Compact fluid flow sensors

A breakthrough in fluid flow measurement discovered on the racetrack offers new benefits for the automotive testing market

Sentronics

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Automotive Testing Expo Europe in June marked Sentronics' unveiling of two new ultrasonic fluid flow sensors. The FlowSonic LF (low-flow) model has been developed for the ultra-low fuel flows found in modern high-efficiency road car engines, while the FlowSonic HF (high-flow) unit is designed to measure the high flows seen in coolant applications and heavy-duty vehicle powerplants. The devices' measurement ranges are 8-4,000ml/min and 0.7-360l/min respectively.

The FlowSonic LF and HF are among the latest examples of race-bred technology crossing over into the wider auto industry, the original FlowSonic range having been created for the fuel flow control regulations introduced to FIA Formula 1 and LMP1 competition in 2014.

"We always envisioned bringing this technology to road vehicles," says Neville Meech, Sentronics' MD. "But with our extensive experience in sensors for motorsport and the opportunity presented by the adoption of fuel flow limits for F1 and LMP1, we knew we could accelerate our progress by using racing as our development platform."

Adapting the principles of ultrasonic measurement to the FIA's demanding specifications and the harsh operating environment of the tightly packaged F1 and LMP1 machines, presented a major challenge for Sentronics' engineers. Detail development and a series of innovations were both needed to resolve problems revealed by gaps in the original technical requirements and real-world running conditions.

Sentronics responded to a leading F1 entrant's request to address measurement errors stemming from aliasing in the FIA-mandated 1.0kHz sensor by more than doubling the update rate to 2.2kHz. The winning car in the last four Grand Prix of 2015 used the resulting FlowSonic unit. Sentronics also enabled a manufacturer LMP1 team to overcome performance and reliability issues attributable to high diesel fuel temperatures by developing its recently homologated FlowSonic Elite HT (high-temperature) model, which increases the upper operating temperature limit from the originally specified 85°C to 120°C.

"Our motorsport efforts led to key breakthroughs on the mechanical and electronic fronts," says Meech. "We realized that they opened the door to a sensor versatile enough for the vehicle testing industry that could also compete with established fluid flow measurement technology in terms of data quality."

ABOVE: The revolutionary FlowSonic HF was developed for the high fluid flows seen in coolant applications and heavy-duty vehicle powerplants

BELOW: Sentronics' FlowSonic LF sensor is designed to measure the ultra-low fuel flows found in modern high-efficiency road car engines

The company went on to adapt its innovative, patented core technology to the needs of the vehicle testing market in producing the FlowSonic LF and HF.

Both models offer lab-quality data in an ultra-compact, lightweight package, for unprecedented portability between test bench and vehicle. Advanced ultrasonic design, a 2.2kHz measurement rate (for the LF), and fully digital internal processing deliver industry-leading accuracy and repeatability. Data outputs include volumetric, mass and cumulative flows, as well as running time, speed-of-sound, and diagnostics. The FlowSonic can accommodate a wide range of flow rates, temperatures, vibration conditions and fluid types. CAN, digital TTL pulse and analog output formats are all available.

With no moving parts and the benefit of intensive testing by teams and engine suppliers in both F1 and LMP1, the FlowSonic's reliability and durability are equally as impressive as its performance. Last but not least, pricing is highly competitive with conventional fluid flow measurement equipment.

"Having proved the performance and reliability of the FlowSonic under the toughest racing conditions, our technology is ready to go beyond motorsport," says Meech. "We're already testing with several automotive and truck OEMs, and have also had interest in applications such as new fuel development by major oil companies, fuel management for commercial fleet operators, and even aviation and marine uses." ❮