Ford Motor Company Keeps Costs Low and Reduces Test Uncertainty at Engine Lab by Using Micro Motion® ELITE® Meters

RESULTS

- Eliminated the need for a separate in-line densimeter
- Recalibration and maintenance costs were much lower than competing meters
- Lower costs allowed the installing of a second Micro Motion meter, reducing test uncertainty

APPLICATION

Ford Motor Company maintains dozens of engine test stands at its Michigan research facility for use in engine development. These test stands are room-sized laboratories that feature extensive engine control and data recording devices. Seeking to expand its research facility, Ford asked AVL North America, Inc. to design the expansion. AVL brought to the table decades of experience in the design and construction of engine test stands.

One of the most important functions of engine test stations is to measure engine efficiency, which requires precision metering of fuel consumption. The automotive industry commonly uses precision gear meters to measure volume of fuel consumed in engine testing. When designing the research facility expansion, Ford and AVL considered Micro Motion® Coriolis flow meters and gravimetric meters in addition to precision gear meters.

CHALLENGE

Engines are tested by putting them through a complete range of operation, from idle to full throttle, under light and heavy loads. Fuel consumption varies widely during the test, so measurement devices must be able to maintain a high level of flow rate accuracy over a wide range. Fuel properties must also be monitored during the test, which requires an accurate on-line density measurement.

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It is often desirable to be able to run different fuels to the same test station. The same station should be capable of testing engines on diesel one day and methanol the next. Since different fuels have different characteristics (e.g., density), volumetric flow meters need to be recalibrated whenever the fuel is changed.

The maintenance requirements of installed meters are another concern. Precision gear meters have finely machined moving parts that are susceptible to damage by particulates in the fluid stream. Solving this normally requires extensive upstream filtering.

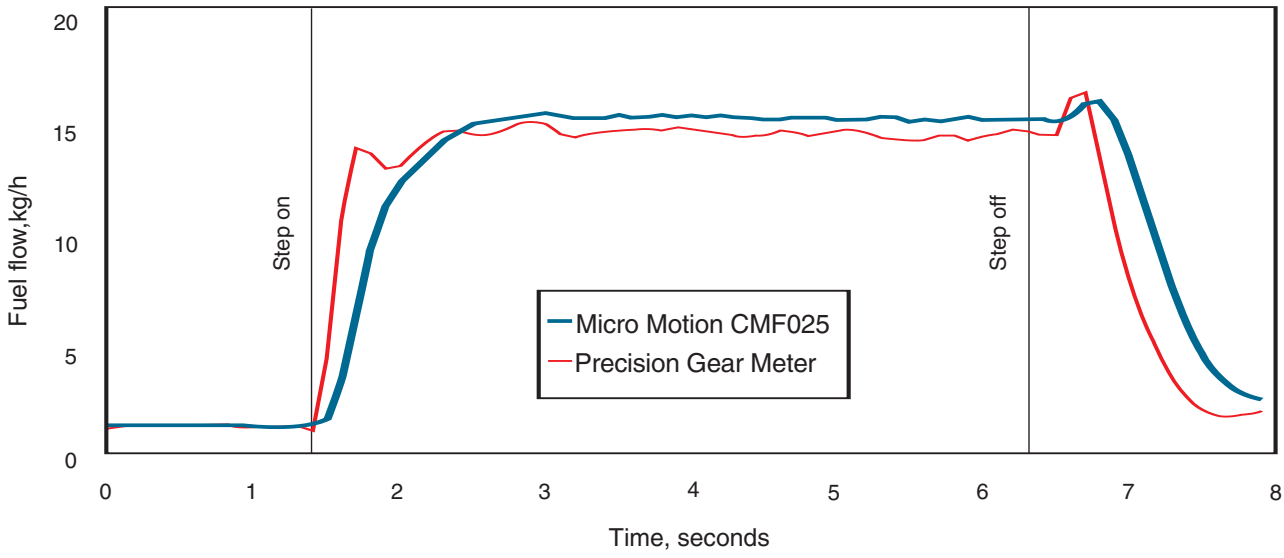
SOLUTION

Micro Motion Coriolis meters were well within the accuracy needs of the new facility. However, Ford and AVL wanted to test Micro Motion's offerings against a precision gear meter.

To test its response to rapidly changing flow rates, Ford and AVL conducted a dynamic flow rate test. In this test, a step change in fuel flow rate was made in 0.1 second. The figure below shows the response of a Micro Motion meter and a precision gear meter. The Micro Motion Coriolis meter closely tracked the flow rate change. The gear meter, however, tried to maintain zero pressure drop and severely overshot. (In Ford's normal operating range, the Micro Motion meter presented less than 0.5 psi pressure drop across the meter — essentially a zero-loss system. To Ford, this was one of the Micro Motion meter's most attractive features.)

In addition to the positive results of these tests, the Micro Motion Coriolis meter was a win for Ford in other areas. Because Micro Motion Coriolis meters measure mass flow and density directly, there was no need to tightly control pressure and temperature, and there was no need for a separate densimeter in the fuel line. Both of these factors contributed to a lower cost of ownership. And since Micro Motion meters have no intrusive moving parts, they are not susceptible to particulates in the fluid stream, which removes the need for upstream filters and reduces maintenance costs. Since the Micro Motion meters were installed, they have continued to function virtually maintenance-free.

For all of these reasons, Ford and AVL chose the Micro Motion Coriolis flow meter for the research facility expansion. The savings for Ford were so substantial that they were able to install a second Micro Motion meter inline with the first. This redundant meter ensures test quality and reduces system uncertainty.



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