

Tackling Tough Fluid Sensing Challenges

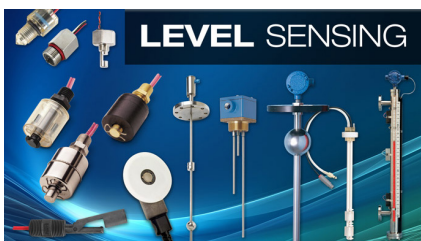
If an application calls for the accurate fluid sensing of liquid level, pressure or flow, Gems Sensors & Controls can help. Their extensive fluid sensing portfolio has evolved from nearly 60 years of field-proven successes in a variety of markets.

Common customer fluid sensing challenges can include the point-level or continuous level sensing of hydraulic oils. They might involve the monitoring of sticky, corrosive, lubricating or coating fluids. They could require reliable measurements of sticky foams and suspended solids. Or, perhaps the monitoring of fluid media with changing dielectric properties or highly stringent anti-contamination requirements. Whatever the challenge, rest assured, none is too great for the team at Gems.



Organizing a diverse portfolio

Fluid sensing technologies can take many forms. Each is designed to solve a specific measurement challenge, such as high proof pressure or low flow rate. The Gems fluid sensing portfolio is organized into families. Level sensing technologies include contact, non-contact, and non-intrusive options. Point level technologies include float/reed switch, electro-optic, capacitive, ultrasonic, and piezo-resonant. Continuous level technologies include float/reed switch, ultrasonic, magnetorestrictive, and potentiometric. Flow sensing technologies include paddle wheel, turbine, and thermal dispersion. Available flow switches include piston, shuttle, and paddle, as well as thermal dispersion types. The key feature of thermal dispersion sensors and switches is that they feature no moving parts. This makes them ideal for use in applications where particulate matter is also a concern. Pressure transducer types include chemical vapor deposition (CVD), sputtered thin film, capacitance, and micromachined silicon (MMS). The unique design of Gems pressure switches combines high-proof piston pressure accuracy with diaphragm sensitivity. Multiple fluid sensing types may be also specified within a single application.



Weighing the options

Gems believes in the importance of informed customer decision making. With this in mind, each new fluid sensing inquiry, whether new or repeat, is approached with fresh perspective. Sometimes, a customer will already have a preferred solution. One of the key questions posed by Gems is, "What led to this choice of sensor?" The answer can reveal a lot about the sensing challenge itself. To help customers determine a "best fit", Gems collects multiple data points, including performance parameters, application goals, target price points, and environmental conditions. Collection involves physical data, such as tank size and fluid type; and conditional data, such as activation cycles and environmental exposures.

An initial analysis is followed by recommendations to the customer of suitable fluid sensing options, their benefits, and associated design, cost and performance trade-offs. As a starting point, Gems typically references the hundreds of available models featured in their digital online standard product catalog. Many times, a “best fit” solution is simply individual customer preference.

Most standard fluid sensors can be rapidly prototyped and manufactured at OEM volumes to exact standards in short lead times. Minor modifications to off-the-shelf products, such as alternative connectors, materials, housings or outputs, are also routinely accommodated.

Optimizing the measurement environment

In virtually every industry, reliable fluid sensing is an absolute must for the support of critical systems. No matter how challenging a fluid level, pressure or flow application might seem, there is always a way to accurately measure it.

Sometimes, the key to success lies in first optimizing the installation environment. Take for instance, the typical industrial HVAC chiller condensers and evaporators found within hospitals, nursing homes and commercial buildings. All require the continuous level monitoring of coolant media and an early means of possible fluid leak detection. Specified fluid sensors must be able to detect low media levels while preventing false alarms. In one application, a pump was used to circulate refrigerant media and generate cool air via heat exchanger. The pumping action was leading to agitation of the media. The agitation was creating a thick foam layer on the refrigerant surface.

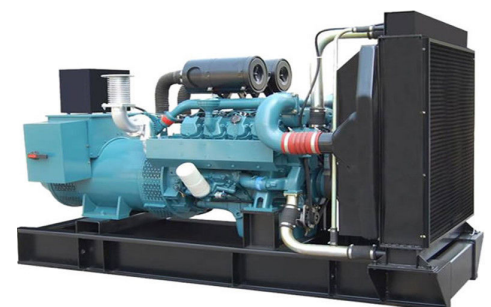
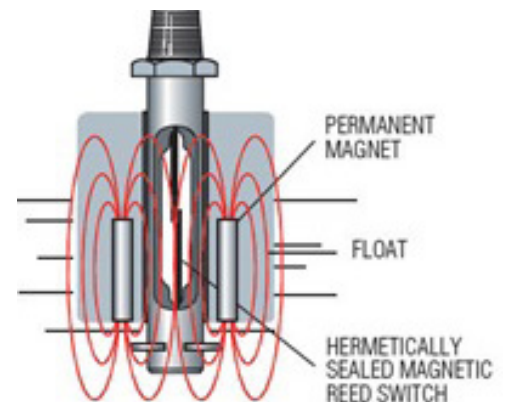
Typically, such conditions preclude the use of a standard liquid level float transmitter. This is because the presence of such foam can lead to incorrect level readings. To minimize foam levels, Gems and the customer collaborated on an expanded anti-foaming baffle plate. By removing this critical external environmental obstacle, the customer could now to specify a Gems XM-800 Series standard liquid level float transmitter at a lower price point.

Sensing “mission critical” liquid levels

Even more “mission critical” is the effective coolant level monitoring of large diesel-powered emergency generators, usually achieved via capacitance-based sensors. These generators serve as essential backup systems for hospitals, skyscrapers, cell phone towers, offshore oil rigs, and remote installations. Although rarely in use, they still need to operate flawlessly upon demand in the event of an emergency.

Over many years of troubleshooting, Gems determined that the performance degradation of capacitance-based industry coolant level sensors was a leading cause of generator system failures. Interestingly enough, they further determined that the primary root cause of sensor performance degradation was typically not related to the sensor itself. Rather, a changing fluid media dielectric constant shifted it outside of the optimal sensor frequency range.

Changes in media dielectric constant can occur for many reasons. It could be something as simple as refilling a diesel tank with non-standard fluid, or a change to a new fuel brand, or simply natural coolant media degradation that occurs over time. By collecting extensive historical performance data on both the sensor and generator, Gems was able to identify important design criteria for a “next generation” coolant level sensor.





Improving reliability with “next generation” designs

This “next generation” coolant level sensor, the CAP-300 Series, incorporates special electronic circuitry that allows it to detect a broader frequency range than other capacitance-based level sensors. As a result, it can support a much broader range of coolants right out of the box. So, whatever fluid media brand a customer might select, even with risk of a changing dielectric constant, the fluid will still remain well within measurement range. The series also features a fully encapsulated integral measurement probe that prevents coating accumulation on the sensor within the coolant tank. This alleviates legacy issues with sensor signal interference caused by the coatings. A reduced overall design footprint now allows for installation of the CAP-300 Series into more space constrained environments. Series units are also CE marked and certified for IP6K9K and IP67 ingress standards and more universal compatibility. The CAP-300 Series is just one example of how Gems listens closely to its customers when developing “next generation” standard products to address critical application needs.

Supporting alternative fuel trends

A growing public interest in alternative fuels is creating new markets for the re-use of restaurant cooking oil. This has increased requirements for low-cost fluid level sensors that are compatible with on-site oil storage tanks.

A customer recently contacted Gems for assistance in finding reliable liquid level sensors that could be packaged together with a wireless transmitter. The finished device was placed into a designated storage tank for restaurant cooking oil. When the tank was full, the sensors signaled the wireless transmitter to send an automated service alert to the oil collection company. A dispatched truck would then arrive to collect the used oil without interrupting restaurant operations. It was then transported to a biofuel conversion center to be turned into automotive fuel. This is just one example of how Gems can effectively support emerging industry trends.



Monitoring hazardous and corrosive media

Medical device, semiconductor, and pharmaceutical OEMs typically use deionized water in their specialty manufacturing processes. Unlike regular tap water, deionized water is an extremely potent and corrosive media. The unique nature of this fluid media requires accurate level and flow sensors that can further maintain water purity levels. A non-invasive sensor design is also needed to avoid any risk of sensor corrosion, material degradation, and water contamination.

ExOsense, a non-contact piezo-resonant liquid level sensor, was created to address this challenge. It is designed for adhesive mounting to the outside of thin-walled plastic containers for high-accuracy, contamination-free sensing with ± 1.6 millimeter accuracy. As the sensor is mounted externally, it never comes into contact with the deionized water, eliminating all corrosion and contamination risks. Now offered as a standard catalog product, ExOsense has expanded its reach beyond deionized water to include hemodialysis, cytology, hematology, reagents, medical waste, sterile water, chemical storage and biohazard monitoring.



Designing for regulatory compliance

Gems pressure, level and flow sensors can also be used to meet stringent regulatory standards. In one example, a customer requested assistance with flow sensor integration into grocery store potable drinking water dispensers. The application goal was to implement an effective and maintenance-free solution which allowed customers to self-dispense water to their own containers. It was critically important that sensor materials posed no contamination risk to drinking water reserves. To address, Gems created the FT-330 Series flow sensor. It is constructed entirely from National Science Foundation (NSF) approved materials to ensure direct sensor compatibility with potable water. The FT-330 Series is now offered as a standard catalog product for universal customer benefit.

Modifying sensors for system design conformance

In another example, an OEM customer was integrating a Gems pressure transducer into its new self-contained breathing apparatus (SCBA). The prototype included a customer-supplied manifold. Each SCBA design relies upon pressure transducers to provide a critical air readings on respirator breather packs. These readings offer firefighters critical early warning of reduced breathable air levels. To ensure such mission-critical reliability and performance, all SCBAs are manufactured to National Fire Protection Association (NFPA) standards.

The new customer SBCA prototype design called for pressure transducer installation into an unusually compact environment. It also called for fairly unique PWM connectors and severe weight restrictions. To address, Gems modified a standard 3100 Series pressure transducer. This included milling down the sensor housing for reduced weight and size without sacrificing accuracy. It also incorporated the required specialty PWM connectors. These modifications allowed the customer to meet overall application goals via a modified standard catalog part, while still remaining in conformance with strict system design parameters.

Beginning with the measurement challenge

Each fluid sensing application begins in the same way: with a challenge. Whether big or small, easy or complex, Gems welcomes each opportunity to find a new “best fit” solution. That can range anywhere from an off-the-shelf catalog part, to a simple standard product modification, to something more “out of the box” with advanced engineering support. No fluid sensing challenge is ever too complex. In many cases, the more complex the challenge, the greater the inspiration for “next generation” product improvements.

