



# PUMP STATIONS: SIMPLE JOB, COMPLEX TECHNOLOGY

By Charles De Haan

**Ask any Course Manager what the most important elements of their golf course irrigation system were, and they would probably tell you it was the central control system and the rotors, closely followed by the pump station. But in fact the pump station is the heart of any irrigation system, and arguably the most critical part. After all, without water being delivered at the correct pressure for the rotors to do their job properly, any irrigation system is both inefficient and ineffective.**

Two main types of pump sets are made for golf courses: the Vertical Centrifugal type, which are the most popular throughout the UK markets, and the Submersible type, typically used throughout courses in the Mediterranean and US regions where water drawn from bore holes is a more common practice.

## Two major pump innovations

A number of important innovations have been made to pump stations and equipment, and for course managers and green keepers everywhere two in particular are worth knowing more about:

- Variable speed pump sets
- Real-time two-way communication between the central control system and pump station.

The experience of a large number of course managers using pump stations installed with these two relatively new technologies is completely

consistent: they are critical to an irrigation system's performance. Even the most economical pump set can still have an operating range based on a flow rate between 20-400m<sup>3</sup>/h, and pressure between 4-13 bar and 70-188 PSI, and when such systems have to work for literally years at peak efficiency, it's worth understanding why these two features are so significant.

## Variable Speed Control technology

On the face of it, just like an irrigation system appears to do the simple job of watering the golf course, the pump station simply has to pump water from the reservoir to the rotors. But supplying that water requires a constant pressure to be maintained so that the rotors' capabilities – length of throw, arc, droplet size, water curtain and volume delivered - are fully exploited. Any loss of pressure means that the course doesn't get watered properly, so reaching and maintaining the ideal water pressure is paramount.

However, while few people would dream of driving a car by keeping the accelerator to the floor and using the brakes to control progress, this is exactly how many pump systems are still being made to work. But a pump set with Variable Speed Control technology will save energy, minimise wear and prevent water hammer.

An electronic or software-based technology, Variable Speed Control enables the pump sets to maintain a constant pressure against variable flow. Variable Speed Control is simply designed to provide a smooth automated start and stop of the

pump station, along with an extremely quiet low vibration operation. This has several other important operational benefits: much higher efficiencies, extremely low energy consumption and long term running costs. So it's a simple technology, but one with very desirable benefits.

## Real-time communication

Real-time communication is another software-based technology, but does a very different sort of job. It manages the pump itself and enables remote control access from the central control system. The pump station is connected to the central control system by either hard-wired communication cable or wireless radio communication. This enables troubleshooting of the pump station from a remote location, a major benefit as more often or not, pump stations are not close to office areas and can easily be forgotten or simply overlooked, a case of 'out of sight, out of mind'.

But with pump management software that links the central control system to the pump station directly, it can both monitor and track both actual and controlled flow and direct or real-time communication between the pump station. In turn the irrigation's central control system optimises the required irrigation cycle by adjusting the flow demand according to actual field conditions. This pump management software can also be linked to the central control system to act as a 24-hour course supervisor. Because it is always watching the system, it can make constant minor adjustments so that the irrigation system runs much more efficiently.



In practice, what this means is that the pump management software will make active real-time decisions on your behalf, depending upon the parameters you have set. So when you've set a required programme of watering, and left for the evening, the upgraded system can automatically detect if there's a problem, such as a burst mains pipe where the demand is greater than the available capacity.

Usually what would happen with most pump stations is that the burst main pipe would cause the system pressure to drop and then cut out and close the pump down automatically on low pressure. Then the controller would continue to open and close valves over the golf course/turf area thus draining the system down of water, as there is no communication between them. So when the course manager returns in the morning there would be no idea of knowing this other than checking on the pump station specifically and then further investigation.

By contrast, the new pump management software would enable the central control system to make an active decision at the moment the main pipework burst. The system would notice the drop in operating pressure and it could decide to reduce the amount of stations it is trying to operate simultaneously, or even stop the watering cycle completely. It then would record what had and what had not been completed against the planned programme, so that on their return the following morning you as the Course Manager would be made aware of this problem - even if your pump station was in a remote location from your office.

**The benefit of experience: Damon Kirk, PGA National Ireland**

With over 15 years in the greenkeeping business, it's interesting to hear what Damon Kirk has to say about his new irrigation system at the new PGA National Ireland course. First, some statistics: Palmerstown's irrigation system can deliver on a daily/nightly basis:

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|------------|----------------------------|
| Greens     | 3.57 mm, or 25 mm per week |
| Tees       | 2.86 mm, or 20 mm per week |
| Approaches | 2.86 mm, or 20 mm per week |
| Fairways   | 2.14 mm, or 15 mm per week |

That adds up to a maximum application of 690 cubic metres a day or 151,800 gallons in old money. The pumping system that drives all that water to the course's 567 sprinkler heads is a Rain Bird V-3200 Series skid-mounted pump set, delivering 80 cubic metres an hour @ 9.0 bar.

But 9 bar of pressure is no use unless each and every sprinkler head can deliver a consistent amount of water over its designated area. The fairways are irrigated using Rain Bird pressure-regulated valve-in-head sprinklers, and set to operate at 5.5 bar, which is enough to provide an irrigated width of 33 metres. The area covered by the Palmerstown course - and thus its irrigation system - is 300 acres in all, so the water has to travel very significant distances to do its job. In fact there are over 30,000 metres of underground pipe work the water travels along before it can be sprayed from those 567 sprinklers.

**Maximum efficiency, minimum effort**

So what does Damon think about it in practice? "One of the most impressive things about the irrigation system is the sheer efficiency. We've had over four years to see the whole system in action, and although this course is one of the most spread out, there's no loss of pressure at the head end and a really good rate of water is delivered."

So what's the moral of this particular story? Water is rapidly becoming one of the most expensive overheads for every golf club, so it's essential that every drop is used as efficiently as possible. In turn, the pump sets used by clubs must be designed to be efficient as possible at delivering water at the correct pressure, and to keep doing that, day in and day out, for years.

To achieve that sort of level of pump efficiency over its lifetime, you need to be exploiting the latest electronic technology like Variable Speed Control, and real-time two-way communication between pump stations and the central control system. Anything else is inefficient, potentially risky, and will cost the club a lot more than planned to deliver expensive water to the course.

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