# Case Study

Water CS41

# WWTPs Overflow Channel Monitoring, Vsetin Microregion, Czech Republic

**Monitoring wastewater quantity and quality in wastewater emergency overflow channels is a priority for authorities in the Czech Republic. Heavy rains can push WWTP capacity to the limit, leading to overflows of untreated wastewater that can contaminate the local environment. Therefore, it is critical to control overflow releasing directly into the rivers.**

## Background

Technoaqua, a Teledyne ISCO Water distributor, was appointed to submit a proposal for accurate flow measurement and event-paced sampling on overflow channels at several WWTPs managed by Vsetín Water Co. (VAK Vsetin a.s.). There were no such instruments installed at the selected sites. Therefore, some of them required small adaptations, including a dedicated sensor mounting system.

## Site Challenges and Requirements

Every overflow discharge point requires an individual approach, as conditions vary from site to site. The common feature is high flow with a rapid increase, as the overflow channels are used to quickly discharge the wastewater from WWTPs.

Most sites have short channel lengths and steep slopes. The flow can rapidly change from partial to full pipe conditions, thus changing the hydraulics significantly. As accuracy is the primary criteria for flow measurements, all of the above situations were considered in the flow technology selection process.

Flow readings, including total flow, are sent to the customer's SCADA system. Therefore, built-in Modbus communication protocol is required in the proposed flow meters.

The project scope also includes stationary refrigerated samplers located at the same discharge points. Samplers are used to collect samples to measure the quality of wastewater discharged to the rivers. Flow-paced sampling is necessary, as samples must be taken only when the channel gate

is open during overflow events. When the channel gate is closed, the overflow channel is empty, and the sampler enters standby mode. All collected samples are stored below 5 °C (41 °F) and then transported to the laboratory for analysis.

*A Teledyne ISCO 5800 sampler and Signature flow meter installed at Kelč wastewater treatment plant.*

## Solution

After site evaluations and consideration of the customer's requirements, Technoaqua's recommended solution included Teledyne ISCO's Signature area velocity flow meters interfaced with 5800 stationary refrigerated samplers and a SCADA system. The instruments are installed in six discharge points, located in several WWTPs.

The TIENet® 350 Ex area velocity technology allows for flow measurements in partially filled and fully submerged channel conditions. The ability to measure reverse flow is also an important benefit of the Teledyne ISCO solution.

The sensor is installed on the bottom of the channel and uses Doppler technology to measure velocity. At the same time, it measures real-time water levels using a built-in pressure transducer to calculate the wetted area.

Project specifics make it necessary to measure a wide flowrate range, from near zero to maximum channel capacity, with high accuracy. The customer needs to report the quantity and quality of each overflow event. Installation in the existing sites requires only a small channel adaptation and a custom-made sensor mount to improve flow conditions and provide the best flow sensor performance. However, the channels did not have to be rebuilt, so expensive construction was avoided.

In addition, the 350 Ex Area Velocity Doppler sensor is dedicated to measuring in open channels without a primary device, such as in flumes or weirs. This feature is critical, as the short approach channel sections, challenging hydraulics and need to measure from empty to full pipe conditions, eliminate the use of any primary device.

Flow meter data are sent to the local SCADA system via Modbus RS485 protocol.

High flows and velocities keep sediments from collecting along the channel bottom, holding site maintenance to a minimum and thereby reducing service and manpower costs. Site and application issues can be evaluated and quickly interpreted based on diagnostics parameters measured continuously by the 350 Ex area velocity sensor.

Integrating the 5800 samplers with Signature area velocity flow meters meets site-specific, event-based sampling requirements. The overflow events are immediately recorded, and the event sample is collected. Individual sampling program setup is available for specific sites, but sampling typically is initiated 10 minutes after the Signature flow meter has recorded the flowrate >2 L/sec. After the first sample is taken, the next samples are programmed for 15-minute time intervals, with 150 mL sample volume for each. All samplers are equipped with 4x10 L PE bottle configurations, sufficient even for sampling during long overflow events.

The 5800 refrigerated sampler is an ideal solution for outdoor installation as it provides exceptional resistance to corrosion and weathering. The 5 cm thick sampler housing insulation and double-wall linear, low-density polyethylene construction prevents heat buildup in the bottle chamber during summer months.

Sample volume accuracy also matters, especially when it comes to collecting samples for reports that must be submitted to the local Environmental Agency. The 5800 sampler is MCERT certified and

*A 350 Ex AV sensor installed in an overflow channel using a mounting ring.*

follows ISO 5667 and EN16479 standards for sampling requirements. Therefore, it can be used in sites where the highest sampling standards are required.

### Customer feedback

Teledyne ISCO Water Signature flow meters, TIENet 350 Ex area velocity sensors and 5800 samplers have been installed in the Vsetin microregion since 2020, ample time to test the instruments under various conditions.

“The ISCO solution meets our expectations in terms of reliability and measurement accuracy,” a Vsetin Water representative said. “It also eliminates the need for reconstruction of the channels, hence reducing investment costs. The new installation allows us to meet current regulations regarding overflow channel monitoring.”

The following information provided by Teledyne ISCO

## 350 Ex Sensor Area Velocity Sensor

The 350 Ex sensor continuously transmits an ultrasonic signal into the flow stream. The signals are reflected off bubbles and solids and return to the sensor with a frequency shift (Doppler effect) which is translated into velocity. A differential pressure transducer in the sensor measures liquid depth to determine the wetted area.

Flow rate is then calculated by multiplying the wetted area of the flow stream by its average velocity. Certified to MCERTS when paired with a Signature flow meter.

The Teledyne ISCO Environmental Network — TIENet® — is central to the flexibility and functionality of the entire range of TIENet products. This network allows for the seamless integration of various Interface Devices and Sensor Devices, enabling you to customize your measurement system without the need for hardware or firmware updates. Its intelligent design minimizes cabling and conduit costs through the use of TIENet expansion boxes, common connectors, and efficient cable configurations.

## Signature® Flow Meter

The Signature flow meter from Teledyne ISCO Water, designed for open channel flow monitoring, supports flow measurement methods including bubbler, non-contact laser area velocity, ultrasonic, and submerged Doppler ultrasonic area velocity.

With the ability to connect up to nine sensors*, the Signature flow meter provides a broad range of I/O and communications options:

- pH and temperature
- SDI-12
- RS485
- 4-20 mA output
- Ethernet
- GSM/GPRS modem

The Signature flow meter is rugged (IP 66) even if the lid is open. It performs data logging with variable rate data storage and data integrity verification, and has the ability to connect a USB drive for data/report retrieval and programming.

** Performance, response and speed will vary depending on the type and number of TIENet devices connected to a Signature flow meter. Check with your representative or distributor to ensure the best configuration for your application.*

## 5800 Sequential/Composite Refrigerated Sampler

User-friendly controls, intuitive design and Teledyne ISCO's dedication to quality make the 5800 Refrigerated Sampler the solution for your stationary sampling needs. Rugged enough to withstand extreme conditions, accurate enough for use in every municipal and industrial wastewater application.

- Operating range of -20 to 120 °F (-29 to 49 °C), without additional heaters
- Four digital alarm outputs
- 4-20 mA and DC pulse flow meter input
- Powerful compressor delivers energy efficient, high-performance cooling

## About Teledyne ISCO Water

Teledyne ISCO Water is a leading manufacturer of a wide range of innovative products and services designed to increase productivity while improving the quality of life on our planet. Our water and wastewater flow meters, samplers, and related products are used across the world and known for their robust construction, accuracy and dependability. Teledyne ISCO is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

For further information contact your local Teledyne ISCO Water representative or distributor.

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