Pickup Truck

One pickup truck is needed on almost every golf course for transportation and moving purposes.

Power Sod Cutter

At least one power sod cutter is recommended.

Heavy-Duty Wood Chipper

A heavy-duty wood chipper will prove exceptionally helpful at every golf course that has a reasonable number of trees.

Trencher

One trencher is needed for drainage and other installations.

Small Equipment

Three or four hand rotary mowers, three or four weedeaters, two power bunker edgers, one clubhouse reel mower, etc., are minimum requirements.

Slicer/Seeder

For use on heavy wear areas.

Fairway Vertical Mower

Depending on area and grass type, a self-propelled vertical mower or interchangeable attachment is needed for overseeding purposes, especially on those golf courses with fairway thatch problems.

Tree-Pruning Equipment

This to include one or two chain saws, extendable pole saws, and regular pruning equipment.

Shop Equipment

To include bedknife and reel grinders, table saws, a steam cleaner, air compressors, a small hydraulic hoist, a welder, paint sprayers, drill press, and many other pieces of equipment vital to golf course operations.

Irrigation Equipment

Equipment needed for irrigation and pumping stations will vary according to the type of system in operation. If any tools are needed to operate the irrigation system, include them in this list.

Miscellaneous Hand Equipment

This area covers shovels, picks, cup cutters, rakes, and all other small items needed for regular golf course maintenance.

Because of regional variations, this list may not include all the equipment your club might require, or it may exceed the necessities of your area, but it is suggested as a basic list of equipment required for maintaining a nine-hole or 18-hole golf course.

If you wish to streamline your maintenance operation and derive maximum benefit from your maintenance staff, equip them with the necessary tools to provide the maintenance results expected by the membership.

Answering the Most-Asked Questions About the Golf Course Pump Station

by KEITH McLAIN INC.
Houston, Texas

THE SPRINKLER heads pop up and water rushes forth. The water is projected across the greens, tees, and fairways, sustaining the life of the turf. The value of water to golf course maintenance cannot be overstated. Without functioning irrigation systems, most courses would cease to exist. Water is the life's blood of a golf course. The irrigation lines to the sprinkler heads act as the circulatory veins and the pump station as the heart of the system.

What comprises a typical pump station?

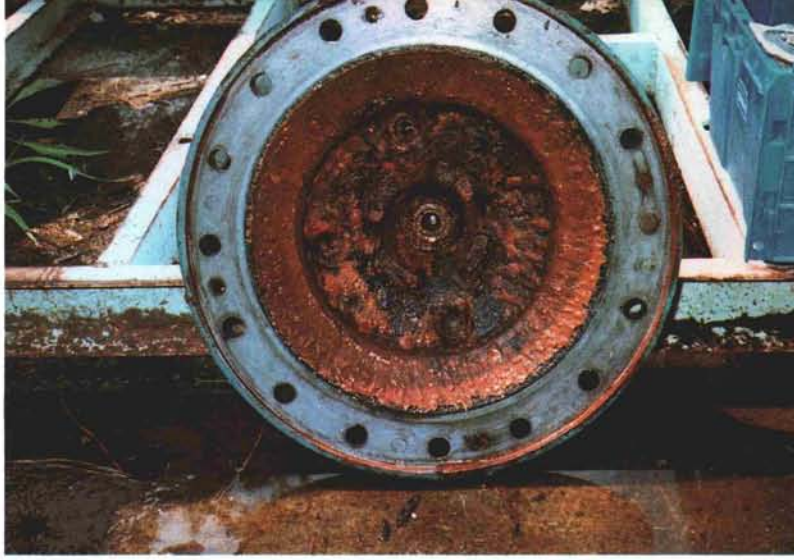
The irrigation needs of each golf course are as individual as the courses themselves, but the average station consists of a jockey pump, two booster or main pumps, a hydropneumatic tank, a control valve, and a controller. The jockey and booster pumps can be vertical turbine or centrifugal pumps. The simplest explanation describing the two types of pumps would be: A vertical turbine pump sits below water level with the motor above water level. The bell-shaped pump is at the end of a standard six-foot column. It has multistage impellers creating pressure that forces the water up the pump column. With a centrifugal pump, both the pump and motor sit above water level and have a suction pipe with a foot valve and intake screen going into the water.

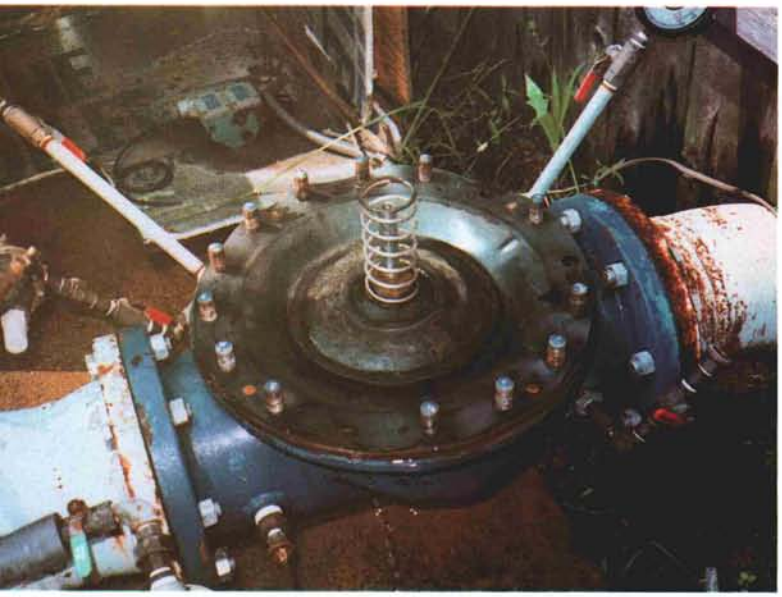
The different components are situated on a steel base or concrete slab near a lake or pond. Each part contributes to the overall purpose of bringing a controlled water supply to the irrigation system.

A jockey pump is a small pump, usually with a 10- to 25-horsepower motor, that maintains irrigation line pressure. It allows for minimum power use without the expense of a booster pump. The jockey pump is the first pump to come on. It begins the job of supplying water while maintaining pressure. When more water is needed, the booster pumps come on.

What does a booster or main pump do?

A booster pump is a pump with a 50- to 125-horsepower motor. Most pump stations generally have two, but it varies according to the demands of the golf course. Booster pumps force water from





the pond into the hydropneumatic tank. They come on in stages. The more sprinkler heads that are on, the more pumps come on. Pressure and flow determine how many pumps operate; the greater the demand for water, the greater the need for pumping capacity.

What is the purpose of the hydropneumatic tank?

The hydropneumatic tank, which is also known as the surge tank, has two functions:

1. When the pumps start, they try to send a shock or surge of air into the irrigation system. The tank absorbs this shock and the air that precedes the flow of water. The tank is filled with 60 percent water and 40 percent air. There is an air-release valve on the tank that regulates and monitors the air/water ratio.

2. The pressure in the tank is used to start the various pumps.

Where does the air come from?

The air seeps into the column pipe through the stuffing boxes or reversed check valves when the vertical turbine pumps are not running.

When the pumps are turned off, the water seeks its own level. This allows the air to fill the space between the pump head check valves and the pond level. When the pumps start, the air is trapped in the column and forced into the hydropneumatic tank. If the tank did not absorb the shock, the water (mass) following the free-flowing air (non-mass) would shatter the irrigation pipes. It is desirable to have the pipes completely filled with water at all times. The irrigation lines should maintain a constant pressure. When the pressure drops, the pipes contract; with the pressure, they expand. This creates wear and tear on the irrigation system.

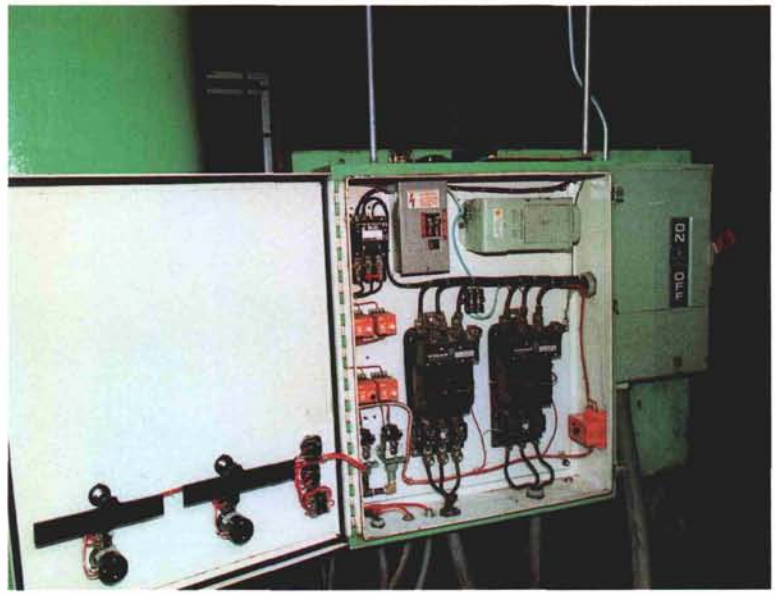
What is the control valve?

The control valve regulates the water from the hydropneumatic tank to the irrigation system. The standard control valve has a cast-iron body, and is piped with three different pilots. These three pilots serve to regulate the irrigation pressure, act as a safety for the irrigation pressure, and maintain tank pressure.

The pressure-reducing pilot is affectionately known as the husband. It maintains a set pressure on the irrigation system.

A surge-protection pilot is known as the mother-in-law. It overrides the husband if he fails to close at the set pressure. The key words here are override the husband (standard procedure for most mothers-in-law).

The sustaining pilot, or the wife, is set to make sure there is always back-pressure against the pumps when they start. This is to keep the pumps from cavitating (when pumps spin too freely or fast they will not pick up water).



(Right) Bear Creek Golf World, Houston, Texas, owned and operated by American Golf Corporation.

What is the pump station controller?

It is an electrical board wired to the control valve. The hydropneumatic tank sends pressure signals to the controller that start the pump after a time delay. When the watering cycle is complete, the control valve closes. Limit switches on the valve send a signal to the pump controller telling it to turn off the pump after a time delay has cycled.

Why is a time delay necessary?

It is less expensive to keep the pumps running than to start and stop them. It takes six times the in-rushing amperage to start a pump. The time delay settings range from three to 60 seconds. Some irrigation systems take longer than others for their sprinkler heads to shut off or come on during sequencing.

What are some special features of a pump station controller?

Computer technology is finding its way into golf course maintenance. There is technology that can gauge and reveal the moisture content of the soil along with recording the daily effects of the weather conditions through special weather instruments. All this data, with help from the computer, will be used to analyze and redirect irrigation practices. It will tell how many gallons per minute and electrical consumption per hour are being used. This will enable the superintendent to conserve not only electricity, but most of all water.

These new pump stations now basically consist of:

Phase protection monitors the incoming voltage to the pump station. If it varies plus or minus 10 percent or a loss of phase or phase reversal occurs, the device will shut the pump station down before excessive heat is generated.

Low level shutdown. This circuit protects the pumps from running without water. There is a probe that hangs inside the wet well. When the water level falls below it, the station shuts down.

High pressure shutdown. This feature indicates the control valve has failed to operate properly. Time to check the mother-in-law.

What about high-temperature circuit shutdown on centrifugal pumps?

Centrifugal pumps usually have the same safeties as vertical turbine pumps, but will have a shutdown circuit monitoring high temperatures. This is because when a centrifugal pump cavitates, the impeller spins freely in the water, causing friction and creating heat.

What is the most common problem affecting the pump station?

Dirt and trash are the primary contributors to the superintendent's headaches. Dirt inside and around the pump station areas builds up, causing dust and debris to gather on the motors and electrical components. This interferes with the components' ability to make solid connections.

Just as dirt above the ground causes problems, dirt and trash in the water lead to other miseries. When dirt in the water makes its way into the pumps, it begins to wear or plug the impellers. Its abrasive action works like sandpaper as it erodes the impellers and bearings. The trash works its way up into the pumps and clogs them. It plays havoc with the check valves. Most check valves have brass seats and ding very easily. Once a ding is created, it inhibits the ability of the seat to seal completely. The dirt then moves through the tank to the con-

trol valve and plugs it. As it continues its journey through the irrigation system, it clogs the sprinkler heads as well.

How can this be avoided?

First, insure the pump station is installed properly during construction. It is not advisable to place the pump station at the end of the pond where the wind blows all the surface trash. Eventually the trash becomes waterlogged and sinks to the bottom of the pond. If this is where your intake pipe is located, the trash is in the direct flow of the water entering the pipe, and is carried with it. To avoid this, locate the pump station at the end of the pond, but extend the intake pipe to the middle of the pond. Always keep the intake at least 30 feet from the edge of the pond.

When you are installing the wet well or intake pipe, place it where it will draw clean water. This can be done by keeping the intake pipe at least three feet above the floor of the pond and 30 feet from the edge of the bank. During construction, dig silt traps like moats around the intake pipe. Always keep the pond at its highest possible point. The lower the water level, the higher the chance of bringing in trash from the bottom of the pond.

What does the future hold for your water source?

With the water shortages looming, I expect to see between 75 and 80 percent of all golf courses using some type of effluent water by the year 2000. With the expense of potable water rising and the restrictions on drilling new water wells, effluent water will be the only water affordable. This will cause a few problems that will have to be overcome, such as the injection of chlorine into the irrigation system, and/or installing filter units or separators after the pump station to keep the irrigation system clean. I recommend cleaning the water before it reaches the pump station.

How do I increase the longevity of my pump station?

Take care of it. Treat it like you would your own heart. Listen to the noises it makes. Visit it every day. Keep notes on everything you hear or do to it — changing the oil, packing the pumps. Knock the rust away. Paint it once in a while. Blow the panels out with air once a month. Keep the area clean. Get into a preventive maintenance program with the station manufacturer or qualified representative. Check with the pump manufacturer and motor manufacturer for their recommended servicing. Treat the pond or lake. The cleaner the water, the longer the life.

Is preventive maintenance expensive?

No. The average is between $400 and $500 a year. Fairly inexpensive insurance when you consider the stress on the superintendent and the value of the turf the pump station is serving.

To wrap it all up, when a sprinkler head comes on, a pressure drop occurs that activates the jockey pump. The heart begins to beat, and the water starts its journey. It goes from the pond, through the intake pipe, and into the wet well. The pumps force the water up the column into the hydropneumatic tank. The tank absorbs the shock and air. Then the water passes through the control valve, travels into the discharge pipe, to the irrigation lines, and out to the spinkler heads. Finally, the golf course turf absorbs the water, thrives, and grows for the good of the game.