IRRIGATION ECONOMICS

Efficient irrigation pump use and precise cycle scheduling cut power costs in half for Singing Hills Country Club and Lodge.

by Jeff Sobul, associate editor

Dehesa Road winds up, around and down one of the numerous hills east of San Diego, Calif. About two-thirds of the way down the east side, the road winds around a corner. For the first time, the valley below comes into view.

The green-carpeted valley is a sharp contrast to the surrounding brown, scrubby hills. The cost to keep that carpet—Singing Hills Country Club and Lodge—green and attractive was about $140,000 a year in the 1970s, based on today's power rates. This figure reflected power costs only. The water, taken from an aquifer, is free.

Since 1980, the cost to supply water to the 54-hole facility, including the clubhouse, tennis club and 80 lodging units, was cut in half despite increased power costs.

The first cut

The decrease came in several stages, superintendent David Fleming explains. In 1980, "we went from stand-alone field controllers that were electrical/mechanical to the first computerized system Rainbird came out with, the Maxi II," Fleming says. "Just by getting more accurate timing, we reduced our power bills to $120,000."

Efficient scheduling also reduced the time it took to water the 320 acres from 12 hours to eight.

The second cut

Fleming and his staff took aim at the pumps in 1982. His was a traditional pump system rated at 110 to 125 psi. "For some reason years ago," he says, "(manufacturers) decided pumps would produce 125 pounds of pressure no matter how many gallons they were producing. It took care of line loss and distance from the pump."

But it was also terribly inefficient. "The energy it took to raise the pump pressure from 100 to 120 psi almost could be equated with percentage of money burned," he states.

What it meant was that every pound of pressure reduced in that 105- to 125-pound range was like a one percent savings in power costs. Fleming notes that this figure reflects current power rates in the San Diego area. (It changes from region to region.)

In analyzing the pump system, Fleming found they "needed only 105 pounds to supply water to the weakest part of the system." Lowering operating pressure cut $20,000 from power bills, bringing it to $100,000 a year.

The third cut

In 1985 the course installed the updated Maxi III system. "With the Maxi III controllers we were able to analyze the pump stations," Fleming says. "Each pump can produce so many gallons of water at its optimum point on a pumping curve. If you're pumping fewer gallons, you're running the pump at an inefficient point. If you're asking for more water than the pump can produce, then you're also running it inefficiently."

The Maxi III monitored the stations as they ran and told how much water was going through the course's 3700 Rainbird 51 SAM sprinklers. A daily printout gave Fleming and irrigation specialists, Mitch Glanis and Tamo Maldonado, the data to reach that optimum point. "We could schedule the pumps to be run at their maximum efficiency point," Fleming says.

This translated into another $5,000 saved annually. It also cut watering time another two hours, down to six.

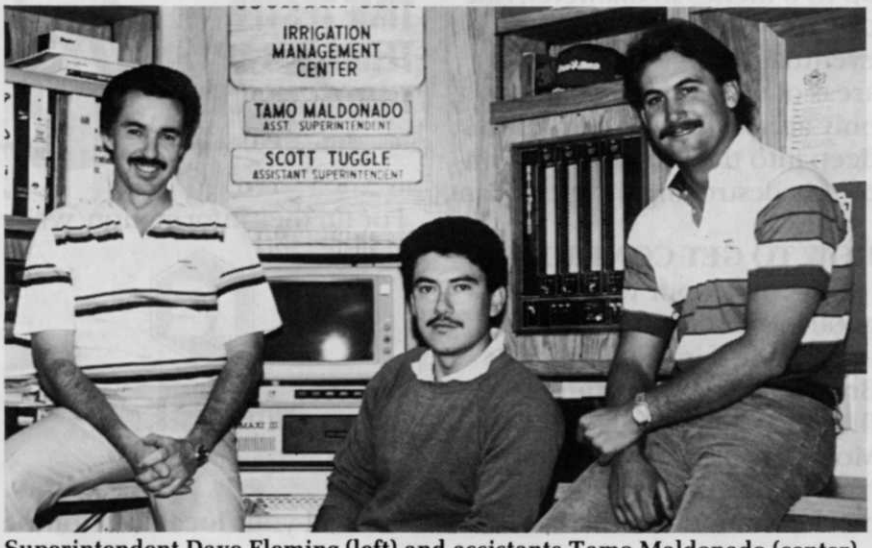
The fourth cut

This stage, which cut costs from $95,000 to $78,000, illustrates well the benefits of efficient watering cycles. Fleming began a system of what he calls "blanket application," based on soil infiltration rates, "not based on technical data on soil but on what actually happens in the field; not what happens on one cycle but on the total irrigation time. How do you get that water on and avoid runoff?" he asks.

The key was matching the application rate to infiltration rate. This keeps applied water on target, not running off into low spots and causing localized hot spots in higher areas. If they were watering a green for 10 minutes in five two-minute cycles, the computer could "introduce pauses so that the last few cycles don't go on at the same interval," he explains. "There's a little more soak time before we bring on another blanket." And less water wasted.

The final cut

Singing Hills cut another $4,000 from its power bills in the second half of 1987 by taking advantage of off-peak power rates offered by the local util-



Superintendent Dave Fleming (left) and assistants Tamo Maldonado (center) and Mitch Glanis used the Rainbird Maxi system to halve irrigation power costs.

ity. Rates between 10 p.m. and 6 a.m. dropped to six cents a kilowatt hour (KWR) from 13 cents/KWR at peak (10 a.m. to 6 p.m.) and eight cents/KWR at semi-peak (the four hours on either side of off-peak). "That's a real motivation to get all my irrigation done in that period," Fleming says. Day watering is kept to the bare minimum because stiff penalties are levied for peak-hour watering. "We take the Maxi and program our irrigation to start at one minute past 10 p.m."

Thus, the savings came in three ways, Fleming says. Proper scheduling reduced water used, which saved in pumping power cost. The water savings, though not translated into cost per gallon or acre-foot, were huge, especially since semi-arid area has limited water sources.

In the 1970s, Singing Hills used 2.7 million gallons a night, about eight acre-feet a year per acre. With the Maxi III, that figure is down to 1.2 million gallons per night, 4.15 acre-feet a year per acre.

Secondly, using the Maxi system, the staff vastly improved the operating efficiency of existing equipmemt. The final savings came with the switch to off-peak power use.

Future efficiency

Fleming admits that his current pump system is somewhat obsolete, though the pumps are tested yearly for efficiency. "Variable frequency (VF) pumps, right now, are the best things going for big water users and big pump people," he says. The system's computer varies pump pressure to match the amount of water being pumped.

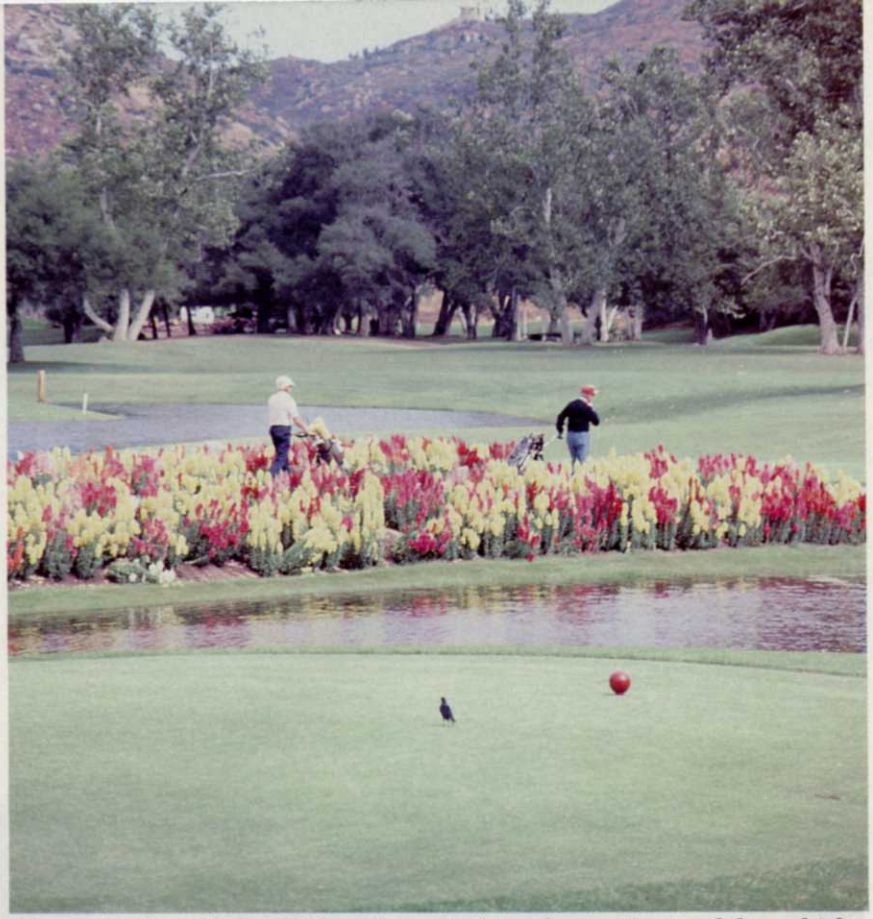
"Whether you're putting down 200 GPM or 700 GPM, you're using the pump at its most efficient point because of the change in frequency," he explains. "I don't have that, so the only thing I can do is schedule my pumps with the computer."

Fleming estimates that a VF pumping system can pay for itself in three to five years on an inefficient course like Singing Hills was in 1979.

Last year, Fleming upgraded to Maxi ET software, which uses a weather station to monitor evapotranspiration (ET). So far, he has allowed the station to control irrigation on only one hole at a time. But he sees the day when weather stations will control all 54 holes.

He further expanded ET monitoring by using Standard Oil's ST-27 Turf

Keeping Singing Hills Country Club and Lodge green in the arid Southern California climate is still a costly task even with an irrigation system at peak efficiency.



After irrigating, Singing Hills pulls water from the aquifer into lakes which act as settling tanks. The process takes 12 to 15 hours.

Monitor. The portable unit functions much like a weather station and is good for diagnosing local hot spots before visible symptoms occur.

Fleming and his staff continually test different irrigation equipment on a small scale. He is testing Toro and Hunter low pressure heads and has the Hunter I-44 Sod Cup Sprinkler installed on one green.

"It's going to be one of the real innovations of the future," Fleming says. The I-44 has a living plug of turf in a cup in its top. When retracted, the head disappears into the putting surface." It will allow a freedom of green design which in the past was constrained by head spacing patterns."

Fleming, who has begun a management group called Golf Properties Management, says future irrigation efficiency will involve weather stations, low pressure systems, bigger mainlines to reduce watering time and pressure loss and off-peak hour watering if lower rates are available.

The main philosophy of his company is its ability to cut a course's irrigation costs, sometimes by 50 percent, using new computerized systems like the Maxi. In Southern California that can be a pretty big chunk of change. **LM**