

Case Study: Ultra™ 8c Technology

Enhances flow measurement performance and
reduces false alarms during pipeline operations

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Problem: False alarms causing havoc with day-to-day pipeline operations, increasing downtime and costs.

Measurement accuracy and stability is a critical function in leak detection to catch a potential pipeline leak quickly, efficiently and reliably. Numerous customers working with ultrasonic flow meters have partnered with TechnipFMC for many of their challenging applications. Some expressed concerns regarding measurement accuracy and its dependence on fluid profile and Reynolds number. Others made observations with regard to data transmission reliability within their leak detection system. One of the few cases reported involved one of our customers, a major oil company in Western Canada experiencing false alarms during pipeline operations, resulting in increased downtime and costs. After TechnipFMC was consulted, it was determined the false alarms were frequent in

those areas where adverse flow conditions were likely to occur. It is worth noting our customer was running a leak detection system with an installed base of 6-path ultrasonic meters. Well known in the industry is that this measurement technology, when used for leak detection, does not compensate sufficiently for adverse conditions in the pipeline such as swirl and crossflow. These are some of the most common causes of false alarms occurring in measurement systems for leak detection. With a lack of visibility, the growing problem was challenging and frustrating as there was no way to determine if a real incident was occurring.

Key Challenges:



Frequent false alarms.



Lack of visibility on flow measurement data.



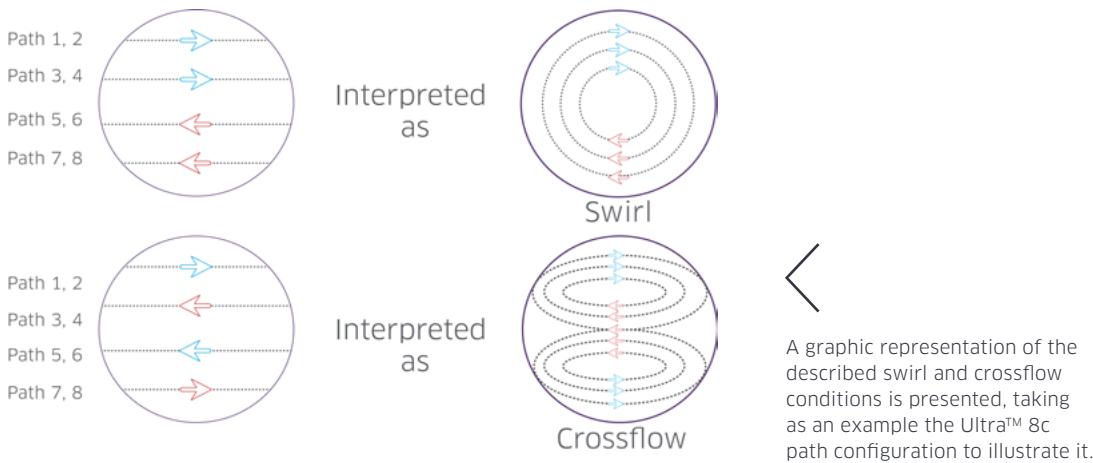
Downtime and cost associated with pipeline investigations.

What are swirl and crossflow conditions?

Imagine a section of a pipe with liquid flowing in a clockwise or counter clockwise motion across the complete section. This fluid dynamic effect is called swirl. Swirl is typically created by a double bend out of plane. A T-bend can amplify the swirl.

Imagine the same section of a pipe cut in half with liquid flowing in a clockwise motion through the top half of the pipe and in a counter clockwise motion through the bottom half. This fluid dynamic effect is known by crossflow. Crossflow is typically created by a single bend.

Both effects derivate in the appearance of transversal components of the flow velocity, which eventually influences the accuracy of an ultrasonic meter as it will either over or under read depending on the measurement path being analyzed.



Solution: Upgrading to ultrasonic 8-path technology compensates for the most challenging swirl and crossflow conditions and enhances the accuracy and performance of the existing installed base.

A 6-path ultrasonic meter is ideal for applications with stable flow profiles and process conditions. But when adverse fluid dynamic effects occur such as swirl and cross flow, the 6-path ultrasonic measurement may read erratically due to its ultrasonic path distribution. Following TechnipFMC recommendation, some customers have replaced 6-path meters with 8-path meters in applications where complex process conditions are known or likely to exist.

When our customer advised us they were experiencing these pipeline issues, TechnipFMC developed a solution to enhance the existing installed meter base and mitigate the challenges in a quick and cost-effective way. With decades of expertise in ultrasonic technology, we embarked on a program led by TechnipFMC Revolve™ department to upgrade the

existing installed base of Ultra™ Series B meters to the Ultrasonic Series C with 8-path technology by adding two additional paths and using our Series B to C Upgrade Kit.

Additionally, “health bits” were introduced in our ultrasonic software, increasing the reliability of the metering readings and the performance of the complete leak detection system. The number of health bits available are 0 to 5. When a health bit is 0 (clear), it indicates a normal value. When it is 1, the value is suspect and indicates a situation that may compromise the accuracy of the reading. In such a case, the value would be disregarded by the leak detection system, improving significantly the data reliability concerns reported by our customer.

Health bit	Process variable	Description
0	Flow rate	Flow rate reading is suspect (already exists)
1	Velocity of sound	velocity of sound reading is suspect
2	Density	Density computation is suspect
3	Viscosity	Viscosity computation is suspect
4	Reynolds number	ReNo computation is suspect
5	Analog output	Analog output is suspect (bad engineering valuable [ex, flow rate], or analog outoput out of range)

TechnipFMC was able to leverage its existing inventory to immediately upgrade our customer’s meters in the field. As an upgrade, it was not necessary to waste operational time by shutting down the pipe insert spool. We appointed a dedicated engineer at the customer worksite and dedicated project managers across our facilities. The project managers coordinated the upgrades to align with pipeline outages and synchronized with our engineering and test center for

How can our ultrasonic 8-path technology help mitigate false alarms? It’s a complete monitoring system!

Our Ultra™ 8c offers advanced crossflow and swirl compensation, an intuitive touchscreen interface and an array of communications options, allowing our customers to connect ultrasonic meters to a network and easily monitor data remotely. The meter also includes a state-of-the-art interface with diagnostic capabilities, which allow customers to monitor and analyze product flow from almost anywhere. With advanced diagnostic features, physical property estimates and configurable alarms, the Ultra™ 8c is more than a meter: It’s a complete monitoring system!

Result: Customers experienced significantly fewer false alarms and less downtime after installing upgrade to ultrasonic 8-path technology.

During a two-year period, TechnipFMC upgraded 34 field meters ranging in size from 16 inches to 30 inches. The conversion program provided our customers access to enhanced measurement data, resulting in significantly lower false alarms and operational downtime. As an additional cost saving, the Series B to C Upgrade Kit lets customers keep the existing electronic enclosures in the Series B meter models.

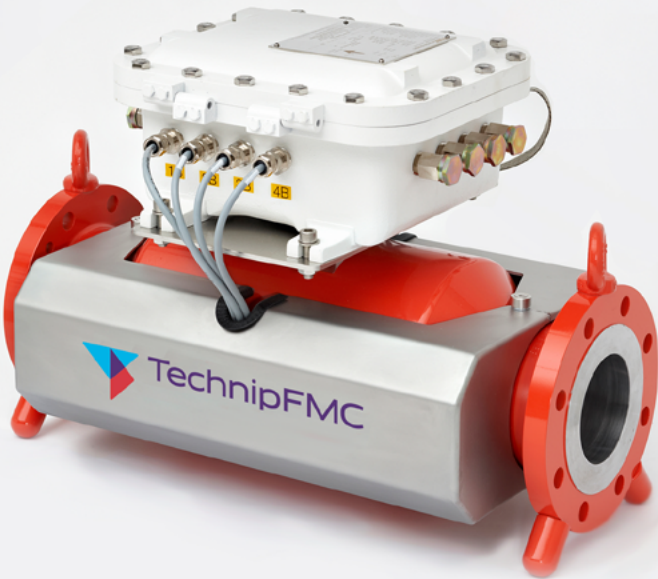
testing and calibration. The process consisted of replacing an installed Ultra™ 6B by an upgraded Ultra™ 8c meter, shipping that Series B back to our facility, performing the upgrade to Series C 8-path technology and sending it back to the field to a suitable location. That process was repeated in a coordinated way multiple times.

This meter has eight crossing measurement paths distributed over four parallel planes across the pipe section for complete measurement and cancellation of the transversal components of the flow velocity. As a result, the Ultra™ 8c maintains its measurement accuracy in the most difficult applications, including no flow conditioning, 5D upstream and transition region flow.

TechnipFMC’s upgrade program adds substantial value to existing meters, providing as good as new 8-path meter technology for a fraction of the cost of new meters.



Ultrasonic Meter upgrades from Series B (below) to Series C. (left)



Benefits

A clearer view of your pipeline health

Our solutions help customers future-proof their assets by offering upgrades that deliver evolving industry-driven enhancements. Ultrasonic 8-path technologies coupled with our pipeline integrity solutions offer customers a clearer view of their pipeline health and reduce environmental risk with enhanced analytic insights and proactive pipeline management.

Added measurement paths

A total of 16 transducers give the Ultra 8c crossed measurement paths across four separate planes, boosting crossflow and swirl compensation and measurement accuracy over a wider range of product type and flow conditions. Improved measurement ability provides more reliable accuracy in flow calculations, making it ideal for custody transfer.

Health bits improve leak detection system performance

Health bits implemented in ultrasonic software reduce the number of false alarms in leak detection systems by assessing the accuracy and reliability of meter reading variables.

Measurement path substitution

Having more ultrasonic paths is a strong advantage in the unlikely event of one or more failing to properly measure. The Ultra™ 8c meter applies the path substitution strategy to mitigate the effect of losing one or more of the eight measurement paths by using the other working paths to substitute the failed path with a calculated value based on recorded profiles.

Reducing cost of ownership

The straight-through run of an Ultra™ series meter results in a nearly nonexistent pressure drop, reducing pumping and operating expenses. Fewer moving parts means less maintenance, making the Ultra™ 8c meter a smart choice for severe operating environments and a boost to operational flexibility and maintenance costs. Converting existing meters to Ultra™ 8 technology adds substantial value to installed bases compared to the expense of installing new meters.