Computerized Irrigation: A Natural for Large Turf Areas



The world is now well into the age of computers—and the sports turf industry is no exception. Every sports turf manager with a large operation should seriously consider the various uses of this space-age tool. Some have already put it to work with great effectiveness. Don't miss the boat—the water's rising, at least in cost.

As recently as the late 1970s, our industry was still in awe of solid state controllers, and rightly so. They provided a new degree of precision and accuracy not available from electro-mechanical controllers. These partly computerized devices gave the turf manager more flexibility in setting and adjusting irrigation cycles, and they had virtually no moving parts to break or jam. These solid-state units introduced the turf manager to the word "program."

Some irrigation manufacturers started transforming their solid-state controllers into more sophisticated electronic devices, to the point they were no longer just controllers opening and closing valves, they were computers performing irrigation programs.

Manufacturers of irrigation controllers, exploring the limits of solid state technology, envisioned devices that could operate groups of other controllers. They saw great savings in the ability to operate an entire network of controllers from one single command center. Step by step they developed the necessary technology to have field controllers receive commands from a central source.

As the '80s emerged, another marvel of modern science entered our world— the personal computer, the same computer you'd find if you went into any computer store. These highly adaptable electronic devices have unlimited potential. As more irrigation programs become available, personal computers have the ability to greatly increase the efficiency and control of irrigation systems, while at the same time serving the turf manager in business functions such as payroll, scheduling, budgeting, etc.

Computerized irrigation is state-of-the-art technology that has produced dramatic waterconservation improvements and labor-saving innovations. Both can mean reduced costs and/or added profits.

Today the computer is one of the most valuable tools in the field of irrigation, and by 1990 it may well prove to be indispensable.

By definition, a computer is an electronic device that can be programmed and updated at any time. However, some computers are designed strictly for irrigation. These units are called "dedicated" systems.

A dedicated system is usually programmed for a single purpose—in this case, irrigation. All the necessary information is actually built into the unit. Program updates have to be made by changing "boards" or "chips" inside the unit. Dedicated systems have one big advantage: In the event of a power failure, the memory is not lost and the computer does not have to be reprogrammed. "Power failures are a fact of life," says Mike Marion, president of Solar Wind Systems, Inc, Novata, CA, whose System 390 is dedicated. "We found in a study of 30 installations, that an average of 50 failures occur each year."

With a non-dedicated computer, the more functions you need, the more you can program in, providing the computer has the necessary memory to operate the programs (and that can be added if needed). As a result, it never becomes obsolete. It allows complete flexibility to irrigate, based on the current needs of the soil. It's more than a machine that opens and closes valves; it's a complete water-management tool.

First introduced into the market over 15 years ago, computerized irrigation was pioneered by Motorola Irrigation in Fresno, CA. Since water consumption is greater for agriculture than for landscaping, it was perceived that ag would benefit the most. Indeed, as the soil began to receive more accurately measured amounts of water and fertilizer, crop yields increased.

At that time, apparently no one envisioned computer use in the turf market for golf courses and athletic fields. How times have changed! multiple capacity started increasing. Instead of installing 60 or 70 controllers on a golf course, irrigation designers and golf course architects gain greater latitude, along with greater simplicity of operation, by using computers.

Irrigating effectively but economically is the major aim of any irrigation computer or controller. People have always had a tendency to overwater, because that was the easiest thing to do. It no longer is.

The computer, by using just the right amount of water for each designated area, is designed to conserve as much as 30 percent in irrigation costs. With escalating water and energy prices, this unique conservation device didn't come any too soon. Reliability, versatility and flexibility are the computer's three greatest amenities in addition to its economy, and all three contribute to its costsaving achievements.

An irrigation computer doesn't look any different than most others. It has a keyboard-some have as few as eight keys,



A decade ago, Rain Bird Sprinkler Manufacturing Corp., headquartered in Glendora, Calif., introduced its dedicated version of computerized irrigation for turf at Ahwatukee Country Club in Phoenix, AZ. It was named Maxi. Two-way communication between the field and the computer was one of Maxi's features.

About the same time, Solar Wind, in conjunction with Griswold Controls, Irvine, CA, installed their version of a dedicated irrigation computer at The Stanwich Club, Stanwich, CT. The race was on.

The demand for irrigation systems with

while others may have 20 or more—and a display screen that lets you see the instructions. It is easy to install and relatively simple to use.

It's true — while a computer is a complex device, learning to use one is not very difficult. You needn't be a computer programmer or even a typist to operate one. The messages are flashed on the screen, and all you have to do is follow the instructions.

The irrigation computer speaks your own language. It has totally eliminated the need for symbolism and hard-to-understand nu-

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merical data. It has a "user-friendly" program – a common computer term. There is no technical computer language to throw you.

If an operator wishes to open a valve say, number six—for a five-minute cycle, he simply types in "OPEN 6 for 5." It would be hard to imagine anything simpler.



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

If the operator wishes to cut the watering time for the entire project in half, he types in "PERCENT 50." The irrigation times on every valve in the system will be recomputed to 50 percent of the former time value in about a tenth of a second. This same change could take several hours to accomplish in a conventional system.

"We work closely with the new customer," says Ed Shoemaker, vice president of Rain Bird's golf division. "Usually in two hours, the sports turf manager has a grasp of the basics."

The controllers are programmed from the computer. Using its store of information, it instructs each station how long to run. One man in one location can operate an entire project. John Skidgel, vice president of Toro Irrigation Division, Riverside, CA, says his company will introduce the Network 8000 this fall which can operate up to 800 satellite controllers, a phenomenal time and water-saver.

Before computers joined our industry, it was necessary to go into the field and physically set each controller. With a computer, if it rains and you decide to turn the entire system off, it can be done by simply pressing a key in your warm, dry office.

According to Chuck Hoover, vice president of Irri-Trol Manufacturing, Inc., in Valencia, Calif., "The greatest advantage to computerized irrigation is the time saved. You can communicate on a keyboard to many controllers at once, without going out and doing any work manually."

Like Maxi, many computers now have twoway communications. The field units, known as field switching terminals (FST), and the computer actually talk back and forth to each other in their own language. The FST interprets between the computer and the valve, deciphering just what is happening in the field.

The Maxi is continuously growing in capability. The current version, Maxi III, is a nondedicated system using an IBM XT. Rain Bird used to make its own computer for the Maxi. "We realized," says Shoemaker, "that we could accomplish more by concentrating our efforts on programming instead of computer manufacturing. Last year our technical staff generated three program updates for our Maxi customers. All they had to do was insert the new disc into the IBM to expand the capability of the system."

Toro's Network 8000 central station will provide two-way communication by "downloading" information to the satellites and "uploading" information from the satellites. Toro's central controller also utilizes an IBM "XT" personal computer as the hub of the operation, including keyboard, color monitor, matrix printer and a light pen for easy access to all functions—with no "computerese" to be learned.

This non-dedicated central is capable of "transparent" multiple function. This means that it is available for simultaneous business and irrigation program operation. Says Skidgel, "In effect, you are getting two important pieces of equipment in one when you install Network 8000."

Melvin Canterbury, vice president of marketing at Buckner/Royal Coach in Fresno, Calif., reports, "There is one very large system in the Midwest where the central system includes a golf course, all the buildings and surrounding grounds, as well as a drip system on some of the ornamentals. In this case, there are 57 satellites, or FSTs."

In many cases a "modem" can be attached to the computer. This device allows one computer to "talk" with another by telephone. It is possible for a computer at one location to command an irrigation system miles away.

For example, the City of Los Angeles uses its Motorola system to control the irrigation for three golf courses: One computer takes care of all their watering needs.

Since a dedicated computer programmed for irrigation is used solely for water management, it can be hooked up to a number of facilities and operated 24 hours a day for irrigation purposes alone. This provides the maximum in watering efficiency.

Of the six major computer manufacturers, four have dedicated systems. They are Buckner/Royal Coach, Solar Wind, Irri-Trol and Motorola. These computers have been on the market for a number of years. Alan Sacco of Griswold Controls says his company will introduce a computerized irrigation control system by this summer.

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Rain Bird's Maxi III is a total irrigation system which will soon include an optional weather station.

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Software is a computer program written by a technician, but in a language that the user understands. It is then placed in the computer, either via a floppy disk (which looks like a mini-record) or directly into the memory banks of the computer. In either case, the format allows you to input your own data how often you would like each station to water, for instance.

As shown by the Network 8000, a system using an IBM computer need not limit its functions strictly to irrigation. On some computers you can do all your billing, accounting and word processing, among other useful functions, as well as directing all the watering.

"There are those who say when you pay that much for a computer you should buy one that doesn't limit itself to irrigation only," explains Rain Bird's Shoemaker.

"The floppy disk on the Rain Bird computer contains the memory and is therefore more versatile than a dedicated computer," Shoemaker notes. "If you want to add another feature that isn't in the dedicated computer, it has to be programmed into the memory. It could be more expensive to update a dedicated system.

"However," he allows, "each individual needs to look at computers based on what their specific needs and requirements are."

Actually, the personal computers were chosen expressly because they did have the flexibility to provide other services in addition to water management.

Despite its high-tech capabilities, no computer is better than its sensors. According to Joe Shayovitch, international director of distribution for remote control systems for Motorola Irrigation, "Computer sensors can determine environmental conditions, allowing you to change regular irrigation procedures in the computer."

Sensors in the field measure water flow and pressure, wind speed, soil temperature and moisture. A sensor can quickly detect line breaks, uncontrolled open valves and other deficiencies and report these back to the central processing unit.

With this information feeding back into the computer through the field units, the entire system can be shut down at a moment's notice by pressing a single key on the computer. Such action can minimize water loss and possible damage. Motorola's MIR-3500 also has a paging system to alert ground maintenance personnel to the problem.

Skidgel notes, "With the new Network 8000, you enter design, weather/climate, geographical and agronomical information. Network 8000 then automatically computes the operating times for all stations, based on the evapotranspiration rate, modified by any applicable rainfall."

Rain Bird is putting finishing touches on a "weather station" for its Maxi III. "The data recorded by the on-site weather station is fed into the computer to adjust irrigation cycles," says Shoemaker. "Humidity, evaporation, and information from other sensors help the computer instruct the system to apply only the water needed, when needed. The computer operator can also increase or reduce the amount of water applied by percentage from the central controller."

Each manufacturer has developed some unique product features. The Solar Wind System 390 uses only two number 14 wires, no matter how big the project. "When designed in a loop configuration," Marion notes, "the computer will continue to operate all FSTs, even if the communication wires are cut."

Marion affirms, "Projects such as the City of San Clemente Golf Course, Salt Creek Golf Course in Laguna and Hughes Aircraft in El Segundo, all in California, have found a great cost saving by using such simplified wiring."

Canterbury feels that versatility is the prime factor in the computer's capabilities. For instance, a video central computerized system can be programmed for a large park where the park manager wants to use it for shrubbery and turf separately, using two completely different programs. It can also be programmed for particular problem areas, such as slopes.

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Toro's Network 8000, available this fall, will enable the turf manager to do business functions on the computer while irrigation programs are running.

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"Each station is programmable from 0 to 59 minutes or from one to nine hours," adds Canterbury. "There is also a syringe program that can be incorporated into the computer."

The syringe cycle is a cooling cycle that is run for a short length of time, usually in the summer, just to cool the grass.

The capabilities of a computer appear to be boundless. For instance, some computerized irrigation systems can be programmed to incorporate fertilizers that are dispensed on command.

Along with its water-conservation and labor-saving capabilities, the computer runs on low power. This not only saves energy but has other advantages as well.

"If there is a power failure in the central and there is no power failure in the field, the computer will continue to monitor the field because it is operating under such low power," explains Motoro-

Should there be a failure of any kind, the field controllers can be switched to stand-alone mode and allowed to operate from their internal programs.

la's Shayovitch. "If complete power failure occurs, you can still program the computer because it has a battery backup."

Should there be a failure of any kind, the field controllers can be switched to stand-alone mode and allowed to operate from their internal programs. No longer need an entire irrigation system be brought to a standstill because of a broken cable or a blown fuse.

Many large projects have switched to computerization. The Motorola system manages agricultural drip irrigation for more than 10,000 acres on each of the islands of Kauai and Oahu in Hawaii. Company headquarters, such as those of Mary Kaye Cosmetics in Dallas, Texas, TRW in San Diego, Calif., and Allergan in Irvine, Calif., all have decided on computerized irrigation systems.

"Motorola's MIR 3500 system was made to think like a superintendent," says Shayovitch. "In that way a superintendent does not have to think like a computer."

"The program is so flexible that it will even turn out the lights. If you have an automatic gate, the computer can open and close it. In fact, it can even be used as a burglar alarm."

Reliability is another great selling point for computers. "The solid state controllers that are used with a computerized system are much more accurate and conserve more energy than mechanical clocks," according to Hoover at Irri-Trol.

"They don't have all the electrical devices that require power and can malfunction," he explains. "There are significant variations in accuracy from an electromechanical clock."

Even before its inclusion in the Network 8000, the light pen was a popular feature of Toro computers. Skidgel says, "You only need to point it at the screen. The computer will take its instructions from the light pen." Toro's full-color screen has also been featured for some time.

Since pioneering its Maxi, Rain Bird has further explored the computer age. With technology changing so rapidly, the company has taken the position that it can better serve the needs of its customers by offering a reliable IBM computer as part of its system, and was among the first to use the IBM-PC.

"Random access is a feature that is unique to us," says Shoemaker. It allows the user to address any device in the program, such as a sprinkler or a sensor, at any time-without interfering with the rest of the program.

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"Using a modem, our system will work with any system via a telephone line," Shoemaker notes. "It is not necessary to have a dedicated home line."

Motorola and Solar Wind now offer radio communication of commands. Motorola introduced its radio-operated system at the Irrigation Exposition in Fresno this past fall. Radio commands can provide a convenient way to test various FSTs while in the field or to send commands to FSTs from the central computer. This provides an alternative to wires or telephone lines as well as enabling one person to test the system from the field.

Computer prices are quite competitive. When you amortize the purchase price with the water economies plus the labor savings, a computer can pay for itself within a few years. Exact figures are not available, but those who sell them offer their own estimates.

The economics of computerizing an irrigation system need to be closely evaluated. With water costs going up, the user has to determine in his own mind what the return on his investment will be.

Over at Buckner/Royal Coach, Canterbury admits, "A computer is considerably more expensive than a solid state controller—but then, it does considerably more. At the present time, managers of residences and smaller projects would probably not be interested because of the price. Today, we may be addressing a small market in computerized irrigation, as compared to controller sales—but the potential is definitely there.

Demand will rise in harness with water and power costs. Indeed, it is already increasing at an extremely rapid rate.

While exact figures are not available, in 1984 it was estimated that there were already some 1,500 computer systems in use in the nation in both farming and turf, while world-

Irri-Trol's dedicated computer irrigation controller was designed with economy in mind.

wide the number was well over 7,000. Since that time, sales have clearly accelerated.

It's easy to see why. As noted, people are becoming more aware that water is a precious commodity that is becoming very expensive. There is a great need to learn how to conserve. While water shortages have hit our sunbelt states particularly hard, they have occurred on the East Coast as well.

The irrigation industry is catching up with the technological world of the computer industry. The computer is undoubtedly the best automatic system today. The main reason for its growing popularity is simple: *It works*.

The only limit on the uses of the computer is the imagination of the individual who is running it.

We all need to have visions of grandeur. Although some goals may not be immediately feasible, still we must have them. Without goals and aspirations a business will not grow.

That is why we must expand our personal horizons to encompass the computer age, which is all around us and must be acknowledged. From giant mainframe computers to video games, the computer is everywhere. If we put this valuable tool to our own good uses, the end result will be conservation of vital natural resources and easier, more accurate water management, which can lead to greater savings or greater profits.

Don't miss the boat. More and more of us are climbing aboard. Using a word processor, this article was input into – a computer.

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