral formations.

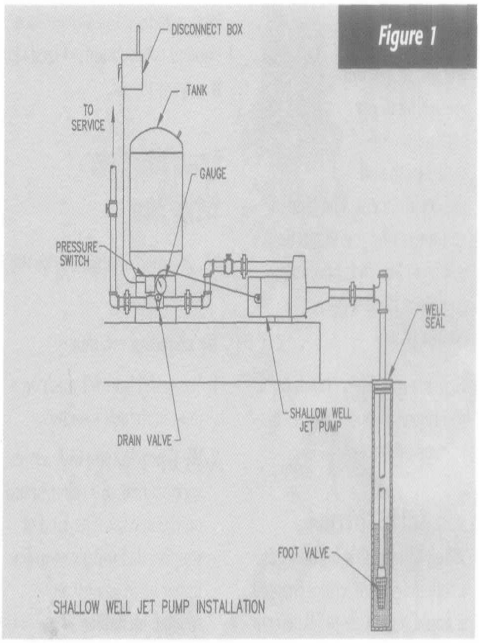
That's where we as water treatment professionals enter the picture. As these underground fresh water sources are tapped, water is brought to the surface. Along with the water come the minerals that were located in these formations. Minerals such as calcium, iron and manganese that had dissolved in the water over time are pumped to the surface for consumption. This characteristic of minerals is unfortunate for the consumer but good for the water treatment professional. Now that we know about subsurface water, we have to access it by driving, drilling and digging wells. The different types of water wells and their characteristics are more important to the water treatment professional because they can affect water purity. The quality of water is not affected by the method of the well construction but by the geology of the aquifer.

Types of wells

Driven wells are primarily in areas where the subsurface is permeable and free of rock. A good example would be coastal areas where a perforated well point can be driven to the surface of the aquifer. Because of the procedure involved, these wells are normally limited to a depth of 50 feet. There is a risk of groundwater contamination with this type of well because surface pollution can percolate down to the water level.

Drilled wells are the most common form of well construction. Drilling uses a large rotary bit that rotates rapidly and breaks up rock, forcing chips and water to the surface. Cable drilling is another drilling method that uses a chisel-shaped bit that is lifted and dropped repeatedly into the well hole. The drilled well is then lined with steel or plastic casing, which serves to prevent the well from caving in and acts as a barrier to contaminants.

Dug wells are the oldest type of well



construction. They are fascinating to examine and each one gives us a feel for the historical aspects of the search for water. Dug wells are excavated by hand usually to a diameter of 3-to-5 feet and depths of 10-to-l 5 feet. The hole is then lined with rocks, bricks, etc. Imagine the effort! Dug wells are susceptible to the surface contaminates that water treatment professionals should be aware of. The water from these types of wells could contain a myriad of problems such as sediment, run-off contamination and bacteria, just to name a few.

Pump selection, the basics

Now that we've found water, how do we get it into the home and convert it to the volume and pressure required for our day-to-day activities? Pumps are an integral part of your water treatment system as they control both the volume and pressure of the flow of water through your water treatment equipment. So it's important to know some "pump basics" in order to do the best job for your customer.

There are two basic types of well pumps: jets and the more recently developed submersible pumps. Jet pumps utilize the ejection principle and incorporate a device known as an ejector. Water supplied by a centrfugal pump flows through a constricted nozzle in the ejector. A partial vacuum is created when passing through the nozzle that increases the water velocity. The water then flows through aventuri tube where, in combination with atmospheric pressure, the velocity is reduced and the pressure is increased. The end result is a smooth continuous supply of water with the ability of the pump to handle air with a minimum of moving parts.

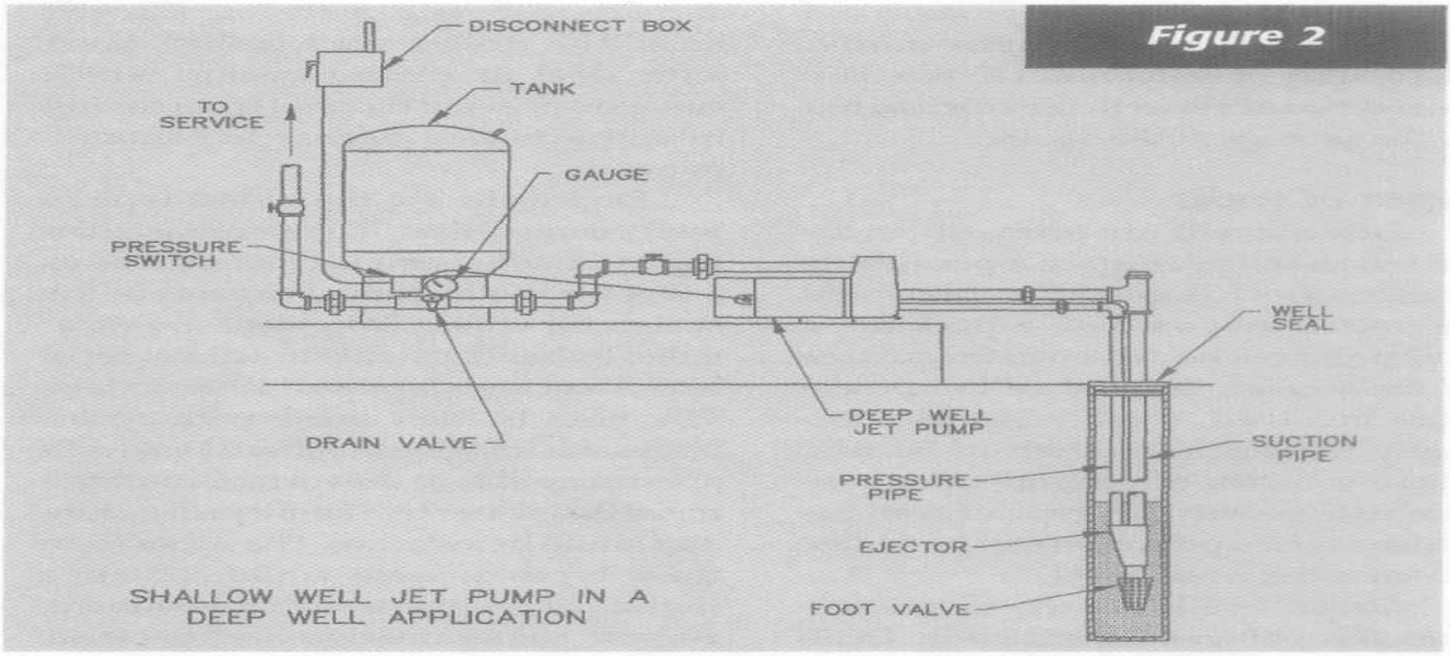
Jet pumps are classified into various types according to the location of the ejector. Shallow well jet pumps (see *Figure 1)* are used in all parts of the country, but are particularly adaptable to coastal areas where the water well is the driven type. A shallow well jet pump has a practical lift of 25 feet and the ejector must be submerged in the well. A well with a lift greater than 25 feet will use a deep well jet pump (see *Figure* 2). The deep well is a "two-pipe" system, installed with an ejector attached to both pipes at the bottom of the well. The principal factor involved is the force of the "drive" water being pumped from the centrifugal pump.

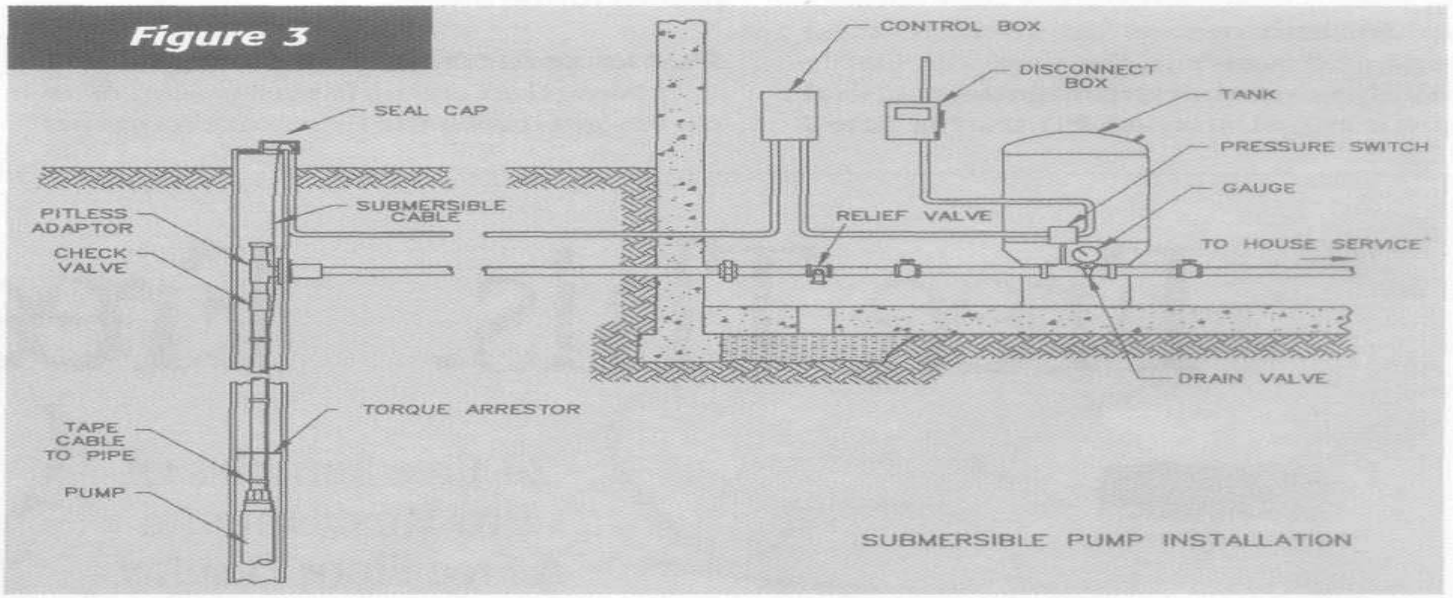
Convertible jets are jet pumps designed for use in both shallow and deep well applications. With shallow applications, the ejector remains on the pump; opposite the deep well application which requires a two-pipe system with the ejector at the bottom of the well. The convertibility of this pump makes it very effective for a variety of applications, but it typically cannot handle applications deeper than *75* feet. A shallow application is considered 25 feet or less.

Multi-stage jet pumps add "head" or pressure to your customer's water delivery system. If you have installed multi-piece water treatment equipment for your customer, you could have excessive pressure drop. One solution is to install a multi-stage jet pump.

A multi-stage jet pump has more than one impeller, which is the rotating component inside the casing of the pump providing the rapid rotary motion to the water, forcing it out. The first impeller pumps water into the housing of the second impeller, increasing its pressure in the process. Water arrives at the ejector at a higher pressure. The additional pressure permits the jet pump to function in a deeper well or deliver greater household pressure.

The submersible pump (see *Figure* 3) is different from others in that the motor is submerged in the well along with the pump. It's also designed with multiple stages, arranged in a series along a common shaft. Each stage consists of an impeller and a diffuser. The diffuser converts water velocity into higher pressure and channels the flow into the next stage. Submersible well pumps can have 10, 15 and even 25 stages.





Because of its multiple stages, the submersible pump generally delivers higher pressure than jet pumps of the same horsepower. This type of pump is normally selected for deeper wells; and, with their high capacity, increased pressure and quiet operation, they make an ideal selection for home and commercial use.

Pumps et al.

The pump is the main component of the water system, but not the only component. The complete installation involves numerous components and accessories. The pressure tank and pressure switch are two of the most important parts of the water system. Water from the well is piped into the pressure tank; the tank contains a cushion of compressed air that maintains a constant pressure on the system. The air in the tank acts as a "spring " to move the water to the household outlets As water is drawn from the tank to the home, pressure in the tank will fall to a given level—a differential of approximately 20 pounds per square inch, or psi—activating the pressure switch that controls the on/off action of the pump. The pump returns the tank's water pressure to its established level, maintaining the pressure available to the household.

The pump and the pressure switch are individual items but work as a unit with the water system. Other important components to the system include: foot valves, check valves and relief valves, in addition to pressure gauges and electrical cables.

Conclusion

The pump is critical to any water delivery and is a very important component of most water treatment systems. Hopefully, now you will better understand the role a water pump plays in your treatment system. A working knowledge of this process will keep your business one step ahead of the "other guy." □

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