Madison®

TECH NOTES

Notes for Ultrasonic Sensor Applications

Ultrasonic Liquid Detection

The key to ultrasonic liquid detection is to keep the beam perpendicular to the liquid level and away from structures like tank walls, internal ladders, and impellers. If ordering a USR Series model with a tri clamp, remember that a ferrule has to be welded to the vessel's top in a way that the perpendicular relationship to the liquid would be maintained. The ferrule needs to be as short as possible to avoid the danger of picking up false targets in what could be considered an effectively long pipe.

Dynamic Ranges

For example, if an application needs a dynamic range of right up to six feet, give yourself a little margin and go with a 12-foot rated sensor for any changes that might happen to the application or problems in mounting.

Power Supply

While a sensor may draw only 35-40mA at 24V, it may require up to 150mA at the time of transmit. If a power supply is current limited, the sensor may suffer as it would from a decrease of available voltage. The sensor would still work and probably remain in specification, however, a reduced sensitivity could be noticed at the far end of the range.

Cable Grounding and Shielding

Occasionally the sensor will be used in environments of high electrical noise. The cable shield wire is hardly ever needed and is cut flush when shipped. If it is needed, the cable jacket can be stripped back and the shield wire exposed. There are a variety of grounding and shielding options. One of the most common is to connect the supply voltage common to chassis or earth ground.

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Output Resistance

The 4-20mA output can drive long cable lengths. In general, you want to keep less than 100-200 ohms of resistance in your cable. The 0-5V output can be used in quite long cable lengths if there is little current draw (high input impedance). 4-20mA outputs are generally preferred in Industrial applications since they are supposed to have higher immunity to electrical noise. However, most electrical noise is brief and longer cable lengths provide higher capacitance that tends to reduce those types of noise signals.

Sensors in Pressure Vessels

Sometimes we get requests to use the sensors in pressure vessels. This is a problem for two reasons. The first is that the sensor is epoxied in a housing that acts like a sleeve. Any pressure differential could result in the sensor being forced out of the sleeve (housing). The second problem is that the sensor operates based on the principle of the speed of sound. Pressure has a significant factor on this speed and would significantly alter the detected level.

Outdoor Applications

Outdoor applications can run into problems. If water is likely to accumulate on the end of the sensor and then freeze, the sensor may not be able to get the sound pulses through any accumulated ice on the end of the sensor. In these applications, it is recommended to construct a shroud to keep the snow and ice off the end of the sensor.

Temperature Sensor Delay

The temperature sensor inside the unit takes a few minutes to respond to sudden temperature changes. For example, a sensor just outside the door of an oven on a bakery conveyor may not give accurate readings when the local temperature instantly changes a hundred degrees.

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