

## Using Micro Motion® Coriolis Meters for Hydrocarbon Interface Detection

### Traditional Water Decanting Method

In petrochemical plants and refineries, there is typically water in the unprocessed hydrocarbons, and this water needs to be removed and properly disposed of. A common solution to this problem is to allow the hydrocarbons to rest in a tank for a time so that the hydrocarbons float to the top of the tank and the water sinks to the bottom. The water is then decanted out of the tank and flushed out to waste.

The traditional method of decanting the water out of a tank employs level metering technology (e.g., float, ultrasonic, optical, microwave) to modulate a valve to drain the water. Figures 1 and 2 illustrate two variations of this traditional approach. The tank contents are allowed to separate, the valve is opened, and as the level instrumentation detects the interface layer between the water and the hydrocarbons, it closes the valve.

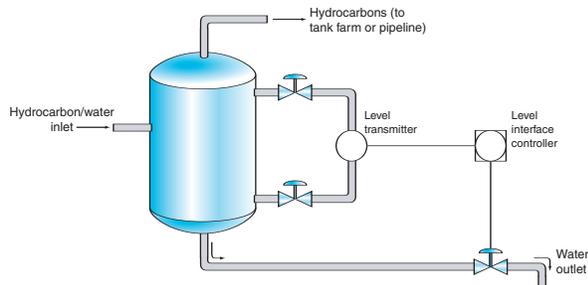


Figure 1. Traditional level-metering system

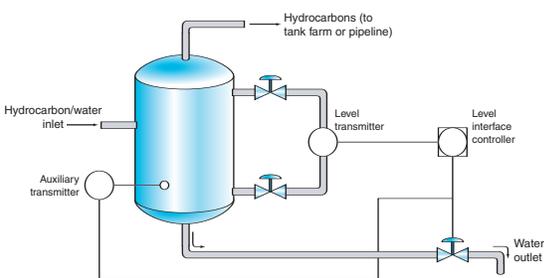


Figure 2. Traditional level-metering system with safety trip

### Problems with the Traditional Method

There are a few key problems with the traditional approach. The accuracy of the level control systems are relatively poor, so the system errs either by allowing hydrocarbons to go down the waste water drain or by retaining water in the tank. The

strippers used to help clean the waste water may have to run the water multiple times to meet environmental code. Retained water still must be removed from the process eventually, so the problem is only pushed further into the refinement process, where it can be much more expensive to resolve. The system's inaccuracy problem can be compounded when there is a rag layer at the hydrocarbon-water interface. Traditional level instrumentation often cannot sense the interface and will miss the rag layer.

These level control systems are also not very robust. Malfunctioning systems can modulate the valve incorrectly, which either improperly retains water or loses hydrocarbons. Just as importantly, malfunctioning systems use up valuable operator time.

### Environmental Concerns

In recent years, environmental regulations have tightened considerably. Companies must now pay strict attention to the amount of hydrocarbons spilling down a waste water drain. Many current government environmental protection agencies will levy severe, non-negotiable fines against companies whose waste is found to be excessively polluting. The accuracy of the measurement devices used to shut off the drain valve therefore has a direct relationship to fines incurred and, consequently, profitability.

Traditional level systems have an inaccuracy of 0.5% to 2.0%, which under previous, more liberal environmental regulatory conditions was theoretically acceptable. However, under the most stringent contemporary rules this level of inaccuracy is unsatisfactory.

### Equistar Coriolis Metering Project

Equistar Chemicals – a multibillion-dollar partnership between Lyondell Chemical and Millennium Chemicals – decided to convert two decanting systems over to Micro Motion® Coriolis technology. Their goals with this project were:

- Ensure compliance with wastewater regulations especially [Hazardous Organic NESHAP (HON), subpart YYY]
- Reduce expensive water removal upstream in the refinement process
- Reduce operator exposure and involvement

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Micro Motion Coriolis Metering Solution

The traditional level control systems were replaced with Micro Motion Coriolis systems. Because Coriolis meters measure density directly, the density of the fluid flowing out of the tank was used to detect the interface layer of the water and hydrocarbons. Figure 3 illustrates the general setup of the Micro Motion system.

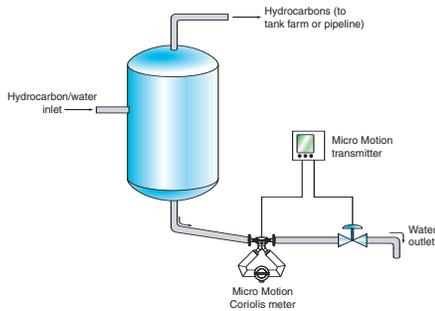


Figure 3. Micro Motion Coriolis metering solution

A single Micro Motion Coriolis meter was installed in the outlet piping between the tank and the control valve. The pipeline draining from the bottom of the tank slopes downward, so that trapped hydrocarbons can escape back up into the tank. The valve is opened and water drains through the meter. When the interface layer contacts the meter, the valve is closed.

The flow and density readings from the Micro Motion meter were sent to a DCS. Equistar used the flow data to track the total quantity of water decanted from the system. The density reading, in addition to controlling the valve in the local loop, was used by the DCS to trigger an alarm to inform the operator that the valve had opened or closed.

Results

The Micro Motion Coriolis meters provided a density sensitivity of up to 0.0005 g/cc. Equistar estimates this is approximately 1000 times more accurate than the level instrumentation that was in place previously. The Micro Motion meters were so accurate and the response of the system so precise and rapid that the plant operators requested that a special delay be implemented because the decanting happened too quickly.

In terms of project success, Equistar achieved every one of its goals:

- The superb accuracy of the Coriolis meters meant that extremely little hydrocarbon material escaped into the waste water, thereby ensuring compliance with environmental regulations.
- The added expense of refinement due to retained water in the hydrocarbons was virtually eliminated, because essentially no water was being passed. This translated into better throughput and longer refining catalyst life.
- Operator exposure and involvement was dramatically reduced. All that the operator needed to do was press the Start button on the Micro Motion transmitter. This freed up operators to concentrate on other tasks.

Summary

Micro Motion Coriolis technology is a viable solution for hydrocarbon interface detection. It helps ensure environmental compliance, improves product quality by keeping water out of the refining process, and helps increase the safety and efficiency of the plant's operators. Furthermore, the direct measurement of mass flow and density provided by Micro Motion Coriolis meters allows users to know exactly how much water is removed from the system, which can aid in operations planning for the recovery area.

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Micro Motion® supports PlantWeb® field-based architecture, a scalable way to use open and interoperable devices and systems to build process solutions of the future.

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