

IRRIGATION RENOVATION DECISIONS AND MAINTAINING SYSTEM EFFICIENCY



Auger replaces soil where vibratory plow began pipe and wire pulling.

Efficiency of sprinkler irrigation systems is an increasingly popular topic on turf meeting agendas, primarily because the cost of water has begun to climb significantly and progress has been made in irrigation system design.

An irrigation system is usually a valuable asset on the books of a park system, golf course, memorial park, or corporation with landscaped grounds. Like any asset, it should be protected through regular maintenance.

Plastic (polyvinyl chloride and polyethylene) pipes have reduced the amount of pipe maintenance necessary since their introduction in the 1950's. A variety of materials was used before and still is to an extent today. They include galvanized steel, copper, cast iron, and asbestos cement. Each has weaknesses which reduce its desirability for use in irrigation.

For example, rust and scale deposits in cast iron and steel pipe can reduce carrying capacity by 50 percent in 15 to 20 years. Reduction in carrying capacity results in reduced coverage of the system. How many quick coupler systems using iron and steel pipe and more than 20-years-old are in use today? Fairly many.

Plastic and copper pipe can be pulled into the ground by vibratory plows minimizing surface disturbance and reducing installation time.

Protective devices such as flexible risers, anti-hammer controls and water/solids separators, have reduced the amount of mechanical damage to heads and lines. Security locks have made pilferage of heads more difficult as well.

Controllers are now available in solid state as well as electromechanical versions. Solid state controllers have fewer moving parts and thus increased reliability and reduced size. They can be custom programmed for any user.

A previously developed but recently perfected type of control system called modulating pressure control (MPC) will be offered this year by Toro's irrigation division. This system does away with wiring between controllers and heads. Instead, pressure impulses in the water lines tell small controls (cyclers) at each head or zone when to open and for how long. This system was designed specifically for renovating older, small quick coupler systems.

Concern over water use has caused the rise of soil moisture monitors which shut off an irrigation system when the necessary amount of water has been used or when rain makes irrigation unnecessary.

These are just a few of the advances in irrigation technology in the past two decades. They should be considered when reduced efficiency of an older system is discovered. If reduced efficiency is suspected, an irrigation engineer should be consulted. For the name of an irrigation expert in your area contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, Maryland 20906, (301) 871-8188.

The National Golf Foundation, the United States Golf Association Green Section, and the American Society of Golf Course Architects have been studying use of wastewater for irrigation. Partially treated wastewater may be a major source of cheap irrigation water in the future.

Each year the University of California sponsors a Turfgrass Sprinkler Irrigation Conference at Lake Arrowhead, California. Since many of the manufacturers of irrigation components are in that state, the conference is a major one and provides a good cross-section of developments in irrigation each year.

Judging the need for renovation

Irrigation systems are more complex than they would seem. Even a simple residential system with six heads may have three different types of heads to provide the desired dispersal of water to turf and shrubs. However, there is some basic information which may help in judging an older system's performance. And there are solutions to these problems based upon current technology.

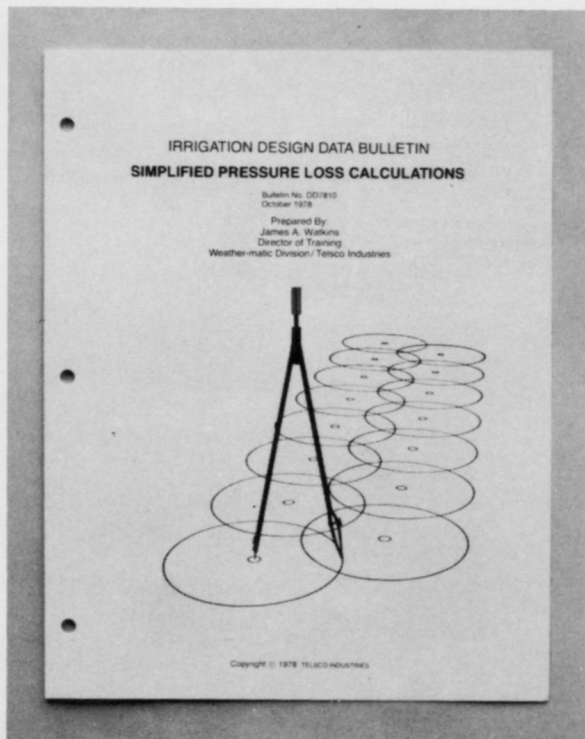
Piping

Pipe is the largest limiting factor in an irrigation system. The size of mains and laterals limits the rate and amount of water available for each section of irrigated area. Selection of heads is based



Pulling pipe and wires into ground causes minimal surface disturbance (above). Pipe is attached to vibratory plow blade with pulling grip (below).





Simplified pressure loss calculations are explained in a technical pamphlet by James A. Watkins, director of training for the Weathermatic Div. of Telsco Industries, P.O. Box 18205, Dallas, TX 75218.

upon the amount and rate of water supplied to it by the pipes in order to cover an intended amount of turf.

Flow capacity of pipes can be reduced by friction of the inner pipe surface, accumulation of deposits inside the pipe, and the amount of pressure the pipe can withstand. These characteristics should be considered for each type of pipe.

Until the 1950's, metal piping was used for turf irrigation systems. Galvanized steel, cast iron and copper were all common.

As mentioned earlier, cast iron and steel pipes can have their carrying capacity halved in less than 20 years because of corrosion and mineral deposits inside the pipe. This problem is solved by use of plastic or asbestos-cement pipes.

External corrosion of metal pipes is also a problem. In the case of copper, the solder joints are an additional problem. Any metal pipe laid in acid soil or gravel will undergo corrosion. Designers discourage laying metal pipes in cinders for this reason. Electrolytic corrosion is also a problem when copper pipe is connected to iron or steel pipes without dielectric couplers.

Copper pipe is still recommended by some designers for shrub heads because of its flexibility.

Cast iron, asbestos-cement, and plastic pipe tend to be more brittle than other types. Care must be taken during installation to provide support along the entire length of pipe. Asbestos-cement pipe requires special concrete blocks at all turns to guard against breakage by water hammer.

There are two types of plastic pipe, polyvinyl chloride and polyethylene. Plastic pipes can creep or stretch when overpressurized. Creep is caused when temporary high pressure causes the pipe to expand and the pipe does not return to its original

size. If this occurs frequently the pipe will eventually break.

Polyethylene pipe creeps more than PVC and consequently should be used in low pressure systems only. Pressure must be watched for PVC pipe as well. There are grades of PVC pipe based on pressure. The right grade is needed for the right pressure designed for the system.

Care must be taken in installing plastic pipe to make sure the pipe is not grooved or scraped. James A. Watkins, author of "The Turf Irrigation Manual" says pulling pipe into rocky soil may damage the pipe. A sand base and backfill may be required in some soils. Grooving plastic pipe can reduce its strength.

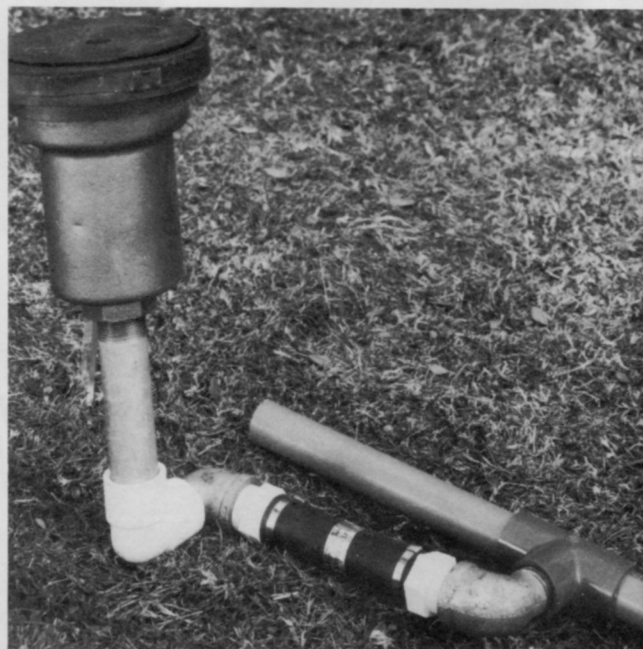
There are other considerations necessary for pipe selection. Inner diameter, friction, and flow capacity are some of them. These involve mathematical calculations which are best done by experts.

Controllers

A controller is a device which implements pre-selected commands for time and location of irrigation. A controller is limited by the number of stations it can regulate. If expansion is likely, a controller should have extra station controls to handle it.

The controller carries out its commands either by signalling main and zone valves through wires or by pressure impulses read by cyclers at the heads.

The electrical methods are electromechanical and solid state. The electromechanical systems utilize a mechanical clock and switches to send the correct signal to valves. The solid state system utilizes computer technology to achieve the same results. Call it a digital watch with microcircuits doing the work. Both systems require a buried set of wires to each zone or station. Solid state offers



Proper way to install a flexible riser to a sprinkler head. Flexible risers reduce mechanical damage to pipes underground.

some additional flexibility in control choices and fewer field controllers according to Johns-Manville.

However, Erich Wittig of the Toro Co., said at the Ohio Turf Foundation Conference this December that solid state systems have their weaknesses too. He said programming mistakes or damage to a chip can cause delays in some instances. In other words, don't give up on a good electromechanical system if it is working properly.

The new modulating pressure control (MPC) system, soon available from Toro, eliminates the need for a network of wires across a turf area. It was designed for smaller manual irrigation systems that now use quick-coupler heads. Commands are sent to cyclers (small controllers) at each head or zone as changes in pressure in the water lines. A disadvantage is that commands are sent in sequence. So, if you want to tell the tenth station to activate, you have to go through commands for one through nine first.

The MPC system can reduce costs if a large amount of flexibility isn't needed. If the system proves popular further development may increase flexibility.

Heads, Pumps and Pressure

Achieving the desired coverage involves a series of relationships with pressure, heads, pipe capability, and design. Making all these pieces fit together is the job of the irrigation expert and is best left to him.

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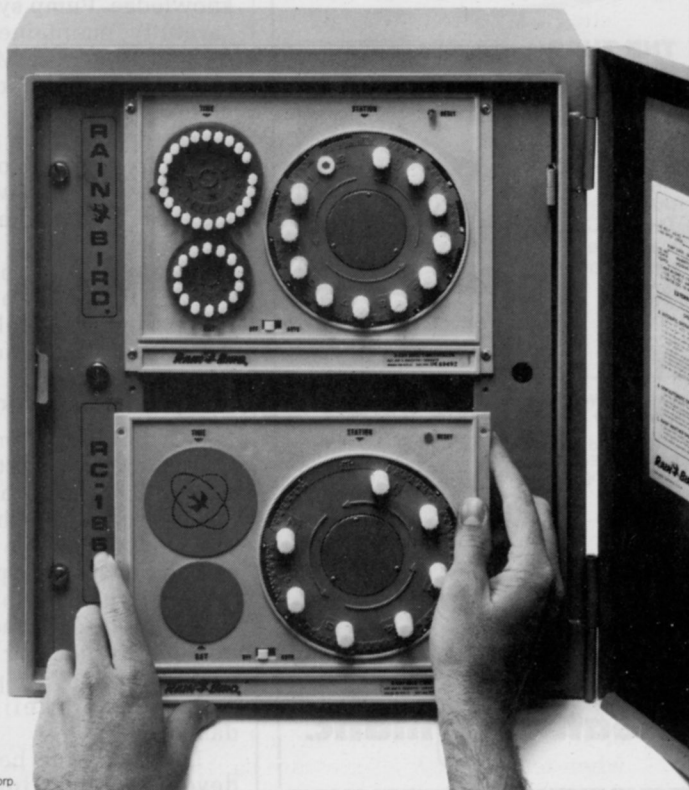
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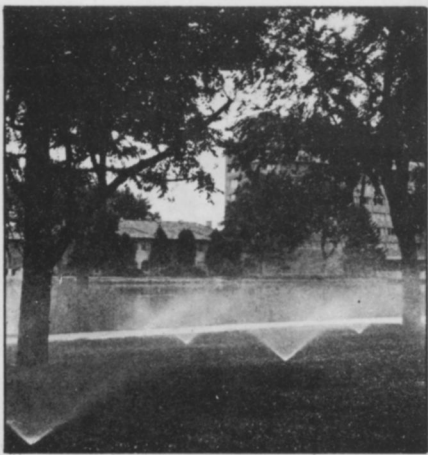


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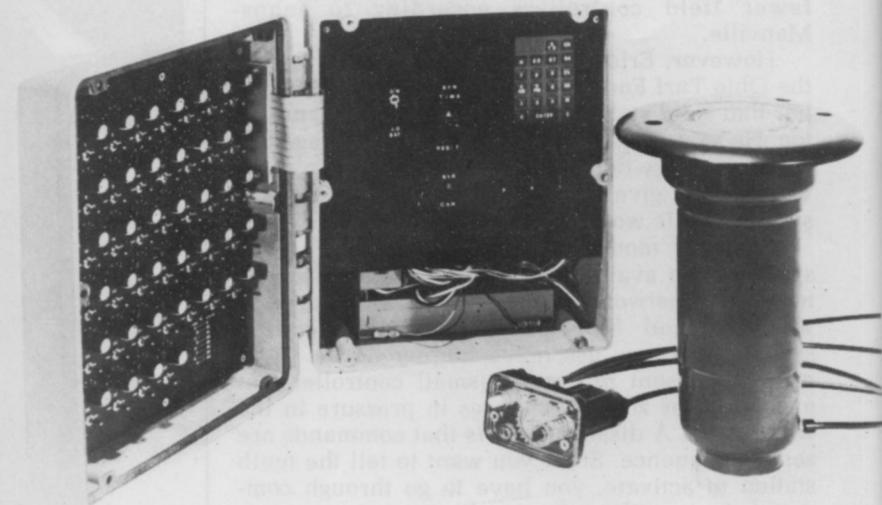
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Components to Toro's modulating pressure control system; left to right, central controller, cyclor, and valve-in-head gear-driven rotary head to replace the quick coupler.

Each part must function to specifications after installation to maintain system efficiency.

Closely designed systems depend upon a consistent pressure level. Systems using city water should be designed for the lowest city pressure with the inclusion of pressure regulators to guard against surges.

Where water comes from natural sources, a sophisticated pump system is needed. Again, the complexity of the device requires expert knowledge. Pump systems should be carefully maintained and checked for performance. MPC systems especially depend upon pump performance.

Heads, whether rotary, spray or other, are selected to provide certain coverage with a given pressure. If they malfunction they may throw off coverage of other heads due to redistribution of pressure in the lines. Damaged heads must be replaced immediately with heads of the same specification.

Protective and security devices

Mechanical damage and vandalism can be costly. If a heavy mower damages a head and breaks the pipe underneath, major repairs are needed. Flexible hoses can be installed between the pipe and head to prevent this. Also, some manufacturers offer heads that retract into the ground after use. How heads are connected to pipes can also reduce the likelihood of pipe damage.

Lock nuts for heads have been developed by King Brothers In-

dustries in Valencia, California. These make removal of heads difficult for vandals.

Another device helpful in protecting irrigation efficiency is a separator. It is a system designed to cause solids, primarily sand, to drop out of water before it enters the pipes. One company making separators is Laval Separator Corp. in Fresno, California. For the separators to be effective, pressure of water entering the separator must be maintained at a high enough level.

A great deal goes into an automatic irrigation system. To keep it functioning efficiently to reduce water use and obtain good turf results requires constant maintenance. **WTT**