Case Study: Smart Irrigation

MAIT industries

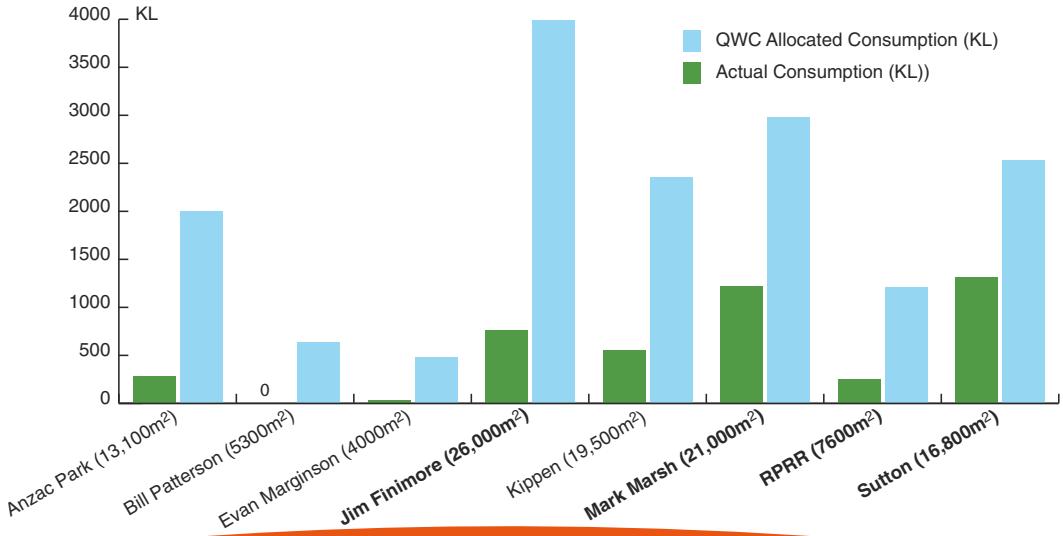
Ipswich sports grounds save $1,822/ha on water costs in 6 months

A pilot program by Ipswich City Council shows using automated soil-moisture monitoring as an irrigation driver conserved water and saved on costs. Yet it still maintained grounds "fit for play" — even during Level 6 restrictions. The automated, web-based system was far superior to a rainfall-based allocation method. The "hands-off" approach means it also needed less soil-profile knowledge and reduced labour to run than irrigation driven by manual monitoring.

Key facts:

- smart technology to irrigate sports fields uses water efficiently
- during pilot, smart irrigation used 11.8ML less water over 11.3ha than rainfall-based allocation
- integrated rain switches turn off water if it rains during an irrigation cycle
- open framework (both hardware and software) will allow growth over time to suit needs
- saves watering costs and improves efficiency
- improved turf quality and uniformity with less water
- pilot program saved a total of $20,639 in water costs in 6 months
- the payback period was just one year, with the system outlay being around $40,000

Actual Water Consumption against QWC Volumetric Allocations for Dec 2007 – May 2008



Bolded = sites with MAIT system

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Background

Continually declining dam levels, because of the drought, have sparked several water-conservation initiatives across South East Queensland (SEQ).

To compare irrigation efficiencies on council sports grounds and active recreation areas (collectively called Active Playing Surfaces, or APS), one project used soil-moisture monitoring as a driver for irrigation, and compared this to Queensland Water Commission (QWC) Volumetric Allocation (which is based on historic daily rainfall).

Ipswich City Council (ICC) strongly lobbied the QWC and peak sporting-body representatives on the technical working group to adopt the soil-moisture method. Research had shown the council this method used water and labour more efficiently — and, therefore, would also save money. The pilot's aim was to provide "fit for play" grounds using the least amount of water. "Fit for play" means APS are safe and usable, including those for elite events.

The project

Initially, ICC used manual probes to measure soil moisture, only irrigating when that fell below 15% (approaching wilting point, turf beginning to degrade). To determine water volumes for this, ICC developed a turf-irrigation calculator, which QWC then adapted for its Volumetric Allocation (VA) method.

However, while efficient in water use, this system was manually intensive and required council staff to understand soil-profile features and interpret the data. Knowing of its work around irrigation scheduling and soil-moisture monitoring across turf, the environment and agriculture for both public and private enterprise, ICC approached MAIT Industries. The result was an automated, hands-off system that was more water efficient, yet required less labour and less technical knowledge.

What was installed

MAIT installed permanent in-ground sensors into 6 preliminary ICC sites in early March 2008. The system provides real-time information on soil moisture, soil temperature, rainfall, water-flow rates and volumes, presenting it graphically.

The web-based system only allows irrigation when soil moisture reaches a predetermined low set-point; it doesn't allow watering once a high set-point is reached. MAIT determines each set point, which is specific to each APS, taking many aspects into account (such as soil type). MAIT's system also integrates a "rain switch", stopping irrigation when it rains. Each field supervisor had access to the MAIT web portal.

Deciding factors

Several factors drove the decision to choose the MAIT system:

a) APS managers do not need high computer literacy or skill levels to use the irrigation technology. Once the moisture set points are programmed into the units, the system manages irrigation schedules automatically. Data is checked via the web site, with occasional site visits to inspect ovals.

b) because the system is automated, it only needs monitoring, so is not labour intensive (this is particularly noticeable compared with the VA method).

c) MAIT installed the system within 4 days, providing key personnel training during and after installation. This meant it was neither costly to ICC, nor was it disruptive to general tasks.

d) it will improve water efficiency: rain switches plus a lower volume used compare very favourably against the QWC VA method, which has no guard against the entire allocation being used, despite rain. The MAIT system achieves better results with the same, if not less, volume of water.

The outcome

For 6 months of the pilot, from December 2007 to May 2008, ICC used an average of 390KL/ha over 11.33ha, compared with the calculated QWC allocation of 1,430KL/ha average for the same fields.

This is a total water saving of almost 11.8ML for the period, equating to a cost saving of nearly $20,640 or $1,822/ha. Actual water costs using smart irrigation were $7,725, while the QWC VA method would have cost $28,364.

The predicted ROI has also been evident. Capital expenditure was around $40,000, giving a payback period of just one year.

While ICC's water consumption is low, partly due to good rainfall (540mm from Dec '07 to May '08), it shows the responsive nature of using soil moisture as the determining factor for irrigation.

Benefits to turf

VA is easy to regulate, but is inferior for consistent turf quality and is unlikely to be enough in drought. The pilot's intent was to maintain a soil-moisture level between 15%-25%. This ensured the turf didn't degrade to be unplayable, but allowed for spare capacity to retain as much rainfall within the profile should it rain. In other words, it was very water efficient.

Greater benefits

For councils, soil-moisture monitoring results in consistent, good quality APS, reduced labour and water costs and accountability to rate payers and club members.

Water efficiency will continue to become more imperative. Even when dam levels rise, water costs may also increase — yet aside from economics, the social and bio-ethical values of conserving this vital resource are equally as important.

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