

INTRODUCTION:

Metering surface water that is pumped from rivers or channels is a challenge that often fails traditional mechanical meters. The stream flows are usually trash-laden and moving at very high velocities (some in excess of 5 m/s (15ft/s)). The wear and tear on a mechanical meter under these conditions is immense, and consistently leads to failures and expensive repairs.

The MACE AgriFlo provides an extremely accurate and inexpensive solution for these types of applications. By using a MACE insertion velocity sensor, the MACE AgriFlo can be used in pipes from 100 mm (4") to 2.5 m (100") in diameter. Furthermore, with a Series3 AgriFlo, up to three pumps can be metered using one AgriFlo. A very cost effective innovation when more than a single pump is used at a pump station.

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

THE PROBLEM:

The Sacramento River in northern California, USA has a large number of river water extraction points that utilize electric powered pumps. Many of these pump stations have multiple pumps with pipe sizes generally in the range of 12 to 24" (300 to 600 mm) diameter. Historically these pumps have been metered with propeller actuated flow meters. However, with the high-trash content in the river, these propeller meters tended to break down regularly and thus require expensive servicing or replacement.



Figure 1: Typical Sacramento River pump-station near Williams, CA with two 18" pumps.



Figure 2: One of twelve MACE AgriFlo units installed along the Sacramento River in Northern California.

THE MACE SOLUTION:

The United States Bureau of Reclamation (USBR) installed twelve, Series3 MACE AgriFlo units on pump-stations along a stretch of the Sacramento River characterized by the pump stations having multiple pumps. In all locations the 2" insertion sensor was used for ease of installation and accuracy of flow reading. The meters are all located within easy "reading" distance of the pumps themselves so that the instantaneous flow rates can be seen easily upon pump start-up.



Figure 3: MACE 2" insert sensor suitable for full pipes between 100mm to 2.5m (4" to 100")

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 The MACE insertion velocity sensor provides very little obstruction to the flow and has no moving parts. With the high trash loads in the Sacramento River the whole system is virtually maintenance free.
- 3 Flow recording allows the USBR to analyze exactly when water was extracted from the river system. Furthermore, the data can be used by the farmer to analyze the performance of the pumps over the course of the pumping season.
- 4 The installation of the insertion sensors meant that the whole flow meter was extremely easy and economic to install as no major pipe-work was required.
- 5 Because the same insertion sensor can be used in any pipe sized from 4" to 100", should the pump station be upgraded in the future, the same flow meter can be used.
- 6 At these pump stations where multiple pumps were present, the Series3 AgriFlo with the ability to accept multiple flow sensors, was an extremely cost-effective solution to the monitoring problem.

