

Monitoring High Flow in Large Channels

SIAAP, Paris
Case Study

Expertise in Flow

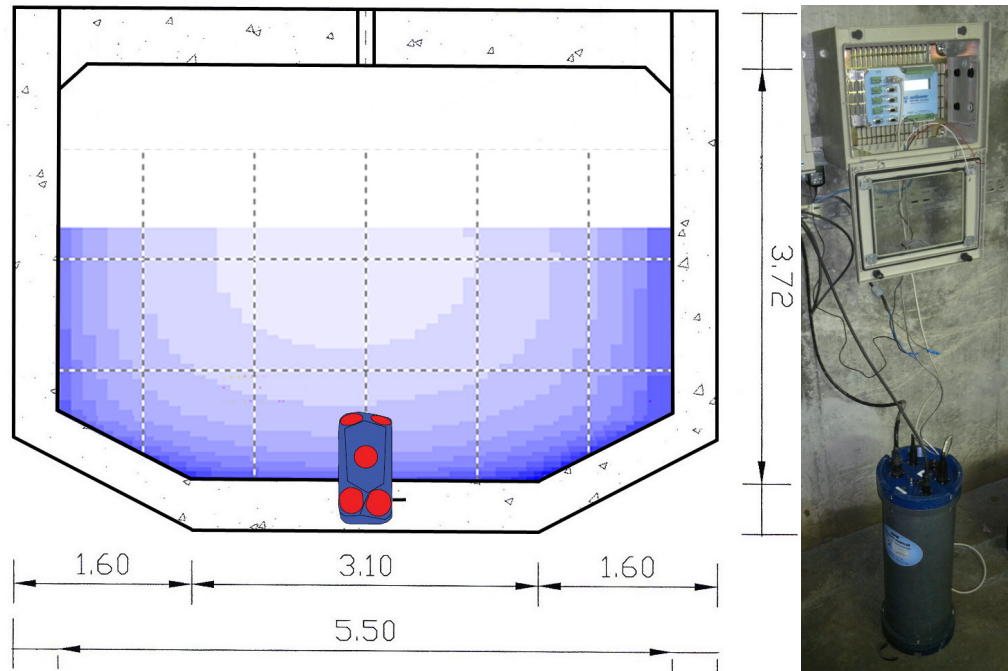
Benefits of ADFM Pro20

- 1-2% flow rate measurement accuracy.
- Accurate velocity measurement in difficult hydraulic conditions.
 - Turbulence
 - Peak velocity shifting from side to side in channel
 - High velocity ($\pm 9\text{m/s}$)
- Large flow measuring span (0.2 - 6 m level).
- 4 Pulsed Doppler velocity sensors measuring in multiple points (bins) and pointing in different directions of the flow.
- Measures velocity even if 1 or 2 sensors are covered.
- Generate true flow profile.
- Calibration-free technology and no drift of ultrasonic level.



ADFM Pro20 sensor

The ADFM Pro20 Pulsed Doppler flow meter from Teledyne Isco, shows its unique flow measuring capabilities at high flows $> 20\text{ m}^3/\text{s}$ in a large overflow channel to a WWTP inlet of SIAAP in Paris, France.



Large WWTP inlet overflow channel (5.5 x 3.7m) with ADFM Pro20 sensor installed

Background

SIAAP, an independent central authority, manages the wastewater treatment for Paris and surrounding areas which include 8.5 million inhabitants. SIAAP operates six WWTP's including the second largest plant in the world, treating an average of 1.5 million m^3 per day. Due to the large volumes of wastewater collected in a wide network, storm events can contribute a significant volume of stormwater into the system. Stormwater is managed by large storage tanks and reservoir tunnels. At the inlet of the treatment plant there is an additional overflow channel regulating the inflow to the plant. During storm events, the large overflow channel (5.5 x 3.7m) can reach peak flow of more than $20\text{ m}^3/\text{s}$. SIAAP wants to accurately measure the flow in the channel, but no previous flow meters tested at the site have successfully managed to do so during peak flows.

Flow Meter Test

SIAAP decided to test the ADFM Pro20 flow meter in the overflow channel. The test criteria established prior to test were:

- Results should be $\pm 5\%$ compared to an upstream Venturi flume, with particular attention to high flow conditions.
- Sensor should not need maintenance during the test period.

"The Future of Flow!"™

ADFM Pro20 Sensor Operation

- Stationary or portable.
- Communication:
 - Data logging (32MB)
 - Analog (4-20 mA)
 - Digital (MODBUS/ Ethernet)
 - Relay alarms
 - GSM/GPRS
- Flowlink 5.1 software:
 - Data analysis
 - Diagnostics
 - Graphs/ tables
 - Editing



ADFM Pro20 with canister or box electronics



accQcom Interface module

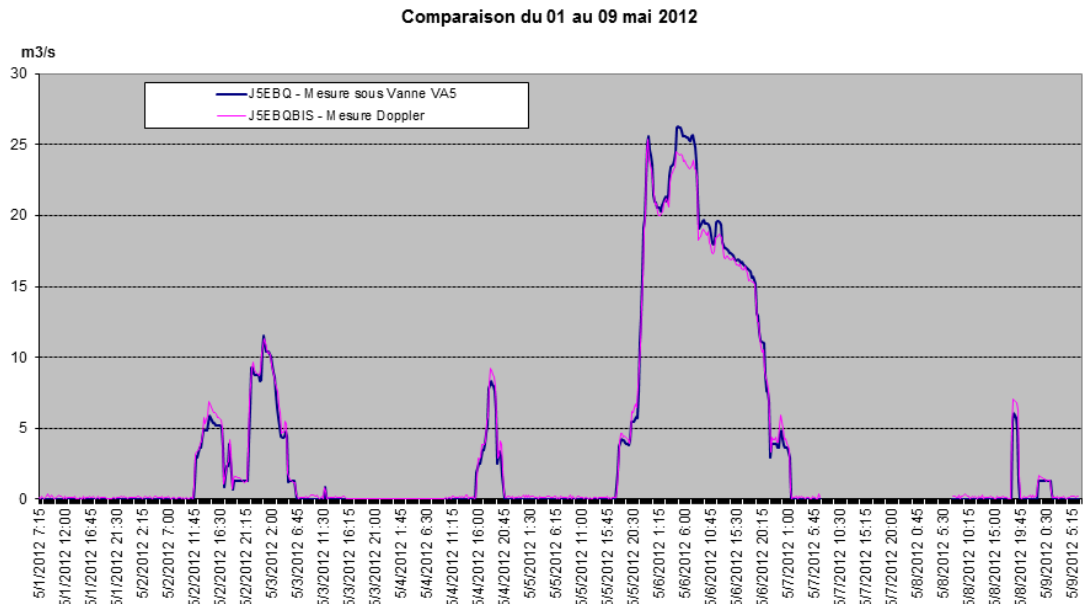
ADFM Pro20 Solution

The ADFM Pro20 Pulse Doppler technology accurately measures the flow rate in large channels and pipes with depths up to 6 meters. Four (4) piezoelectric ceramic sensors emit short pulses along narrow acoustic beams pointing in different directions in the flow. Each sensor precisely measures velocity at multiple level points (bins). The measurements are then used to determine the flow pattern over the entire flow cross-section, creating a true velocity profile. Since the flow pattern and measured velocity distribution are dependent upon each other, the ADFM Pro20's advanced flow algorithms automatically adapt to changing hydraulic conditions. It removes the need for in-situ calibration and ensures accurate flow rate measurement even in difficult flow conditions with turbulence, non-uniform flow, and high velocity. A redundant flow measurement is ensured with the four independent velocity sensors and the system will measure velocity even if one or two sensors are covered.

Measuring Results and Feedback from SIAAP

The ADFM Pro20 was installed in the overflow channel for a period of four months. During this period, there were several storm events with more than 20 m³/s flows. The ADFM Pro20 consistently tracked the comparison flow meter during all events. The total difference between the two measurements when water was flowing in the channel was only 4.8%. The sensor did not require any cleaning during the test period.

Mr. Duranteau, from SIAAP, was impressed by the performance of the ADFM Pro20 flow meter. ***"This is the first Doppler technology flow meter we have tested that is giving accurate readings during high flow conditions at this challenging site. There were some error readings during stagnant/ zero flow conditions, but this could easily be managed. We will therefore approve the test as successful for monitoring flow in large channels at high flow conditions."***



Measurement results (8 days) with comparison between ADFM Pro20 (pink) and reference flow meter (purple), showing strong correlation during storm events with high flows

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