A New Web Edge Sensor for Guiding Applications

Article

Why is a web edge sensor important?

To converters, faster speeds, thinner and lighter materials mean more production at less cost. However, these conditions can also mean a higher cost of downtime. Web guiding is one of these important, yet often overlooked aspect of the converting process. The trend for faster speeds and thinner material exposes the limitation of the current web edge sensor technologies; accurately detecting the web edge position for thinner and low basis weight materials are becoming increasingly difficult. This can potentially lead to operational problems such as glue on rollers, misplaced layers of material, material wrinkling or tears which can lead to downtime. Moreover, these problems can also lead to poor quality products with aesthetic problems as well as products that fail quality and regulation standards. All in all, time, money, and products are wasted with inaccurate sensing technology. The new web edge sensor technology eliminates these problems for the nonwoven industry.

How does the current edge sensor technology perform?

Today's sensor technology is based on the principle of signal blocking. The blocking principle requires an emitter in one arm and a receiver in the opposite arm. The web runs between the arms and blocks an ultrasonic, pneumatic, or infrared signal. By measuring the magnitude of unblocked signal on the receiver the web position is inferred. This sensing principle provides a inferred measurement that is dependent on the web material properties.

Blocking principle of U-shaped web edge sensors

Drawbacks of existing web edge sensors

Sensors based on this blocking/unblocking principle work on the assumption that the material is 100% impermeable to the emitted signal. However, materials are often not 100% impermeable, especially nonwovens. This requires calibration of the sensor for each type of material. Furthermore, this type of technology can only infer or guess the position of the material. When the material characteristics change the sensor will perceive a change in the signal but the position of the material is wrongly inferred. Every time the material characteristics change, the sensor has to be recalibrated to a new percentage of impermeability.

How does the new web edge sensor technology work?

Faster speeds and thinner materials… these are two of the most important trends the nonwoven industry equipment manufacturers are challenged to adapt to. One of the innovative technological developments of 2015 addresses these two trends by providing a major leap in web guiding through **a new web edge or web position sensor technology** based on the principle of light scattering and a patented fiber optic sensing principle.

What is the fiber optic sensor's working principle?

The new sensor technology with the light scattering and patented fiber optic sensing principle provides a repeatable, high-resolution web edge or web position measurement. The fiber optics act as a spatial filter that allows only the light signal that is in direct line with the fibers. A one-dimensional pixel array collects and converts the filtered light into a digital voltage signal which is processed using an advanced digital signal processing algorithm. Unlike the current sensor technology, the fiber optic sensors have the ability to detect the true edge position of any type of material without the need for any manual adjustments of the sensor.

Fiber Optic Sensor - Light Scattering and Spatial Filtering Principle

How is the new web edge sensor technology unique?

An interesting difference between the current technology sensors and the fiber optic sensor is the latter is encased in one arm. This breaks away from the traditional design of U-shaped sensor that requires an arm for signal emission and an opposite arm for signal capture. Fiber optic sensors have the signal emission and reception on the same arm. This compact design reduces damage from impacts in the production line.

How is the new web edge sensor's capabilities quantified?

Extensive testing has proven the capability of the sensor with any material without calibration both in static and closed loop setup. Results confirmed the ability of the sensor to reliably detect the material, and in combination with the control algorithm of the guide, correctly position the material under various simulated disturbances. The new sensor technology has a resolution of 0.0635 mm and linearity error under 0.25%.

Conclusion

In general, the new fiber optic sensor technology offers the nonwoven sector an easier transition into higher speeds, handling thinner and lighter materials. Moreover, this sensing technology allows converters to reduce equipment inventory since one sensor can be used for multiple applications where a combination of ultrasonic, infrared and pneumatic sensors might be required.