

INTRODUCTION:

Combined with a submerged siphon structure, the MACE AgriFlo has been used extensively throughout Australia and USA for metering water supplied to irrigation farmers.

Generally, an insertion sensor is mounted through the wall of the pipe and the cable is routed to the pole-mounted AgriFlo electronics module. With all cables routed either underground and/or through the mounting pole this provides an extremely tamper and vermin resistant design. A solar panel is used to charge the internal battery, thus making the AgriFlo a truly remote electronic flow meter.

By utilizing a full pipe structure, the accuracy of such an outlet is increased when compared to open channel (or non-full pipe) configurations. Field accuracies better than 2% are easily obtainable. This degree of accuracy leads to far better management of the overall water resource.

Because the MACE insertion velocity sensor provides very little obstruction to the flow and has no moving parts, there is no measurable head-loss and the whole system is virtually maintenance free.

THE PROBLEM:

Murrumbidgee Irrigation based in the Riverina district of New South Wales, is one of the largest privately owned irrigation companies in Australia. It supplies water to approximately 3000 customers through a network of pipes and channels in excess of 2,500 miles long. It delivers this water through about 3800 metered farm outlets.

Historically these deliveries were metered using a simple paddle wheel device known as the Dethridge wheel. However, although the Dethridge wheel provided a degree of accuracy (+/- 15%) this was deemed unsuitable for water delivery into the 21st century. The Dethridge wheel also has other attributes that make it unsuitable for modern irrigation delivery. For example, when too much water is flowing through the outlet it tends to erode channel banks that in turn requires more regular maintenance. Furthermore, Dethridge wheels are a large moving structure that do not meet the strict Occupational Health and Safety requirements of a company that strives to provide the safest environment for both its staff and the general public.



Figure 1: Dethridge wheel, note the large sharp vanes

The MACE solution is on the following page

THE MACE SOLUTION:

Murrumbidgee Irrigation embarked upon a Dethridge meter replacement program in the 1999/2000 growing season. The first step in this program was to assess the “new breed” of meters in the marketplace to determine which was most suitable to their enterprise with three meter types tested:

Propeller type flow meters were tested but quickly dismissed as they were prone to choking with weeds and other water-borne trash. Furthermore, in the highly turbid waters of the district they lacked the accuracy required as their bearings slowly seized and/or corroded;

Battery operated electromagnetic flow meters were also trialed but although they provided good accuracy, they were expensive to purchase in the larger pipe sizes required (greater than 18”) and were expensive to install when the costs of the flange fittings and extra equipment/staff required were taken into account;

The Doppler ultrasonic MACE AgriFlo with an insertion velocity sensor was trialed in conjunction with an inverted siphon structure. This meter outlet provided a flexible and cost-effective solution for pipes in the range 15 to 24” (375mm to 600mm). Installation costs were able to be kept to a minimum as the structure enabled the company to make significant savings through economies of scale. Furthermore, the full-pipe inverted siphon structure used was highly accurate under the vast range of flow and head conditions that could be expected in the delivery of water to their customers.

Following the trial period, Murrumbidgee Irrigation embarked upon a full scale meter outlet upgrade program in 2002/03. Since this time, nearly 3000 MACE AgriFlo meters have been installed throughout the district.



Figure 2: MACE 2” insert sensor suitable for full pipes between 100mm to 2.5m (4” to 100”)



Figure 3: “Unearthed” Murrumbidgee Irrigation meter outlet showing the head/discharge drop boxes (sumps) with the resultant fully submerged pipe.



Figure 4: A completed MACE AgriFlo meter outlet. Head ditch is to the left.

THE MACE AGRIFLO BENEFITS:

- 1 With MACE continuous wave advanced spectrum Doppler processing, each sensor “sees” velocities through the whole cross-section in each pipe and calculates the true average flow rate. This is unlike any other insertion device such as electromagnetic or mechanical, which only sense velocities in a “tennis ball” sized area and then use complex algorithms to attempt to calculate an average flow rate. Because of this technological difference, MACE Doppler technology has a shorter straight-run requirement than other devices.
- 2 Provides reliable and accurate flow data over a range of head & flow conditions, with no head loss and is far more accurate at much lower and higher velocities than the Dethridge wheel it replaced;
- 3 With the built-in data logger it provides, “watchdog” water use logging (recording) that provides back-up of individual farm water use, and when required, information on when a turnout started (for example if earlier than ordered) or when/why water flows over an escape;
- 4 Murrumbidgee Irrigation decided that in the first instance it was most important to meter their water deliveries accurately. The flexible design of AgriFlo allows a meter outlet to be upgraded in-expensively for:
 - remote meter reading
 - full gate/delivery automation;
- 5 The submerged and buried full pipe structure gives better channel bank access so that channel attendants (ditch riders) can travel along the bank unhindered, thus providing cost savings on attendants time;
- 6 Driving along the channel banks provides extra benefits from the compaction
 - less erosion
 - less weed growth on bank edges (no disturbed ground)
 - vast monetary savings due to decrease of channel maintenance

