



APPLICATION NOTE

Water & Wastewater

Flow monitoring in an open irrigation channel

- Reliable determination of the volumetric flow rate of irrigation water for cultivated areas
- Use of an 80 GHz radar in the upper stream of a weir with a rectangular notch according to ISO 1438
- Simple commissioning and configuration via smartphone app and Bluetooth®
- Replacement of an outdated and error-prone ultrasonic level sensor

1. Background

A man-made canal bed around 40 kilometres long supplies around 10,000 hectares of agricultural land in the south of France with irrigation water. For this purpose, the canal carries up to 30 million cubic metres of water downstream into a distribution basin every year. Secondary canals allow continuous distribution of irrigation water to farmland along the main water canal.

2. Measurement requirements

The responsible water supplier also continuously monitors the volume of water transported in these secondary canals. In one of these open channels, the company uses a weir with a sharp-edged rectangular "Rehbock" notch in accordance with ISO 1438 for flow measurement. Lateral contraction of the notch causes the water level upstream of the weir to rise. As the overflow height of the water is in a lawful relationship with the flow rate, the water discharge can be determined as a function of the water level. Measuring the water height upstream of the weir and the existing notch and channel geometries, the discharge flow rate can be calculated using a corresponding approximation formula (according to Poleni).

Previously, the water company used an ultrasonic level sensor to determine the overflow height and flow rate. However, as the measuring point is located outdoors and is exposed to the usual weather and environmental conditions, there was a history of inaccurate readings. As the acoustic wave of ultrasonic sensors is dependent on pressure and temperature, these problems were mainly caused by temperature changes, but also by cobwebs or deposits such as condensation on the antenna. These influencing factors cannot be fully compensated for by ultrasonic sensors. The utility was therefore looking for a more robust and reliable, yet cost-effective measurement technology for flow measurement.

3. KROHNE solution

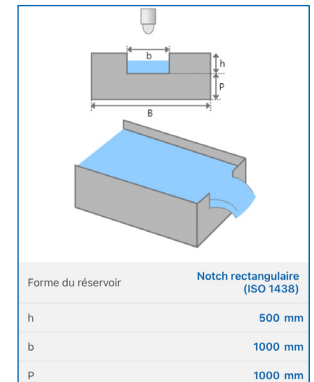
The water supplier has replaced ultrasonic technology with modern 80 GHz radar technology. The company now uses the OPTIWAVE 1540 non-contact radar level transmitter for flow measurement. Due to its high accuracy and repeatability, the very compact level radar is ideal for cost-effective flow measurement with structures such as weirs, venturi and other measuring flumes. Thanks to its high measurement dynamics, the OPTIWAVE 1540 delivers reliable measurement values even under external influences such as rapid temperature and weather changes. The flush-mounted lens antenna and the compact housing are made of PVDF and are resistant to media and environmental influences. For additional protection against heavy rain or strong sunlight, KROHNE has also fitted the radar with a weather protection cover.

To mount the OPTIWAVE 1540 optimally above the measuring weir, the 80 GHz radar was installed with a long bracket, which KROHNE can always supply from a single source. The installation for the measurement was carried out upstream of the weir. The measuring device was quickly put into operation via Bluetooth® and the user-friendly installation wizard of the OPTICHECK Level Mobile app. The rectangular measuring weir is already stored here as a standard application. All that remained to be done was to enter all the necessary parameters for the open channel and notch via the app and transfer them to the level radar for configuration. The level transmitter can then calculate and output the flow rate based on the overflow height.

The OPTIWAVE 1540 also offers many device diagnostics. For this purpose, the level radar utilises the self-diagnostics of "OPTICHECK technology built-in", which enable permanent self-monitoring of the measuring device. This allows the operator to check the device functionality at any time by the push of a button and generate a verification report via the app.



Installation of OPTIWAVE 1540 above irrigation channel



Quick configuration of the OPTIWAVE 1540 via the OPTICHECK Level Mobile app

4. Customer benefits

The radar level transmitter ensures reliable and long-term stable flow measurement of the water volumes transported via the secondary canal. The operator has a constant overview of the amount of irrigation water made available to the farmers. Given that radar beams are electromagnetic waves, the OPTIWAVE 1540 is unaffected by pressure and temperature fluctuations or wind.

With its narrow beam angle of 8°, the measuring device is optimally designed for measuring in weirs and flumes. Unlike the ultrasonic technology previously used, the OPTIWAVE 1540 delivers reliable measurement values even in the presence of condensation or natural deposits such as spider webs. Thanks to its extremely high measurement dynamics, the level radar works drift-free and maintenance-free and therefore does not need to be recalibrated. The user-friendly app allowed the device to be set up quickly and easily without any prior knowledge. Configuration directly on the device was not necessary and could be carried out conveniently and safely from the shore using a smartphone.

5. Product used

OPTIWAVE 1540

- Compact radar level measuring device for flow in open channels
- Robust 80 GHz radar with flush-mounted PVDF lens antenna
- 2-wire, 4...20 mA HART®7; user-friendly commissioning and verification via Bluetooth® and OPTICHECK Level Mobile app



Contact

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