CASE STUDY

Honda Cars Philippines Ensures Quality Manufacturing With Advanced Gas Measurement Solution

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Improving repeatability and ensuring a higher level of quality and consistency in its manufacturing processes were the important benefits achieved by leading car manufacturer, Honda Cars Philippines, Inc. (HCPI), in Santa Rosa, Laguna, when Uniwell Technologies Corporation installed the McCrometer V-Cone® Flow Meter.

Honda utilizes state-of-the-art facilities in its manufacturing operations that have set new standards in the automotive industry. HCPI was a recipient of the annual Best Quality Award granted by Honda Motor Co., Ltd. of Japan. For its testing methods, HCPI was also granted an ISO 9002 certification.

The Problem

Providing accurate and reliable liquefied petroleum gas (LPG) consumption data for Honda's oven burners is necessary to ensure accurate production cost and billing as well. Unfortunately, the planned thermal flow metering system could not measure the low end of the LPG flow scale without major changes to the piping system and purchasing a new insert probe.

Honda contacted Uniwell to find a solution to this flow measurement problem. With the plant's piping space constraints, Uniwell recommended the McCrometer V-Cone Flow Meter, which due to its compact configuration, required minimal changes to the existing piping system.

The Solution

ith accuracy of ±0.5% and repeatability of ±0.1%, over a 10:1 flow range, the McCrometer V-Cone Flow Meter typically requires minimal straight pipe runs for

Figure 1: V-Cone Flow Meters Installed In A LPG Piping Application

accurate flow measurement. The V-Cone Flow Meter was the perfect fit for Honda's LPG piping application.

Nearly all other types of flow meters require as many as 10 pipe straight diameters upstream and 5 pipe diameters downstream to prevent swirl and other flow-profile disturbances from affecting measurement accuracy.

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McCrometer's V-Cone Flow Meter offers an advanced, differential pressure flow technology that acts as its own flow conditioner. This design enables the flow meter to provide outstanding performance without the longer straight pipe runs of other flow meters. Safety was another factor in the decision-making process because with the V-Cone Flow Meter there are no moving parts or electronics that could potentially come in contact with the LPG flow.

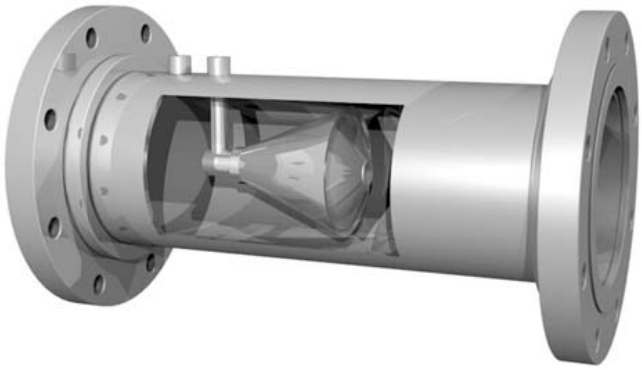

Figure 2: The V-Cone Flow Meter's Centrally Located Cone

The V-Cone Flow Meter utilizes a centrally located intrusion that redirects the flow to the outside of the pipe and conditions the flow by reshaping the velocity profile, all but eliminating the need for straight pipe runs.

The V-Cone Flow Meter requires straight pipe runs of only 0 to 3 pipe diameters upstream and 0 to 1 pipe diameters downstream — thereby solving the piping issue at Honda while measuring accurately at the low range of the LGP flow.

The V-Cone Flow Meter measures fluid flow by utilizing the conservation of energy theory, which basically states that in a closed system, energy can be neither gained nor lost. According to the PV=nRT equation, pressure multiplied by volume equals temperature while "n" and "R" are constants. Imposing a volume change within the pipeline, results in a differential pressure drop that can be measured directly.

The design of McCrometer's V-Cone Flow Meter places a "V-shaped" conical intrusion centrally in the line, redirecting the fluid to the outside of the pipe and around the cone. One pressure-sensing tap located upstream from the Cone measures static pressure while another pressure-sensing tap measures the low pressure created by the cone on the downstream face of the cone itself.

Figure 3: The V-Cone Redirecting Fluid Around The Cone

This pressure difference is incorporated into a derivation of the Bernoulli equation to determine fluid flow. As the fluid moves past the cone, very short vortices are formed that result in a low amplitude, high-frequency signal optimal for excellent signal stability.

The low permanent head-loss achieved by the V-Cone Flow Meter results from the shape of the cone itself. The shape of the cone minimizes energy losses commonly caused by areas of low flow, cavitation and erratic flows. Each V-Cone Flow Meter is sized to meet desired application requirements and may be specifically designed to have high or low head loss. Regardless, the overall energy consumed by the V-Cone Flow Meter is minimized because of its inherent characteristics.

The turbulent vortices produced by the V-Cone Flow Meter condition the fluid flow to be homogeneously distributed and extremely stable. It is this turbulent flow that actually protects the cone as well as the surrounding pipe. The turbulent flow forms a boundary layer against the pipe wall and cone protecting it from particle impingement, which can cause deterioration or buildup on the surfaces.

Normal surface deterioration in flow meters, piping and other equipment occurs as a result of fluid sheer stress. Shear stress creates a problem where there is a solid boundary layer in direct contact with the walls of the pipe. Shear stress occurs in laminar and unstable turbulent flows.

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The V-Cone Flow Meter's very stable turbulent flow all but eliminates this shear stress and consequently results in no surface deterioration. Additionally, due to the shape of the cone, there is little chance of cavitation on the backside of the cone to erode the surface.

Conclusion

Since the McCrometer V-Cone Flow Meter system's initial installation at the Honda facilities in 2008, maintenance has been minimal. Honda has given its seal of approval and provided Uniwell with more flow metering projects on its various process lines.

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