From Forest Nursery Notes, Winter 2013

132. New advances: a look at newer variable speed irrigation pumps. Bartok, J. W., Jr. Greenhouse Management 32(12):16. 2012.

New advances

A look at newer variable speed irrigation pumps

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HAVE A QUESTION?

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Variable speed pump (VSP) technology has been around for many years, but recent advances in the controls have made them better. When applied to greenhouse irrigation, these pumps are most effective and economical when there is considerable difference in demand between large irrigation zones.

The basic system consists of a submersible or turbine pump, small pressure tank, variable speed driver, sensor, controller and programmer. The components are sized for the maximum water flow that is needed for irrigation.

A variable speed pump operates similar to the cruise control on your car. Once you set the desired speed, the electronics in the engine control the motor to maintain that speed. In a variable speed pump, when more water is needed, the pump runs faster to provide it. When less water is needed the pump slows down. There is no pressure cycling between 40 psi to 60 psi, as you would get from a conventional pump with a pressure tank. The pump runs constantly when water is needed but speed varies to meet demand.

The speed on a VSP is controlled by modifying the 60-cycle electric signal. This changes the voltage and current going to the motor. The result is a change in the motor speed and thereby water flow and pressure.

What are the benefits of VSP?

- By having constant pressure, the output from the irrigation nozzles is constant. This gives a uniform irrigation pattern. Today's controllers can be easily adjusted to provide the exact pressure needed to cover the crop area. Unlike the conventional system, there is no overshooting of the pattern, wasting water, when the pressure varies from 40 to 60 psi. Having constant water pressure is like being on a municipal water system.
- It saves energy in a couple of ways. Providing 60 psi in the pressure tank when you only need 40 at the nozzle increases electricity use as it takes more energy to raise the pressure. Also, operating the motor at a slower speed saves considerably more energy.
- Pump and control life is extended; the motor runs constantly when water is needed. The frequent starting and stopping of the motor in a conventional system wears it out much faster. Cycling kills the pump as well as the contacts in the pressure switch.
- VSP eliminates the need for large pressure storage tanks. In a conventional greenhouse system, one or more pressure tanks are installed to supply water. In a VSP system, only a very small tank is needed to control the system. This also saves floor space.
- The VSP electronic controller protects against a number of hazards including rapid cycling, water log problems, a short circuit to the motor, low voltage, surge voltage, pump overload and running dry. Built-in diagnostics detect a system problem and take corrective actions to correct it if possible. For example, it will shut the pump down until a low or surge voltage situation is corrected.
- VSP eliminated water hammer as the water flow and pressure are constant.

Variable speed pumps are most cost effective for irrigation systems that have large differences in water needs between zones. For example, if you have several sizes of hoophouses on the same irrigation system, or if you have both drip and overhead in the same greenhouse. If you have a system where all the zones are the same size, a conventional pump that is designed for the flow needed is generally most economical.

The initial cost of the VSP system is generally more expensive due to greater cost of the variable speed motor driver and electronic controller. There is some savings on the smaller pressure tank size needed. There will be limited savings in pumps with fractional horsepower motors. Before committing to a system, have the supplier do an economic analysis based on system size, water demand and the pump efficiency chart. GM

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