Irrigation Pumps

The Heart Of The System

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THE HUMAN BODY and an irrigation system are somewhat alike in that they both depend upon a pump in order to function properly.

Fortunately for most people the human heart is a very good pump and supplies the body with the needed blood to maintain life.

Unfortunately, not all irrigation systems have good pumps and therefore many of these systems do not perform up to their capabilities.

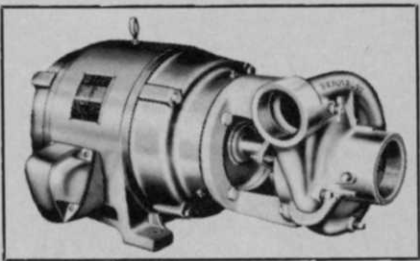
The pumping plant is one subject that is often times lightly passed over when discussing a new water system. A great deal has been written about automatic water systems. But seldom is the pumping plant mentioned, so let's look into the heart of the matter.

In order for a pumping plant to be designed properly we must know: (a) source of water, (b) type of power available, (c) the gallons and pressure required to operate the particular system, (d) pump location and total elevation (either gain or loss) from pump to outer extremities of the system.

Let's look at the several different items needed to make up a good pumping system.

Pumps: This is the most important part of the system since it does the work. Pumps come in all sizes, shapes, and types.

Centrifugal pumps are the most popular and the most economical pump used on irrigation systems today. They can be driven by gasoline engines, electric motors, or PTO drives. They are relatively cheap upon initial investment. They have few moving parts and are economical to maintain. Centrifugal pumps are available in a wide range of volumes and pressures. Studying data on pump performance will enable nearly anyone to select the pump to give maximum efficiency.



Centrifugal Pump

Their one disadvantage is they require an intake line which must be kept primed. But this can be easily solved if you keep your system under constant pressure. They also require a footvalve on the end of the intake line which should be inspected yearly and kept in top condition. If you have city water and are using the pumps as boosters only, then your priming problem is solved and a foot valve is not needed.

Vertical turbine pumps are the next most popular in use today. They are more costly to buy. And their design is more complex. Thus, these pumps are more costly to repair if anything goes wrong.

But there are instances where centrifugal pumps will not work and a turbine must be used. If your water source is a well or you must lift the water more than 15 feet to the pump, then a turbine is for you. They are also available in a variety of horsepowers, volumes, and pressures, so select the proper pump to do the job required.

Specialty valves: These are special application valves that are used to control flow—reduce pressure—sustain pressure—start and stop pumps and also act as check valves if the check feature is wanted. They are usually fully adjustable and can be set to precisely control pressure and flow on your system by sensing the amount of water required.

It is beyond the scope of this article to dwell into the workings of these valves but almost any flow or pressure problem can be solved by selecting the proper valve. It would be smart to contact someone knowledgeable in these valves before deciding which valve to buy.

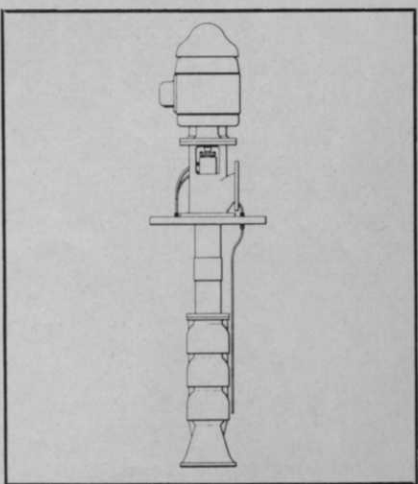
Check valves: Check valves are used to stop the back flow of water.

In every instance where system pressure is to be maintained you must have a check valve on each pump. Check valves are available in several different styles and for our purposes the no-slam or slow closing check valve should be used. Regular check valves close much too fast and can set up tremendous vibrations and noises when they close.

Pressure Tank: The pressure tank serves a couple of purposes in a water system but its main purpose is to provide an air cushion for more stable pressurization of the system. Since water cannot be compressed we use the air chamber to give us the expansion needed when water is demanded on the system.

Pressure tanks which have no membrane between the air and water tend to become waterlogged (loss of all air in tank) and cease to function a an expansion chamber. The last few years has seen

Vertical Turbine Pump



the development of the bladder type tank where a rubber diaphragm keeps the air chamber free of water. Once this type of tank is pressurized in the spring no further attention is needed until the fall draining. Even-though these tanks are higher priced the reliability will more than offset this added cost.

The above are some of the major components needed for a pumping plant.

Now let's set up a typical pumping plant that a golf course might need. The club which we are going to design a system for has just installed a new irrigation system with automatic green and tees and manual fairways. The total system demand is about 1000 G.P.M. and the water source is a lake.

Electrical power (440 volts) is available. We will choose 3 centrifugal pumps for our installation.

Our system is to be fully pressurized at all times so we can fill sprayers or hand syringe during the day. Thus, we will include a 5 Hp—90 gpm at 90 psi jockey pump for this purpose.

We also know, by adding up our sprinkler requirements, that for green and tee watering a second pump rated at 250 gpm at 110 psi with a 25 Hp motor will be needed.

In order to get our fairways watered manually, in a reasonable length of time, we will need the third pump, a 40 Hp unit rated at 600 gpm at 110 psi.

While we are at this point in our discussion lets look at a typical pump curve chart and see how we arrived at our Hp requirements for pump #2. (See Figure 1)

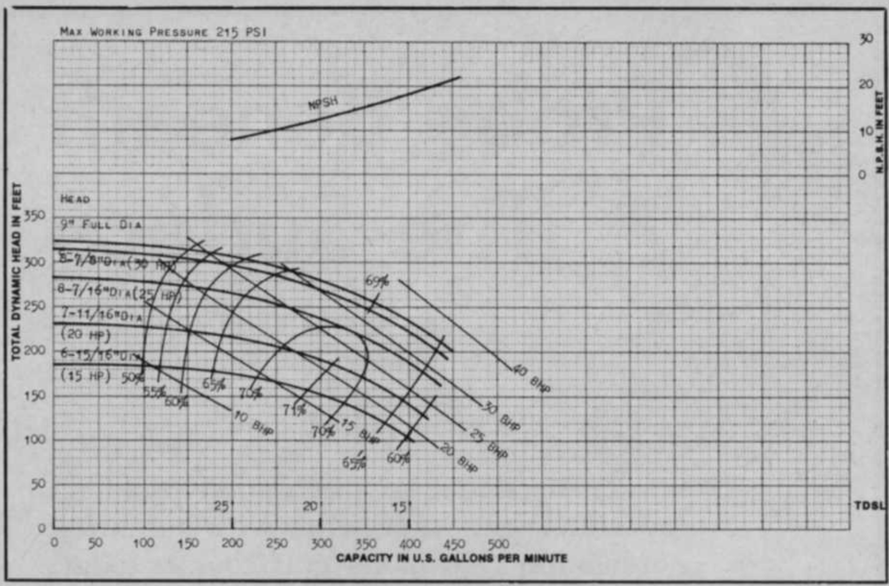


Figure 1. This is a typical pump curve chart. Capacity in gallons is plotted on one axis and dynamic head in feet on another axis.

The gallons per minute (gpm) is across the bottom and total dynamic head (TDH) in feet is listed on the vertical left side. To convert total dynamic head to pressure per square inch (psi), multiply by the factor of .43. We need 250 gpm at 110 psi.

We now convert 110 psi to TDH (divide 110 by .43 which equals 255 TDH). Then on the chart we find where the lines of 250 gpm and 250 TDH intersect.This indicates that a 25 Hp motor is needed to give us this performance. All pump manufacturers have pump curves available so you can choose the right pump for your own particular needs.

Now let's take a look at Figure 2. Here is a schematic of a typical 3-pump installation and how the components should be laid out. The concrete pad to which they are affixed should be about 12' x 16' so as to give ample working room. Whether a structure is erected around the pumps is up to the owner but it is highly recommended to reduce vandalism, and to keep the automatic pump controls clean and dry.

The piping in the pump house should be laid out so as to give maximum efficiency of flow. The use of flanged fittings or dresser couplings is recommended so any component can easily be removed without disturbing the rest of the piping system. Also, the use of long radius cast iron flanged fittings is highly recommended for the pump house piping—particularly on the larger pumps to reduce pressure loss.

The pumps are automatically controlled by a series of pressure and flow switches and the entire pumping plant is fully responsive to the demands of the irrigation system.

One final note. Each pumping plant is an individual system. Good pumping plants don't just happen; they are carefully designed and engineered to do a particular job and it is well worth your time to contact competent help when planning a new pumping plant. □

Each pumping plant is an individual system. The plant design below was developed after all the input factors were known. This typical design features three pumps for added flexibility in the system.