topdressing and infield mix business located in Great Meadows, NJ. The Associated Press picked up the story and things started happening. "I guess it means that sports reporters are starting to pay more attention to the field," he reasons. "Hopefully they will get the word out to managers of high school and park fields so all baseball players can enjoy playing on a "professional quality field."

M. E. "MAX" SNODDY

M. E. "Max" Snoddy, founder of Weather-matic, Dallas, TX, and a pioneer in the irrigation industry, died recently in Dallas after a brief illness. He was 75 years old.

Like many others after World War II, Snoddy went to Texas to seek his fortune. He found it.

In October, 1945, he opened the Texas Lawn Sprinkler Company (TELSCO) in downtown Dallas. Forty-two years later, TELSCO is known throughout the world as Weather-matic and is highly respected in the turf irrigation industry.

One of his favorite axioms, in business as well as his personal life, was represented by a plaque in his office: "Develop Your Push and Your Pull Will Take Care of Itself."

Indeed, Snoddy did push. In 1961, manufacturing and design demands dictated a move to a larger facility. The offices and manufacturing plant of Weather-matic were moved to their current location in Garland, TX, where they have since doubled in size with three expansions.

Snoddy contributed greatly to advances in the irrigation industry. He pioneered the diaphragm-operated, solenoid electric valve, as well as electric sprinkler-system controllers, including early electronic-timing models.

Other Snoddy innovations include matched-precipitation, milled spray-head nozzling; precision-machined, metal-to-metal seating for pop-up, gravity-retract sprinklers; and an integral, adjustable riser sprinkler.

Among his water-saving accomplishments is the "Rain-Stat" rain-sensing shutoff device for lawn sprinkler systems.

He kept pace with advancing technology—and often managed to lead it. In a keynote speech to the Texas Turf Irrigation Association (TTIA) in 1984, Snoddy told members, "The hammer-and-plier days of product development are long gone. Then, it took several months and several thousand dollars to bring a new product to market. Now, product development, depending on the complexity of the product, takes from two to five years from concept to market, at costs ranging from $50,000 to $500,000 for each product."

To further the advancement of technology and education, the Weather-matic College of Irrigation Knowledge was initiated in 1968. Since then, hundreds of contractors, designers and distributors have taken the intensive ten-day course.

Subjects include soil-water-plant relationships, basic and advanced hydraulics, sprinkler application and layout, piping-system design, and business-related topics.

With his strong desire to educate, Snoddy was moved to implement and publish the "Turf Irrigation Manual," authored by James A. Watkins, a longtime associate. It has been hailed by many as the "bible" of the irrigation industry.

Snoddy's dedication to learning did not stop there. His company has been active in its support of the Irrigation Association (IA) and the IA Education Foundation.

At Texas Tech in Lubbock, Snoddy established a 19-year tradition of awarding an annual scholarship to an outstanding college student majoring in park administration or landscape architecture.

The success of Weather-matic in our industry has been attributed to the integrity and foresight of its founder. Snoddy once summed up the way he saw his company by saying, "Quality cannot be inspected into a product. It is achieved by engineers, machinists and assemblers who are quality-conscious.

Reflecting Snoddy's commitment to various youth programs, his family has requested that memorials and donations be made to Cal Farley's Boys Ranch, P.O. Box 1890, Amarillo, TX 79174.

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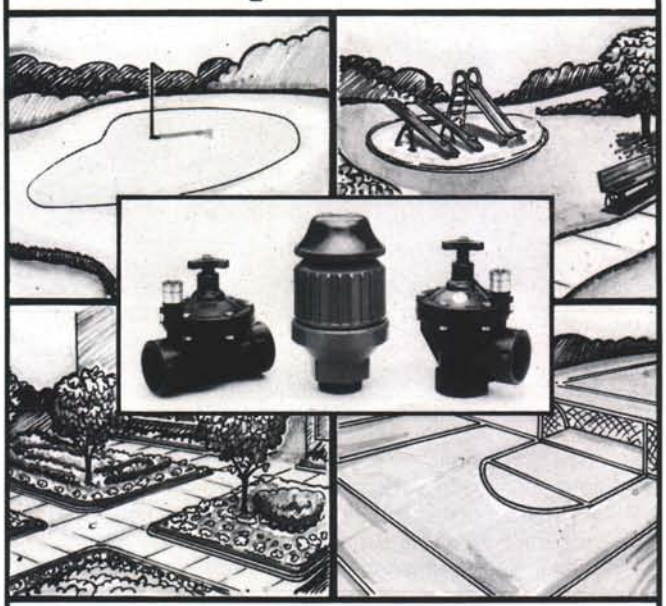

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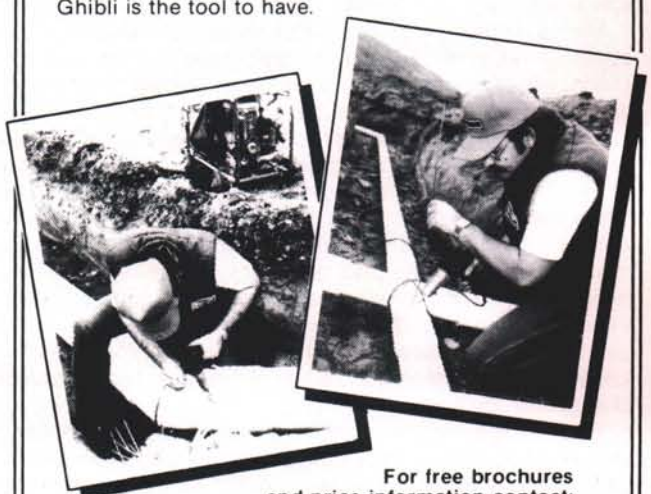

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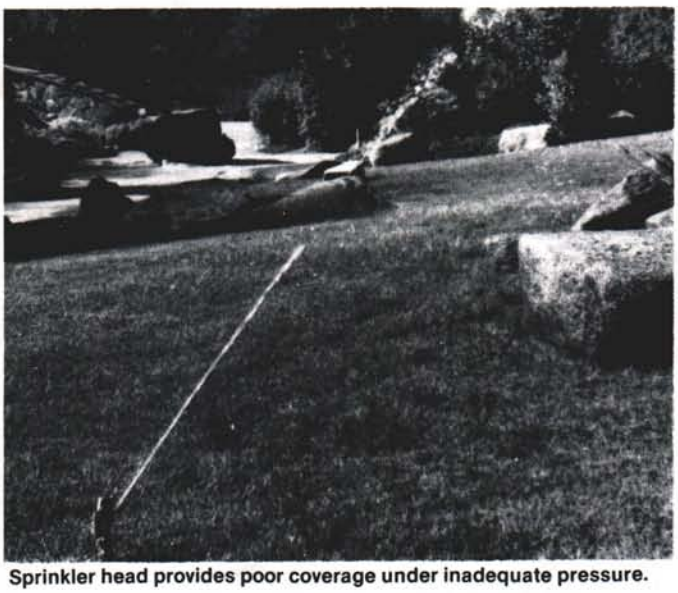
The demand for sports fields and golf courses today is simply too great to rely on natural rainfall as the only source of moisture for turf. It is also too great to rely on older, unsophisticated irrigation systems with high labor requirements, poor coverage and low reliability.

Rising labor, energy and water costs, combined with the escalating value of sporting events played on turf, are forcing managers of sports turf to reevaluate their irrigation needs as well as the effectiveness of older, conventional drainage systems. This article focuses on controlling irrigation in sports turf.

Sports turf use is becoming less and less seasonal. Golf courses at winter resorts are no longer empty in the summer. Despite often intense heat, summer play is increasing on golf courses across the South and West. After losing business during summer droughts over the past few years, northern courses are also investing in improved irrigation systems. Golfers, expecting conditions similar to those they see on television, are no longer satisfied to play courses with brown fairways. Northern courses can't afford to lose a serious portion of their busy season to drought damage.

Higher expectations, combined with a growing concern over player safety and an exploding popularity of league sports, are putting tremendous pressure on parks to improve their fields. Softball and soccer leagues are forcing parks to keep fields, once maintained only during football and baseball seasons, playable for most of the year. Even stadiums have greatly increased the number of events to generate more revenue. Finally, colleges and universities, forced to compete for students, are raising their turf standards to attract sports-minded individuals to their campuses.

To really appreciate the importance of an irrigation system you have to understand its potential—both good and bad—as it relates to sports turf. An irrigation system must be able to deliver the right amount of water to the right place at the right time. Many older irrigation systems simply do not do this.



Sprinkler head provides poor coverage under inadequate pressure.

"For a long time, irrigation designers were forced to adapt irrigation systems manufactured primarily for agriculture or small residential/commercial use to fit sports turf," says Ed Shoemaker, vice president of Rain Bird. Agricultural systems lacked the uniformity and coverage important for sports turf. Smaller systems could not withstand the beating from players and large turf equipment. Irrigation systems for athletic areas and golf courses are larger and more complex than agricultural and commercial systems and require more sophisticated control.

continued on page 24

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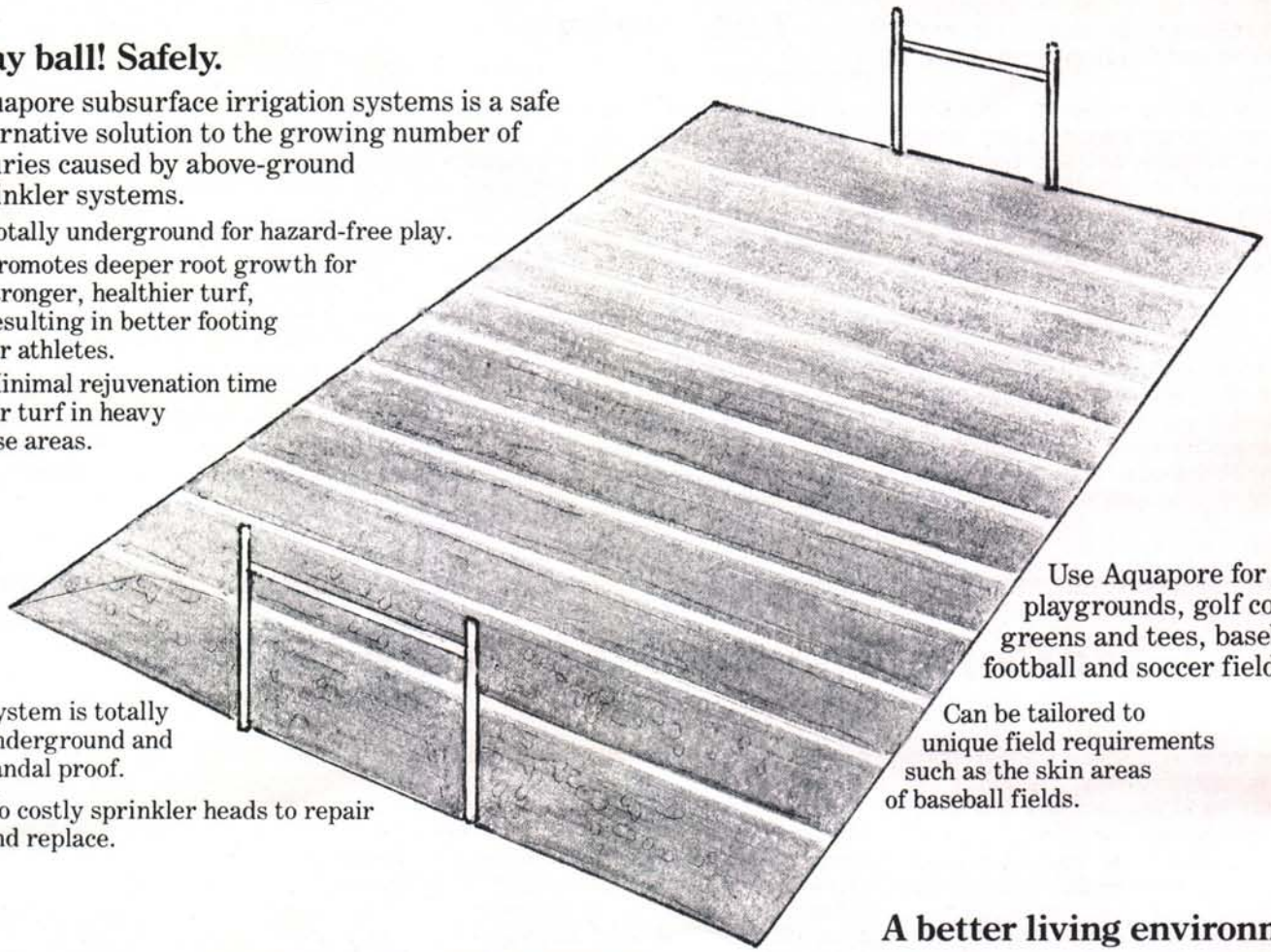

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Keeping Pace
continued from page 22

Manual, quick-coupler systems were the early choice for parks, fairways and athletic fields. To irrigate these large areas with the least number of heads, large, high-pressure impact sprinklers were necessary. Unfortunately, the uniformity of the spray pattern from these heads was comparatively poor. Irrigating with these systems was also labor intensive since each head must be snapped into place to start irrigating and removed to stop.

Early automatic controllers, developed to reduce labor costs, were very limited in scheduling flexibility. With so few stations available on a clock controller, "there was a tendency to put as many heads on each lateral as possible," remarks Toro's Don Fisher. As a result, shaded areas would often receive the same amount of water as sunny areas. When the sunny areas were dry, the shaded areas were still wet.

Control over water pressure was also poor. Systems using city water can experience great variations in pressure. As the pressure changes the distribution of water from the sprinkler changes. "Water changes its pattern depending upon the pressure," explains Bob Cloud of Associated Irrigation Consultants in Los Angeles, CA. "A manufacturer usually specifies that a sprinkler head should work between a range of pressures. It's not uncommon to have 25 pounds' difference in operating pressure when using city water. When the pressure exceeds the manufacturer's recommendation, the head will not come close to its desired diamater because the water will atomize and mist."

As the pressure changes, the distribution of water from the sprinkler head changes.

Many golf courses and parks use wells as a source of irrigation water and pumps to generate system pressure. The higher the system pressure the harder these pumps have to work. "Twenty-five years ago," says Richard Choate of Weather-matic, "pumping systems had to use a lot of energy to deliver the pressure needed to operate the sprinklers common in those days. Pumps had to produce enough pressure to overcome friction losses in the pipes and valves in addition to the high pressures required by the heads."

"There is a definite trend toward lower pressure systems," observes Larry Keesen, president of Larry Keeson Irrigation Design & Consulting. "By using smaller heads and reducing the spacing we can get better coverage at lower pressure. Basically, what you get is a larger droplet that is less prone to wind and misting. Better distribution results in better coverage."

Lower pressure systems save money since energy costs for pumping are directly proportional to the pressure. "If you lower the pressure 20 percent, you'll save 20 percent on your electric bill," says Fisher. "That can be thousands of dollars a year."

There is a trade off, it takes a low pressure head longer than a higher pressure head to apply a given amount of water. "Sports turf managers only have a certain amount of time to irrigate," says Brandon

continued on page 26

Troubleshooting Irrigation Valves

Valves Whether a valve is manually controlled, remote-controlled or automatic, it performs one of the following functions: releasing water into the distribution lines or into a sprinkler head; retaining water at a certain point in the distribution system to maintain a desired pressure; or draining lines.

The simplest irrigation system is manually controlled. It generally uses either angle-type or globe-type valves that are turned by hand to release water to sprinklers nearby.

The majority of valves in modern, automatic irrigation systems are known as remote control valves. These valves open and close according to signals they receive from a field switching terminal or satellite controller. These signals are either hydraulic pulses directly to the valve or electric currents received by a solenoid attached to the valve. Whether the valve is hydraulic or electric, hydraulic pressure is used to open or close it. Most remote control valves are designed to withstand burial, but their placement in a valve box permits easy access for servicing or for manual operation.

Most remote control valves are a globe design. Valve operation is based on a pressure differential between the top and bottom of a diaphragm or piston. Control of the movement of water through specially-designed ports and chambers within the valve allows water pressure to be applied in such a way to open or close the valve assembly. The assembly may be either a diaphragm or piston type. The diaphragm valve is used more often because piston valves have washers and rings that require periodic servicing and replacement.

Automatic valves are either "normally open" or "normally closed," referring to the position the valve assumes if the hydraulic or electric control line is cut or broken. Electric valves are "normally closed" while hydraulic valves can be either type.

It is vital that the water which is used to operate the valves through hydraulic control tubing be absolutely clean. In addition, wherever freezing is possible, all water must be blown out of the hydraulic control tubing with an air compressor. For this reason and others, the trend is away from hydraulic valves toward electric ones. "Hydraulic systems are difficult to maintain and troubleshoot," says Rain Bird's Rod McWhirter.

A valve-in-head design is being used today for larger pop-up sprinkler heads, often where quick-coupler systems are converted to automatic. The valve is located in the base of the sprinkler head housing or below the head in valve-under-head versions. This location allows independent control of each head. However, since each head has its own valve, it uses up one station on the controller making a large number of valve-in-head sprinklers impractical.

"Valve-in-head sprinklers are being misused in some locations," says Truttman. To operate more than one from a single station, turf managers are linking valve-in-heads together with a common wire. "It's really preferable to use a separate valve and standard heads from a maintenance standpoint," he explains.

Since standard electric valves are the most commonly used control valves in the industry today, we will zero in on them first with maintenance tips.

An electric valve can be opened manually by opening the bleed button or bleed screw approximately one turn. A small amount of water normally bleeds out when this is done. Close the bleed valve to return the valve to normal operation.

To shut off an electric valve manually, turn the flow control clockwise one-half turn at a time until hand-tight. It is not necessary to use a wrench. The pressure downstream from the valve can be adjusted by turning the flow control knob.

If an electric valve was recently installed and it is not operating properly, first check its position. Electric valves can't be installed upside down, on their side or pointing down since this will trap air in the bonnet cavity and cause the valve to chatter and probably fail to close. By leveling out the valve it will operate as designed. Also check to see that the direction of flow matches the arrows on the valve.

There is a trend toward electric valves (background) from hydraulic valves (foreground). Photo courtesy of Toro.

If the valve is in the right position and still doesn't open, first check the flow control handle to make sure it is open. If it's open, check the pressure in the main and the voltage from the controller. If these are proper, then the problem could be the solenoid. Attach a 24 VAC coil with a 12 VDC battery to the solenoid. If none of these methods work, the valve may need to be dissassembled.

If the valve fails to close, check to see that the current from the controller is off. If the valve is only partially closed, turn the flow control handle down to assist the closing action. If these don't work, the valve may need to be dissassembled.

To tear down the valve in the field, first turn off the water supply. Manually bleed the valve to remove pressure from the line. Then, remove the screws or nuts and remove the bonnet. Leave the solenoid in place to avoid getting dirt in the solenoid assembly.

You are now looking at the diaphragm assembly. Inspect it for any obstructions between the seat and the seat seal. Check for condition and either replace or reassemble.

Now, check for plugged porting between the bonnet and the solenoid and from the solenoid cavity downstream. Make sure the solenoid plunger moves freely up and down. Check for any damage to the solenoid seat in the bonnet or seal in the solenoid plunger.

Clean all parts thoroughly. Reinstall the diaphragm. If applicable, tuck the diaphragm bead in carefully before replacing the spring and bonnet. Don't forget the body "O" ring. Make sure the bonnet is on straight. Start all screws or nuts before tightening. Tighten one nut and then the nut on the opposite side of the bonnet until all are secure. Now install the solenoid with the "O" ring. Finally, check all electrical connections to the solenoid.

Close the bleed valve and open the water supply. Test the valve again for operation. It is wise to have spare valves in case field repairs don't locate the problem. You can also see the advantage of installing valves in valve boxes.

When hydraulic valves fail to close there is some type of leak in the hydraulic system, either a loose bleed screw, a leak in a control line or loose fittings. If they won't open, the cause may be crimped or plugged control lines. Like with an electric valve, debris can get caught between the diaphragm seat and valve seat. The condition of the diaphragm and the stem should also be checked.

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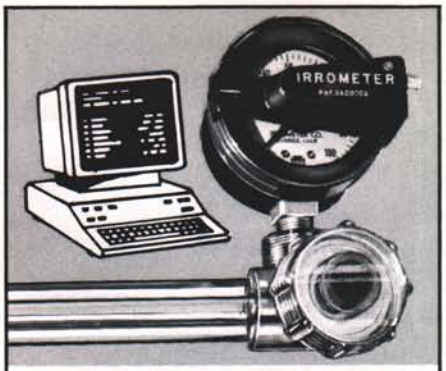

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Keeping Pace
continued from page 24

Meadows of Hunter Irrigation. "It may be necessary to reduce the number of stations to obtain the extra time needed for low pressure heads. Instead of 18 stations running 20 minutes each, you might have to run 15 stations for 24 minutes each.

At the same time, manufacturers are reducing the friction loss of their valves. Lee Caviar, president of Imperial Underground Sprinkler Co. in Lenexa, KS, explains, "Valves (as well as the pipes) always create a friction that slows down the water they are supposed to deliver to the turf. This slowdown lowers the gallons per minute (gpm) delivered. It also lowers the pound per square inch (psi) of pressure needed to make the water arc through the air accurately to its final destination." To compensate for the combined friction loss of the heads, valves and pipes, the pump must work harder. Any improvement that lowers the friction loss will lower the demand on the pump.

Proper maintenance is the easiest way to get the most out of an irrigation system. Simple things like fixing a head that was knocked out of alignment by the wheels of a mower, keeping debris off pop-up sprinkler heads and visually inspecting the irrigation system while in operation can prevent water losses and insure a healthy turf surface. All it takes is one malfunctioning head to change the coverage of all the other heads in a zone. Irrigation designers carefully balance system components to deliver a specific amount of water to where it is needed. Anything that disrupts this balance reduces the efficiency of the system and results in waste.

It's easy to see that there are many things to consider in achieving greater irrigation efficiency. Changes can be made to dramatically improve the coverage, control, and efficiency of older irrigation systems. The cost for such improvements can be justified by savings in water, energy, repairs and labor. But the greatest benefit of all is turf that stands up to heavy sports use with a predictable amount of maintenance.

Sprinkler heads for sports turf are a special breed. First of all they must not interfere with the sport. That might not be a problem for a golf course green where heads can be located around the perimeter. But the wrong head in the middle of a football, baseball or soccer field can cause a bad bounce or injury to a player.

"As much as we would like to develop an irrigation head that would cover a football or soccer field from the sidelines, it isn't really practical," says Choate. "Distribution suffers as heads get further apart. To cover an entire field with heads located on the edge of the field, you'd have to use heads with relatively poor distribution. As a result, some heads are needed on the field to achieve proper coverage."

Many times turf managers just want to irrigate the area between the hash marks on a football field where the most damage occurs without watering the rest of the field. Sometimes they want to water only the infield of a baseball diamond. They can't do this without having heads located within the field and on a separate zone.

In addition to special zones, proper coverage requires overlapping. This overlap is often 100 percent, meaning the longest stream of water from one head just reaches adjacent heads, explains Choate. "There are a number of ways to arrange sprinklers to do this, but one of the most efficient is a triangular pattern since fewer heads are required. It's always best to consult an irrigation designer before deciding on an overlap or pattern since there are differences between some brands or types of heads."

Select a sprinkler head that will evenly distribute water the distance needed for the pattern at the system pressure. Once installed, pressure changes can disrupt the water distribution from the head. Higher pressures will cause misting and lower pressures will cause unusually large droplets falling short of their intended mark. In either case, the coverage of the area will be inconsistent.

Dave Truttman, vice president of Buckner, recommends low-trajectory heads for windy locations. "The higher the water is sprayed into the air, the more chance wind has to break it up and ruin the pattern," he explains.

The three most common heads for large sports turf areas are the impact rotary, the gear-drive rotary and the cam-drive rotary. When not in use, the impact rotary retracts into a can inserted in the turf. Impact sprinklers must be installed so the cover of the can is flush with the soil surface and perfectly upright. If the sprinkler is slightly cocked to one side or at the wrong height, players can trip over them. Manufacturers make models with rubber covers specifically for sports turf installations.

During use, the sprinkler rises out of the can. Water from the nozzle strikes a spring-loaded arm which rotates the head in precise increments. The arm also breaks up the stream from the nozzle to distribute water over the desired area.

One major advantage of impact heads, says Shoemaker, is that most of the component parts inside the sprinkler can be replaced fairly easily. "You can replace a washer or spring without replacing the rest of the mechanism. Impacts have also been around a long time and have a good track record."

Gear-driven rotary sprinklers have two primary advantages—they can be installed slightly below grade and the surface area of the top of the sprinkler when retracted is smaller than the impact sprinkler. "An athlete's shoe should never contact a properly-installed gear-drive head," says Fisher. "Because it is a half-inch below the surface it is also protected from the wheels of turf equipment."

A third benefit of gear-drive heads is the smooth rotation of the head provided by the gears. "This consistent rotation gives the gear-drive better uniformity," says Fisher.

The relative complexity of gears makes repair of individual components impractical so "drop-in" repair modules are used when a head fails. "You pay more for the repair part," says Fisher, "but you waste less time fixing a head. It's really a trade-off between parts and labor."

Sports turf managers should use gear-drives with stainless steel sleeves around the risers for areas topdressed with sand, suggests Meadows. "While the sprinklers themselves are designed to be maintenance-free, the rubber seal around the riser can be easily changed if necessary. There is also a filter in the base of the sprinkler that can be cleaned or changed periodically."

The cam-drive head is an older type of retractable head. The brass sprinklers are about the same size as gear-drive heads at the surface. "Cam-drive heads are relatively easy to repair and last forever," says Truttman. Buckner is the main manufacturer of the heads.

Gear-drive rotaries can be installed just below grade and have the smallest exposed surface.

"One of the best things a sports turf manager can do is attend irrigation troubleshooting seminars," says Choate. "There are a variety of adjustments that can be made to a system in the ground. By knowing how to make these adjustments and being able to recognize and correct problems quickly, the turf manager can keep or restore a system to design specifications."

Any variation from the original specifications can affect the sprinkler arc, radius and the matched precipitation rates, says Tony Pejsa, president of Champion Sprinkler Equipment. Pejsa recommends an in-depth check of irigation systems by a knowledgeable irrigation specialist at least once a year.

The annual inspection should be a *working* inspection according to Cloud, "where you advance it through each station.' While it may not be practical to make a monthly inspection at the normal watering time, "it would be a good idea at least once, at the beginning of each season, to either check the water pressure to make sure it's adequate or observe the system at the time when it's normally on."

Keeson is including "remote control" units on many of his designs. By sending a radio signal to a receiver at the controller, the turf manager with a remote control unit can actuate individual zones from the field. "One person in the field can inspect the system while it's operating," explains Keeson. "He can then make the necessary adjustments and check them right away."

Finally, head heights may need to be changed over a period of time, especially on fairways and fields that are topdressed. As topdressing and or thatch build up around the head, it becomes lower than the surrounding turf and starts to collect debris. Impact heads can become clogged or damaged by debris collecting in the can. "It's wise to cover heads while topdressing," says Shoemaker.

Anytime heads are removed or pipes are repaired, the system should be flushed out to remove sand or other debris that can clog or damage the heads. "Larger systems should include a filter," Keeson points out. "If water is pumped out of irrigation lakes or canals, or effluent water is used, special heads may also be necessary."

When an irrigation zone finishes its cycle, water in that zone will naturally drain to the lowest head on the line. Wet spots associated with low head drainage are very undesirable on sports turf. Check valves, optional with many heads, prevent low head drainage. They also hold water in the line so the pipe doesn't have to be refilled when the cycle starts again.

Controllers More progress has been made with the controller than with any other part of the irrigation system. The addition of computer technology, two-way communication between controllers and components, and an assortment of add-on devices to gauge moisture needs have evolved from the original clock timer.

But don't write off the mechanical clock controller too quickly. For a while, it looked like the solid-state, digital controller would put an end to the easy-to-understand mechanical clock. "A lot of turf managers feel programming solid-state controllers was too complicated," says Fisher. Designers took the easy-to-understand features of the mechanical controller and combined them with the memory and flexibility advantages of solid-state controller to make a hybrid. "There is a definite trend toward the hybrid controller," he states. "If the power goes out, you haven't lost everything like you used to with a solid-state controller. Programming is easier and in one glance you can check a variety of station programs instead of just one."

The solid-state portion of the hybrids expands the flexibility of the mechanical components. Sports turf managers have discovered that repeated, short cycles get more water into the soil than one long cycle. "Once you exceed the infiltration rate of the soil, you start losing water to runoff, especially on slopes," Cloud points out. The solid-state and hybrid controllers allow the turf manager to program repeat cycles.

continued on page 28

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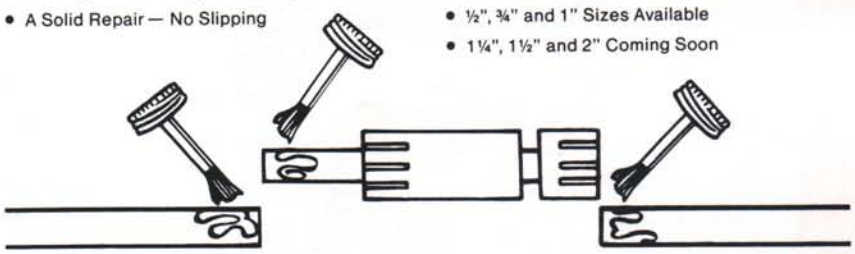

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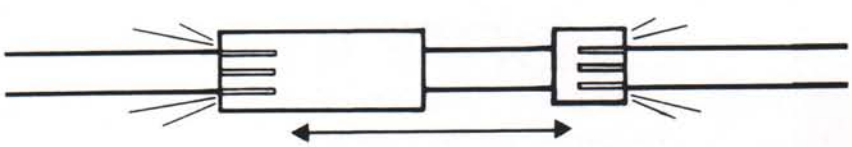

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Keeping Pace
continued from page 27

For those turf managers who have stepped into the computer age, the potential for control has gone far beyond the solid-state controller. Buckner's COPS, Motorola's MIR-5000, Rain Bird's Maxi III, and Toro's Network 8000 have turned the turf manager's office into "mission control."

Working through satellite or field controllers, the centralized computer not only issues commands for thousands of heads, it keeps track of water use, energy use and weather conditions fed to it from the field. Moisture sensors, weather stations, pressure gauges, flow meters, rain switches and more devices send their data to the central computer to give the turf manager information he can use to reduce water and energy consumption.

By keeping track of water pressure and flow rates for each zone, the turf manager knows that each sprinkler is working to its design specifications providing the best possible coverage. With greater control capacity, he can block out sprinklers and adjust irrigation to compensate for shade, wind, humidity and rainfall. "Maintaining efficient irrigation at a number of remote locations is much more practical with the new central controllers," says Shoemaker. "Instead of being a slave of the hardware," says Fisher, "the turf manager is the master once he grasps the basics of computer operation." Everything he needs is right at his fingertips for him to irrigate around an increasingly complex schedule of sporting events."

By keeping track of water pressure and flow rates for each zone, the turf manager knows that each sprinkler is working to its design specifications and is providing the best possible coverage.

Even maintenance is simplified since irregularities are quickly pointed out. "With computerized central control and radio remote control for field testing, the turf manager has new control over systems that were once too large to maintain without a large irrigation crew," says Keeson. "It also puts the decision-making back in the hands of the person most knowledgeable about irrigation."

The Buckner, Motorola, Rain Bird and Toro systems can be used for other office duties such as word processing, accounting and even video games. Rain Bird and Toro utilize IBM personal computers while Buckner's can utilize any IBM-compatible model. Thousands of programs can operate on these systems beside the irrigation programs. Motorola builds its own central computer and provides programs for it.

The Motorola MIR-5000 is dedicated to irrigation and energy management. In areas, with frequent power outages, the built-in programs can be an advantage. "When power is restored, you don't have to reboot the program and start over from the beginning," says Art Brannan. Motorola has also pioneered radio communication between the central controller or a remote control device and field switching terminals.

continued on page 30

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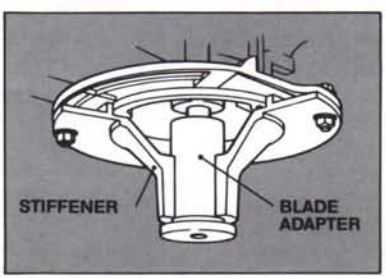

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continued from page 28

Irri-Trol's CMC 3200 is another dedicated central controller with many of the capabilities of personal computer systems without the personal computer. "LEDs show the irrigation manager which stations are operating at any moment," says Chuck Hoover, Irri-Trol's vice president. "It can run up to 32 satellites or nearly 800 heads at cycles from a few seconds to nearly ten hours long. It's an economical option for smaller courses on a budget who need better control."

Pipe repair and installation has also been simplified with the onset of PVC and polyethylene. Metal pipe is fading into the sunset for irrigation. "It's easier today to install new PVC or polyethylene pipe when you update a system than it is to adapt new heads and valves to a network of old metal pipe," explains Fisher. "After 25 years or more in the ground, you really don't know the condition of metal or asbestos pipe. It makes more sense to replace it so you know what you're working with.

Fittings for all types of connections and repairs save hours of labor and shorten the down time for a repair to minutes instead of hours.

Turf managers have developed preferences between PVC and polyethylene. "It's easier to go out and repair a damaged piece of polyethylene pipe than it is PVC," says Wally SaBell, an irrigation contractor in Englewood, CO. "Sometimes it takes only one pipe coupling and two clamps to make a repair without major excavation. You can also pull polyethylene pipe through the ground with a pipe puller more easily than you can PVC. It's more flexible as well."

Motorola Irrigation's MIR-3500, a dedicated system, was one of the first computerized irrigation systems.

But PVC is the choice when high pressure is a concern like in mains and laterals. The two can be combined into the same system. "New fittings and repair products made by Lasco, AMS and King Brothers, have influenced our decision to use more PVC pipe," says Richard Stelles, a turf and landscape consultant based in Okemos, MI. The products telescope over the two pipe ends and are easily glued with a PVC solvent making repairs far simpler and faster to perform."

A third type of pipe, the porous or leaky pipe, is working its way into irrigation. Designed to sweat or release moisture through emitters in the pipe buried in the ground, the pipe delivers moisture at low pressure without loss to evaporation. "Porous pipe is an excellent choice on football fields surrounded by running tracks," explains Cloud. "It does the job without the overspray of a sprinkler disturbing runners." The pipe has also been used successfully in areas with consistently high winds and low water pressure.

With the advancements in computerized irrigation over the last few years, maintaining an irrigation system at its highest level of performance has become less labor intensive. As a result, sports turf managers can benefit from tremendous savings in both the cost of water and energy, while achieving higher quality turf.

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