

Utilizing Mag Meter Diagnostics to Trend Meter Health and Measurement Efficiency

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Electromagnetic flow meters possess the ability to deliver real time diagnostic data regarding meter health and flow processes. Using the onboard diagnostics can help an individual trend fluid quality and measurement accuracy by understanding each KPI and how it correlates to a known standard.

A mag meter uses Faraday's Law to calculate the fluid's velocity passing through the meter. In order to accurately measure the velocity, a mag meter is equipped with a process ground, which aids in the ability to rid of any excess voltage created within the meter run. This in turn allows the meter to accurately convert the fluid's velocity into a flow rate given a known pipe size. Mag meters can be used in a variety of applications from produced water, wastewater, food and beverage, oil, and chemical. It is important to understand and be familiar with the application in which you use a mag meter, as it can be very fluid dependent. For example, measuring freshwater vs oil, the water has a higher conductivity (lower resistance) than the oil. This will directly impact the accuracy of measurement from the mag meter.

When utilizing mag meters in the produced water industry, it is extremely important to understand that not all produced water is the same. Depending on the specific application, a use can measure dirty water or clean water, but how can you tell the difference? Without having the luxury of physically seeing the product moving through the pipeline, you need a set of tools to help with monitoring the quality. Diagnostics can directly measure electrode coating, electrode resistance, signal to noise ratio, line noise, empty pipe value, and coil inductance. These KPI's can be trended to create a scenario in which an individual can independently interpret the processes occurring within the meter.

DA1 is a suite of diagnostics within Emerson Rosemount mag meters that directly reflect the processes in and around the meter itself. By obtaining data related to the empty pipe value, a use can determine whether they have a full pipe, or possibly water with a high gas or oil mixture. Empty pipe value is unitless, it is merely a magnitude based KPI in which the smaller the value the better. When you pair EPV with Signal to Noise Ratio, you can start to understand better what may be flowing through your meter (water vs oil, or a mixture). In order to better interpret your data, you need to be familiar with known standards within the industry. Looking at a set of raw data is hard to understand if you do not have other examples to compare with. Line noise is also an excellent set of data to monitor due to the nature of mag meters being electronically driven for measurement. Stray voltage is detrimental to mag meter measurement, but with Line Noise, you can actively monitor any outside voltage that could be causing inaccurate measurement.

DA2 is the second set of diagnostics that pertain to the meter health itself. The coil's inside the meter tube are actively producing an electromagnetic field. By measuring the field strength, along with the Coil Resistance, you begin to obtain a real time health check on the meter. These two KPI's should relatively never change. When you start to see a major deviation of these values, you then become concerned with the meter health. Electrode Resistance is essentially a by-product of the fluid being measured. Unlike Coil Inductance and Resistance, you may see some slight deviation over time with this KPI. The produced water industry is keen on having shifting water quality, which in turn directly affects the Electrode Resistance of a mag meter. This KPI paired with Electrode Coating can instantly show an individual whether they are measuring water or something else.

There are many benefits in using the onboard diagnostic suite within mag meters. The main benefit is producing a preventive maintenance plan. Whether an application requires a multitude of meters, or a handful, you can utilize these diagnostic KPI's to help trend and develop a schedule for maintenance. When discussing produced water applications, regarding a pipeline system, the goal of the company is to remain accurate and well balanced. When balancing your pipeline system, you may have a few meters that are causing a red flag in your system. Without diagnostics, you can be searching for that red flag for an extended period of time. If you can efficiently utilize the diagnostics, paired with volumetric balancing, you can reduce that time needed to find the meter(s) that may be causing inefficient measurement.