

Thought Leadership

The New World of
Transportation Electronics

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Planes, trains, automobiles and more... providing quality components for diverse applications - By Mark Faulhaber and Travis Lane, Standex Electronics

Standex-Meder reed switches, reed sensors, reed relays, and magnetics are present in millions of operations daily within the transportation industry. With the growth in the number of on-board systems, the increasing number of "smart" features, and the importance of safety and security, convenience, and energy, these sensors are becoming an even more integral feature of next generation vehicles.

The importance of reed switch-based sensors in transportation sensor applications is abundant. From fluid level management, to magnetics for heavy construction vehicle satellite systems, to fuel injector coils, reed switch-based sensors have long played a key role in cars, trucks, and recreational vehicles.

Reed sensors ideal for transportation applications



Reed switch-based sensors are ideal for transportation applications because, unlike other sensors, they draw no power, leading to significant energy savings. This is particularly important in the electrical vehicle market, which wants to reduce battery power consumption. Also, the contacts of the reed switch are sealed away from the environment, protecting them from dirt, water, and other fluids.

High quality/high reliability reed switch-based sensors can be found in thousands of transportation applications, including fluid level sensors as well as automotive navigation, entertainment, communication, convenience

systems. Here are a few of the more recent interesting and innovative transportation sensors on the market.

Fluid level sensors



Brake, washer fluid, and coolant level sensors are one key area of use for transportation applications. Washer fluid sensors and safety standards vary in different areas of the world, and switch makers can tailor the sensor design to meet the unique requirements of the particular application. Standex-Meder makes an all-inclusive electronic liquid level reed sensor that contains the sensing element (reed switch), float, and magnet all as one component. The hermetically sealed reed switches are then further sealed in rugged plastic with epoxy seals.

One new area for fluid control is fluid delay, sensing when you are banking or going uphill and don't want the fluid light to flicker. Designs are being developed for this issue, which is called "sloshing." Other new coolant applications are focusing on greater functionality, for example sensors that show two to three different fluid levels instead of just one. Another innovation is the addition of sealed high performance connectors used for packaging where there is a tight fit geometry, for example in washer bottles that need short length sensors. For this project, designers are helping customers work through bottle geometry and sensor sealing issues, as well as eliminating magnetic interference issues caused by the location of the pump next to sensors.

And one more new trend in the fluid level area is to include more technology in one product, for example building temperature sensors and fluid quality sensors into one unit. These multi-function sensors, designed for applications where drivers have to properly use a specific fluid, are now the subject of research and development and should be on the market in the near future.

LED systems

A rather interesting new area for reed sensors is for automotive LED applications. For example, Standex-Meder is developing a reed sensor that activates and LED light in the visor with a mirror. In the past, reed sensors could not be used for switching lamp loads on and off due to high inrush currents. With the introduction of low power, lower energy consumption LED lights, it is now possible to switch the load directly using reed switches without adding additional components.



Emissions

A unique sensor application was recently developed for a truck with a diesel engine. California regulations require ensuring that a vehicle's closed crankcase ventilation system (CCV) is properly connected, and there was some concern that the emission system could be modified by a truck owner to disengage the system to give them better performance while spewing emissions to the atmosphere.

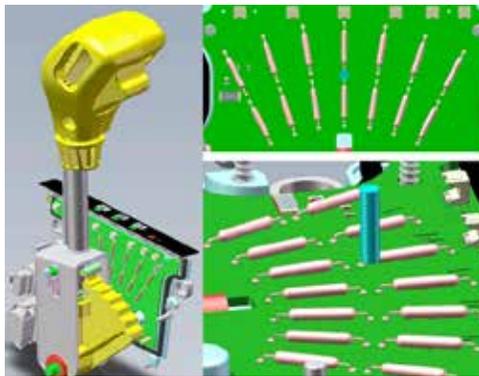




Standex Electronics developed a sensor that can detect a small amount of hose coupling movement to make sure the truck computer and CCV emission system is properly connected. If the system is not connected, the engine is put in a lower power mode. The unique patented design has an inductive coil sensor so the over-molded packaging would work accurately in the harshest environment.

Gearshift switches

Many European OEMs are using micro-switches for gear shift position switches designed to give the car feedback on the location of the gear shifter in automatic transmissions. The switches are unsealed causing reliability concerns and make an audible noise. More reliable sealed non-contact reed switches are now available that can monitor the position of the gear shifter and can also be used for parking brake switches.



Safety

Many new safety-related sensors take the place of the prior reliance on user vigilance. A couple examples are sensors ensuring gas cap covers are working correctly or sensors indicating that the soft tops for convertibles are fully latched in position. In one recent ap-

plication, a European OEM had developed a cover to be placed over the electronics on an electric car to protect owner safety, and Standex-Meder developed a special proximity sensor to reliably indicate when the cover is properly shut. The non-contact switch has special features to add redundancy and was specially built to work in a harsh under-the-hood environment and protect against salt and engine heat.

Planar transformers

While not a reed switch-based sensor, a related and very important innovation in the transportation arena is the planar transformer,



which is being used more and more instead of traditional wire-wound transformers for low-profile applications where height is critical. More efficient and with enhanced electrical capacity, compact high power density planar transformers are typically 30 percent of the volume and weight of traditional wire-wound transformers, which eliminates many design constraints. Standex-Meder has developed planar transformers for use in a variety of in-cabin accessories power supplies, including a video system for police cars that can be stored under the seat, and a wireless headphone system that needed a slim profile.

Working with sensor designers is key to success

With such a wide variety of applications and customer requirements, it is critical to work closely with the reed-based sensor manufacturer's engineering group. Engagement between the engineering team and the customer's engineering group ensures that the switch manufacturer can work through issues and fully understand the customer's needs.

The process usually begins with telephone conference calls, and then usually moves to an in-person meeting to get a better understanding of the issue. The design team should then begin working with the customer on a design, or make suggestions to improve a customer's initial drawings. Sharing engineering files, developing samples and providing 3-D printed parts, or using such techniques as low pressure hot melting molding to build prototypes, are all ways that design collaboration can build into successful parts.

Standex-Meder partners with customers with a collaborative approach to the design process extensively in all areas of the transportation industry. One area where the approach is really growing is in the motorbike and recreational vehicle market. Brake fluid and position (throttle, brake, and clutch) sensors are becoming more prevalent in that market, in response to an increased interest in safety and feedback systems. One example is a recent collaboration on the development of a throttle position sensor for a major recreational vehicle OEM that is addressing safety concerns associated with using its ATV vehicles in northern climates. At very extreme subzero temperatures the throttle cable could become frozen in full throttle. The newly developed sensor detects this state and puts the engine down to an idle state.

Quality remains one of the biggest concerns



for most customers, particularly in the automotive part of the industry, where TS 16949, the International Quality Management Standard specifically written by the automotive industry, aims to achieve zero defects.



Working with a sensor designer that holds the TS 16949 certification will ensure that designs are reliable and robust. Standex-Meder is certified to TS 16949 and uses the standard in the design of all its products. With in-house vertical integration, the company can perform all necessary requirements for the required production part approval process (PPAP), and uses failure mode and effects analysis (FMEA) to ensure and document quality.

Environmental and dynamic contact resistance testing ensures design success

In addition to the ability to provide design assistance, it is very important that switch designers have the ability to conduct proper testing, including upfront environmental testing for shock, vibration, dust, gravel and salt spray. Especially for recreational vehicles exposed to harsh environments, the sensor manufacturer should be able to provide in-house shock and vibration testing to ensure the part can work through these extreme conditions.

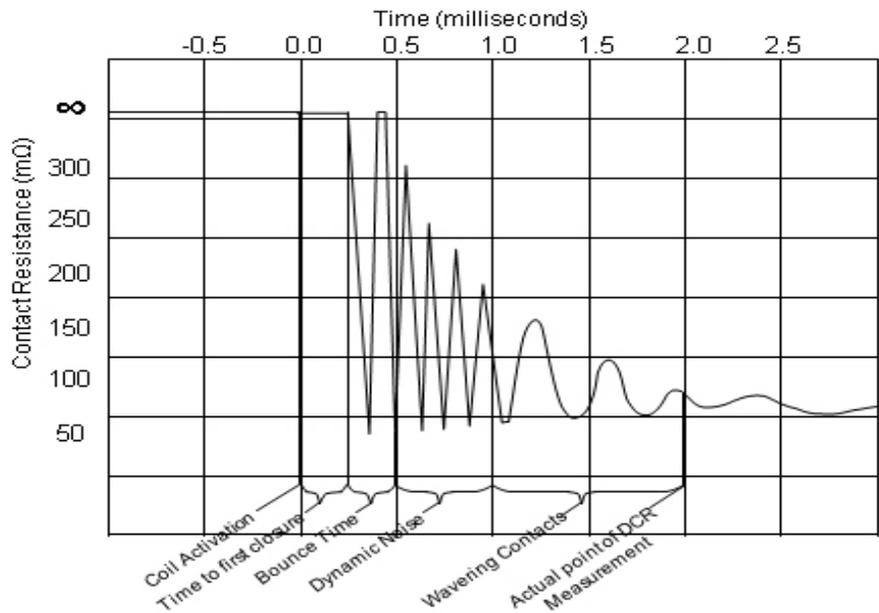
In addition, DCR (dynamic contact resistance) testing should be used to qualify a new reed sensor or relay. The goal is to ensure that all tool operations involved in the manufacturing process are not adversely affecting the reed switch. This is particularly true in any operation involving bending or forming the reed contacts, along with any over-molding of the reed.

DCR testing improves the quality and reliability of the product by weeding out a variety

of problems, including an overstressed reed switch (usually from assembly), small cracks on the reed seal, broken reed switch, plating or sputtering peeling off, air contamination in the glass capsule, and particles on the con-

and reed switches fit well with that scenario. Using simple reed switches, which do not draw power, means you can add features and convenience to the vehicle without incurring great expense.

Normal DCR Wave



tacts. DCR testing eliminates early failures and improves long-term reliability in the customer's equipment and/or technical systems. Sensors have always been used in transportation applications, but industry trends are leading to an increase in the use of proximity sensors along with simpler reed switch devices. Now that we are using computers in cars, not as much current needs to be switched,

Standex Electronics has extensive experience in the many markets that reside in the transportation industry. Planes, trains, automobiles, recreational vehicles, light/heavy duty trucking, mil-aero, eBikes, and more. We are your resource for high-quality reliable components for diverse applications. Give us a hello@standexelectronics.com to partner, solve, and deliver!

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