

NCEA team cracks evaporation puzzle

By Gary Alcorn

Irrigated crop growers will have access to world-class applied research results next April when a team from the National Centre for Engineering in Agriculture (NCEA) releases its findings about the efficiency of various Evaporation Mitigation Technologies (EMT) applied to storages.

The Evaporation Control Project forms part of the Rural Water Use Efficiency Initiative (RWUEI) of the Queensland Government's Natural Resources and Mines (NRM).

NCEA team member Dr Ian Craig says the mid-term results are exciting with two major breakthroughs producing a flood of relevant new data.

"We have established that the Pressure Sensitive Transducer (PST) method can record water depth to an accuracy of about plus or minus one millimetre. Each PST unit is located a constant 30 cm above the dam floor by a float-weight mechanism.

"For the first time we are able to distinguish evaporation losses from seepage by comparing the rate of water level change through the day and night — this is a real breakthrough" he said.

The PST method also provides an alter-



Being able to compare the rate of water loss during night and day has been a big breakthrough for evaporation mitigation.

native to conventional ground water sensing methods for determining dam seepage losses, which may not pick up flows through cracks in a dam floor or wall.

FIGURE 1: A typical output produced by a pressure sensor transducer (PST) unit for change in dam water depth with time, showing very good agreement with the Penman-Monteith based EvapCalc model for evaporation

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Quality data is streaming into the data-loggers from the various sites and team members are analysing the information using Penman-Monteith (PM) based EvapCalc software developed at the NCEA to compare evaporation losses under the various treatments.

According to PM theory, solar radiation and temperature alone are responsible for about 90 per cent of the evaporation loss. More research needs to be done to fine tune the model and determine appropriate aerodynamic and surface resistant con-

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Aerial shot of the Evaporation Control Systems E-VapCap floating cover at Moonrocks Farm, St George.



Netpro shade cloth structure reduces evaporation by around 75 per cent.

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starts for open water surfaces, and also investigate the effect of the sun's angle of incidence on water surface albedo values.

Early analysis shows evaporation losses of seven to eight millimetres per day in summer rising to 10 mm per day when air temperatures exceed 40°C. Seepage losses range from one to three millimetres per day for a well constructed earth storage to more than 10 mm per day from poorer quality storages.

So how are the various surface treatments performing at Queensland test sites located at Toowoomba, Stanthorpe, St George, Dirranbandi and Capella?

Ian stresses current opinions are based

on interim results only but some trends are evident.

Data analysis reveals the Netpro shade-cloth structure achieves an almost 90 per cent reduction in both radiation and wind, which translates to around a 75 per cent reduction in evaporation.

Evaporation Control System's E-VapCap, is a floating plastic cover treatment which has demonstrated a better than 90 per cent reduction in evaporation at some trial sites. Holes in the cover allow rainwater to drain and the lack of sunlight could inhibit algal growth contributing to better water quality.

A chemical treatment, Nalco's WaterSavr, is a single molecule layer of

acetyl alcohol with repulsion agents which facilitate rapid spreading of the product across the water surface. The product's performance is affected to a certain degree by the wind, but continuous reapplication could overcome this problem. The evaporation reduction performance has been rated at better than 20 per cent, which could prove economical for temporary or seasonal fill storages.

The NCEA research team comprises Director Erik Schmidt, Ian Craig, Andrew Green, Michael Scobie, Andrew Piper and Charles Reynolds.

A poster presentation 'Evaporation Control Project' showing the various treatments can be found on the NCEA website www.ncea.org.au/Irrigation/Evaporation. 