Determining Urea Quality

AB Elektronik begins series production of Fluid Quality Sensor first introduced in 2014

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Last year, AB Elektronik introduced a new sensor based on optical technology that was designed to determine urea quality in exhaust aftertreatment systems (see October 2014 Diesel Progress). Now, AB Elektronik has put the sensor into first series production in its plant in Klingenberg, Germany, for an Audi SUV vehicle project. As part of the project, AB Elektronik — part of TT Electronics — is partnering with a France-based tier one supplier of complete plastic fuel systems and emissions-reduction-related fluid systems to car manufacturers.

Frank Rothe, product application manager for Pressure, Temperature and Fluid Property Sensors at AB Elektronik Sachsen GmbH, said that the company’s Fluid Quality Sensor is a logical step forward in completing AB Elektronik’s sensor portfolio for exhaust system and green emissions technology, which has been growing and constantly optimized since the early discussions about emissions technologies.

The Fluid Quality Sensor expands the company’s business in legislation-driven markets for larger diesel engines, where selective catalytic reduction (SCR) aftertreatment systems are used to reduce nitrogen oxide (NOx) emissions. For U.S. Environmental Protection Agency (EPA) Tier 4 final, European Union (EU) Stage 4 and Euro 6 markets, the quality of the urea solution in the SCR system must be monitored to ensure the correct functioning of the catalytic reduction.

“The Fluid Quality Sensor is offered as an integrated component into a complete tank unit,” Rothe said. “Based on system design requirements, the sensor can be positioned on the bottom or bottom-side of the tank as a standalone solution, integrated on the tank head combined with a level sensor unit or inside the tank in a fully immersed supply unit design.

“Together with partners well experienced in development and production of tank supply units on heavy-duty and off-road applications, AB Elektronik works on optimized integrated units to combine the latest technologies of contactless position sensors for accurate level measurement with its new quality and temperature sensors.”

The new Fluid Quality Sensor with optical electronics is a development for the exhaust aftertreatment systems market, based on AB Elektronik’s experience with optical components for other applications, the company said. The sensor measures the refractive index of fluids and is designed to accurately measure the urea concentration in the SCR tank based on its expected refractive index — between 1.3814 and 1.3843 at 20°C.

“The sensor works with the principle of transmitted-light refractometry,” Rothe said. “The plastic sensor housing accommodates an LED that emits a beam of light, which passes through a light guide and into the fluid media.
This beam is directed into a second light guide and hits a complementary metal-oxide semiconductor (CMOS) cell. Depending on the refractive index of the fluid, the direction of the light beam changes, and this direction change is measured in pixels by the sensor.

As the refractive index of fluids can be slightly impacted by temperature, the Fluid Quality Sensor also includes a temperature sensor for temperature compensation. The temperature signal can be supplied to the electronic control unit (ECU), as well, and is also available to the end user via CANbus communication.

“For its latest developments, AB Elektronik is using its new level sensor, which works on the magnetic inductive principle: the so-called SIMSPad — a further step from AutoPad,” Rothe said. “Using this new technology, level measurement can be more accurate than, for example, with reed switches. It can measure through metal and can thus be used in harsh environments or media.”

According to Rothe, the sensors can withstand the freezing of the urea solution. Signals are automatically blocked when the sensor releases an ice block alarm, he said. Sensors mounted inside the urea tank are not damaged should the urea be frozen, Rothe said, as the plastic tank is capable of expanding.

Because SCR systems in off-road machinery tend to utilize a urea concentration of up to 40%, the Fluid Quality Sensor is capable of measuring up to 45% concentration, Rothe said. The device is not subject to wear, as there are no mechanically moving parts, working instead with contactless technology, he said, and vibrations do not impact sensor functionality.

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