Quantum Automation TECH CORNER with Benjamin Russell Perry

July 28, 2011

Detecting the Path:

An explanation and reference for basic sensor models

Choosing the right sensor for an application can sometimes be a daunting task if you're unfamiliar with the different types of sensors out there. In order to make this process a bit easier, you'll find a quick reference guide to multiple sensor categories and variations, as well as a few questions you'll want to ask yourself straight away.

Inductive Proximity Sensors

- Inducting proximity sensors sense Ferrous metals such as Brass, Nickel, Steel & Stainless Steel.
- They have a max sensing distance of about 20-25mm, or 1 inch.

Shielded vs. Non-Shielded

- The threading on a shielded sensor completely covers the barrel of the sensor, making the sensing face flush within the housing.
  - These are also referred to as "embeddable sensors," because a user is able to embed the sensor within a machine without having false readings.
- On non-shielded sensors, the threading is recessed from the sensing face, allowing for a greater sensing area.
  - These are also known as non-embeddable sensors, because mounting them flush in a machine might lead to improper readings due to a phenomenon known as side-sensing.

Harsh Environment

- Harsh environment sensors are meant to withstand the fiercer beatings that other sensors can't handle. They are great for applications where a sensor would be in danger of repeated abuse and vibration. They are also submersible up to 669ft or 290psi.

Analog

- Analog sensors are also available with multiple out types, such as 4-20mA, 0-5VDC, 0-10VDC, and others.

Capacitive Proximity Sensors

- Capacitive proximity sensors are triggered by a change in the surrounding dielectric content. These sensors are adjustable to hone in on a specified dielectric content range, allowing the sensor to ignore all other materials except those with a rating in the specified sensing range.
- Capacitive proximity sensors are also available in Shielded, Non-Shielded, discrete and analog varieties.

Ultrasonic Sensors

- Ultrasonic sensors emit a sound pattern which quickly increases in width as it gathers distance. The receiver in the sensor detects sound waves reflected from targets like a sonar. They contain both an emitter of the sound pattern and a receiver.
- Ultrasonic sensors are also available with an analog output which supplies feedback as to the distance between sensor and target.
- These sensors are great for applications where users would like to disregard the color of the target, as sound waves can bounce off a clear sensing surface which might be difficult for other sensing devices to pick up.
- They are also commonly used in applications detecting and monitoring the level of a product in a container or tub.

Photoelectric Sensors

- A photoelectric sensor is an electrical device that responds to a change in the intensity of light falling upon it. They contain both an emitter and receiver.

Reflective

- Reflective sensors contain both an emitter and receiver in one housing. The emitter sends a beam to the reflector, which then in turn reflects it back into the receiver. Once this beam is interrupted, the sensor is activated.

Thru-Beam

- Thru-beam sensors are made up of two units, an emitter and a receiver, placed on opposite sides of the sensing area. They offer the longest and most accurate sensing.
    - A disadvantage to the Thru-Beam lies in the fact that it requires two units to be set up, and therefore two sets of wires to be connected.

Diffuse

- Diffuse sensors act similar to reflective sensors, only they are activated when they receive a reflection from a passing object. So, the target acts as the reflector in this case.
- A feature called “background suppression” is also available. Also known as “fixed-field,” this feature allows users to designate a specific sensing range. Objects too far to one side of the field will be ignored.

Accessories

- Quick-disconnect cables are available in multiple lengths for many sensors. These cables allow operators to quickly troubleshoot and maintain machines without having to replace entire units by enabling users to simply detach the sensor from the cable at the base of the barrel. In applications that go through multiple sensors, the quick-disconnect cables supply an additional cost-savings down the line.
- Replacement reflectors and reflective tapes can be purchased for use with the photoelectric sensor line.
- Mounting brackets are also very helpful in the installation and trouble-shooting of sensors. These mounting brackets provide an ease-of-use for users, allowing them to skip over the hassle of attempting them to “jerry-rig” sensors onto their applications.

Questions to Ask When Choosing a Sensor

Q: What type of material is it?

A: If you're working with something like steel, brass or any other ferrous metal, an inductive proximity sensor should be the first thought on your mind.

Q: How far away is the target?

A: If the sensing distance is longer than about an inch, inductive proximity sensors won't fit the application. At that point, you'll have to look at something like a photoelectric or ultrasonic sensor.

Q: Output type?

A: If you need to detect whether something is simply present or not present, then a discrete output will suit you well.

A: If exact distance is an important factor, then you'll need to purchase an analog sensor.

Q: Parts per Minute?

A: How fast does your sensor need to act? If you're working with a high-speed application, you'll need to look for a sensor with a high frequency switching rating.

Q: Are there any limitations?

A: This one can get very specific to an application. For instance, how big is the area the sensor needs to fit into? There are multiple factors that go into the actual size of sensors, so certain variables will need to be adjusted for size restraints.