

How Ultrasonic Sensors Help Make Factories Smarter



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A key driver of efficiency within a factory is automation; more and more factories are starting to adopt a factory environment that is fully autonomous, known as “lights-out manufacturing.” Sensors are a key component of the intelligence required to achieve this level of automation.

TI has created an animated video that showcases six examples of ultrasonic sensing to kick-start the world of automation:

http://4com.ti.com/deliverables/2019/1399_UltrasonicSensing/Final/1399_FullVersion/1399-Industrial-Sensing-Animation_V3M_H264_H264.mp4

The six examples are:

- **Drone collision avoidance sensors.** Already popular in the consumer and medical spaces, drones are finding uses in the industrial space for aerial photography. Industrial companies are also looking at drones to deliver packages from facilities to homes or from one spot in a large factory to another. Ultrasonic sensors in such applications sense for any obstacles so that the drone can steer its course. A benefit of using ultrasonic technology is its ability to work in any ambient lighting conditions and to detect clear surfaces like windows and water.
- **Automated door and gate sensors.** Found nearly everywhere – supermarkets, offices, parking garages and large warehouses – automated doors and gates offer a hands-free method to enter buildings. It is important to be able to detect humans or vehicles approaching a door but ignore smaller objects like debris or small animals. Ultrasonic sensors work even in the presence of rain and fog and are more reliable than infrared-based solutions.
- **Occupancy detection sensors.** Buildings and factories use occupancy sensors to lower energy consumption and improve security. Energy control is driven by the increasing integration of electronics and network capabilities, along with power-consumption limits adopted in some countries. Occupancy sensors can detect people in conference rooms, detect whether people are present in a “caution” zone in large open spaces, or wake appliances up from sleep mode when a user approaches. While passive-infrared (PIR) sensors are the cheapest sensors, they can be unreliable and lead to false positive readings. Ultrasonic sensors, used either in addition to PIR or stand-alone, can provide more confident sensor readings.
- **Industrial robot sensors.** Robotic arms are found all around manufacturing and assembly lines in factories to fabricate material or look for defects. Sensors integrated in industrial robots need to be flexible and adjustable in case there is a change in the manufacturing process or end product. For example, in a soda factory, sensors mounted at the head of the liquid dispenser ensure that the soda bottle is face up and aligned to prevent liquids from spilling. Ultrasonic transducers come in many frequencies (enabling flexibilities in resolution and range), and the technology itself can detect clear objects, which proves advantageous in industrial robotic applications.
- **Logistic robot sensors.** Some warehouse robots transport packages from one end of a factory to another. Sensors mounted on robots help them maneuver through factory floors without colliding into walls, objects or humans. Ultrasonic sensors can detect up to 10 m, with a resolution of 1 cm or lower.
- **Level transmitters.** In the food and drug industry, contactless level transmitters avoid product contamination. Ultrasonic is one of the most reliable contactless sensing technologies for use inside containers and storage tanks compared to technologies like optical or infrared, due to the ability to detect clear liquids. Ultrasonic sensors can be mounted above, inside or underneath tanks to detect fluid levels and control the inflow and outflow of contents.

Ultrasonic sensors are a reliable choice for proximity-, position- and level-sensing applications due to their ability to reliably detect clear surfaces such as water and glass and to operate in adverse environments such as smoke, fog or rain.

Additional resources

- Learn more about [ultrasonic sensor integrated circuits](#) from TI.
- Read the application report, “[Ultrasonic Sensing Basics](#).”
- Download the [Ultrasonic Distance Sensor with IO-Link Reference Design](#).

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