Unique Smart Sensing for Inspection Applications

Integrated for more effective control and data logging capability, today's analog output sensors have been paired with exceptionally capable controllers as a system to deliver seamless discrimination outputs and reporting. Compact laser and inductive gauging systems solve some of the most challenging measurement problems in food and beverage packaging, automotive and semiconductor manufacturing, and other industries.

Why Choose a Measurement Sensor?

Measurement sensors fill the void between conventional photoelectric and proximity sensors, even those with analog outputs, and low-cost vision sensors. Using conventional sensing techniques combined with advanced analytical tools preprogrammed into the amplifier, measurement sensors solve a wide range of application problems. The main advantage is that they collect inspection information and make high-speed decisions right in-line with your manufacturing process without stopping the operations. They incorporate easily set high-pass-low discrimination outputs and an analog transfer output for data logging. Often, these are used as a cost-effective inspection system retrofit to improve quality control and reduce waste. Typical applications showing the range of uses for measurement sensors are at the end of this article.

A Look Back

Just a few years ago the typical way to source an analog inspection and measurement system included working with a sensor supplier, a panel meter or controller supplier, and engineering to integrate the results into a PLC or PC for control and data logging. Most laser sensors at the time used FDA Class IIIb lasers that require special installation requirements such as safety laser shut-off kits, operator protection and posted warning messages. The equipment used in the solution was pretty bulky: large sensing head at the inspection site, a dedicated amplifier to provide discrimination outputs or a panel meter with discrimination outputs and communications. Often special programming was required to handle simple arithmetic calculations of thickness based on analog input from two sensors.

One important factor remained elusive: calculation of the application's resolution. While the sensor specifications provide reference resolution from the manufacturer's testing program, the installed system often contains quite different conditions that can influence the real resolution achieved. Lengthy calculation and speculation yielded estimates of varying accuracy regarding the resolution.

Smart, Compact Solutions Lighten Everyone's Workload

Today's measurement sensors have taken their physical size cue from fiber-optic sensors. In particular, they now offer compact sensing heads to inspect in space-confined areas and amplifiers with large digital displays and multiple teaching functions to simplify setup. For comparison of two inspection inputs, a calculation unit can be sandwiched between two amplifiers to provide thickness measurements that are accurate regardless of target object positioning relative to the sensing heads. To keep the amplifier small and DIN track-mountable, a separate communications module provides serial communications for setup, monitoring and data logging. Software used for remote setup includes simple data tracking and display options for the PC without resorting to a full-blown SCADA package. Omron's ZX laser and inductive measurement sensors are examples of compact solutions.

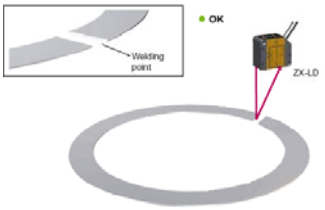
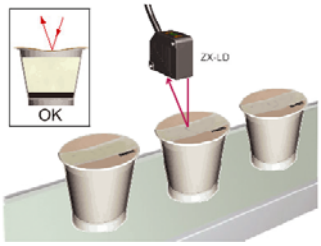
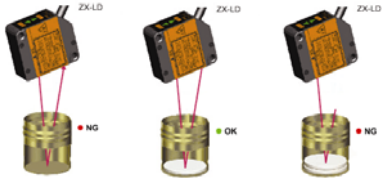
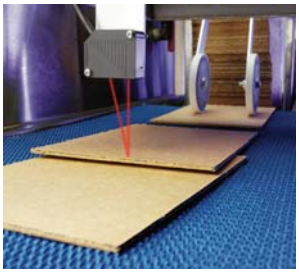
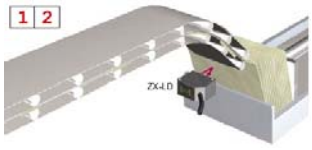
Ultra High Resolution Inspection Tools

Most of the gauging sensors described so far provide high resolution and high-speed response so they work well as part of an overall in-line inspection system. However, some more complex two-dimensional inspections call for greater resolution and require slightly longer decision-making time. While the sensing head may be compact, the decision-making amplifier/controller is generally pretty

large. The capabilities offered include simultaneous X- and Z-axis measurements using a single sensing head. Omron's Z500 inspection system is an example of this type of product.

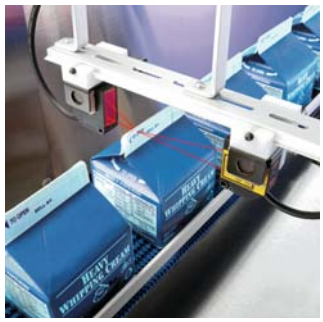
Applications for Compact Laser Measurement Sensors

The following examples show the wide range of industries and applications where laser measurement sensors offer outstanding solutions.

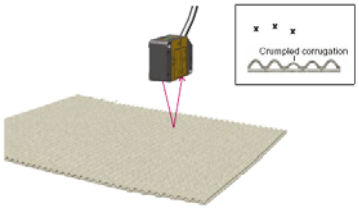
Industry	Application	Description
Automotive		Detect the position of the welding point on ring gears using a laser measurement sensor. The sensing head's compact size allows mounting in tight spaces on welding machines.
Food & Beverage Packaging		Detect vacuum under lids of jars and dairy cups by measuring the concave shape on acceptable products and flat surface on unacceptable ones. The raised or flat safety button on jar lids indicates an imperfect seal and lost vacuum. A flat foil lid on a dairy cup indicates vacuum lost through a pinhole or other seal imperfection.
		Determine the number of inner linings deposited in bottle caps with a laser measurement sensor. The judgment output of the amplifier can be used to eject unacceptable caps before they get reach the capping machine.
		Detect double feeds of cardboard sheets into case formers. Use a laser measurement sensor to prevent jamming and reduce wasted packaging material. The problem is usually associated with variations in the cardboard density or environmental conditions such as excessive humidity that makes the stacked blanks stick together.
		Count sheets of wrapping paper with laser measurement sensor detecting stack thickness.
		Detect improper seals from product obstruction in Form, Fill & Seal machines. Product mis-feeds in vertical or horizontal form, fill and seal machines often result in the product being pinched between the sealing jaws at the seams of the package or pouch. If not detected quickly, this type of "jam" can result in significant loss of product and packaging because the condition that caused it continues to create jams until it is corrected.

Food & Beverage Packaging
continued

Use a single measurement sensor to detect multiple bottle cap application problems. Get 100% in-line inspection at full production speeds and accurately detect these defective capping conditions:
• Missing caps
• Improperly threaded caps
• Loose caps (insufficient torque)
• Wrong cap
Conventional inspection systems employ multiple sensors to detect all of these conditions leading to increased expense and machine complexity.

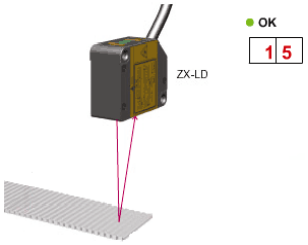


Inspect seals on gable-top cartons regardless of product position using two laser measurement sensors and a calculating unit. Prevent spillage and spoilage from improperly sealed cartons that lead to wasted product and added machine cleaning costs. If spoiled product reaches the supply chain, it can lead to loss of consumer confidence and product recalls.



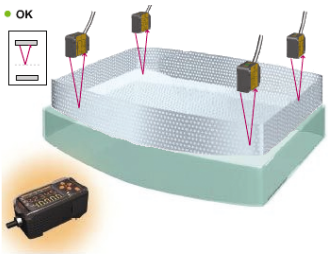
Detect crumpling or weakened corrugations in cardboard packaging materials as sheets move along a conveyor. The laser measurement sensor inspects each corrugation for uniform height.

Material Handling



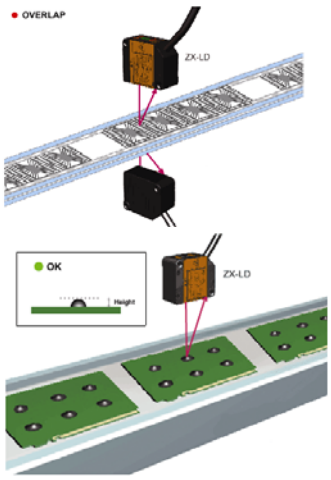
Check proper count of staples in sticks for copier and desk staplers. The ultra-small spot of the ZX enables counting by precisely detecting the grooves between the staples.

Assembly



Confirm proper installation of a shadow mask into CRTs using line beam laser measurement sensors at each corner to ensure proper insertion depth.

Semiconductor



Detect overlapped lead frames and other shiny metals. The laser measurement sensor detects metal plates just 0.15 mm thick.

Inspect board mold height. The peak height of a board can be measured using the self-peak mode of the laser measurement sensor.