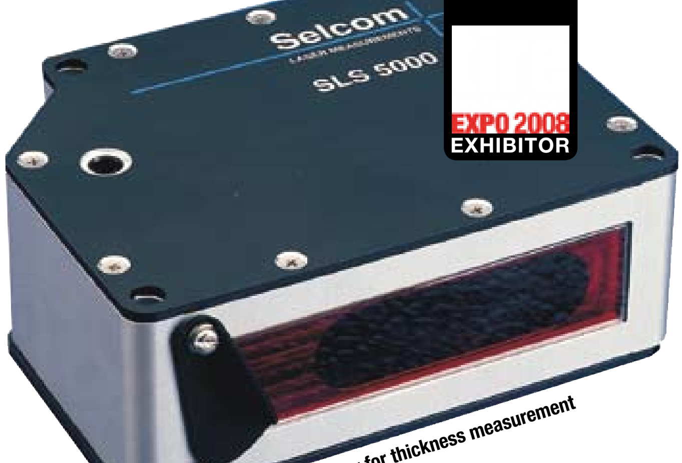

The 16kHz SLS 5000 sensor for thickness measurement

Laser team

A variety of laser sensing devices have been developed by **LMI Technologies** to ensure quality and safety in tire production

Offering major advantages over other sensing technologies, thousands of laser triangulation sensors have been implemented for in-process thickness measurement and control. When considering implementing laser sensors in either a new or retrofit application, the integrator is faced with the question of how difficult it will be to mount the sensors and integrate sensor data with the control system. Today's sensor technology makes interfacing easy, offering a selection of commercially standard techniques, based on specific application needs. Simplicity of implementation not only makes integration straightforward, it provides the end-user with maximum system reliability and minimum maintenance.

Automated non-contact, in-process thickness measurement of products such as calendered rubber optimizes material use, reduces setup times, and improves quality and consistency. In-process measurement ensures rapid response to thickness variation, and eliminates the cost of manual measurements.

A frequently used laser sensor for thickness measurement is the LMI Technologies, Inc. Selcom® SLS5000. This sensor provides high-speed (16kHz) data with real-time control of laser intensity to provide accurate measurement data from surfaces with varying texture, color and reflectivity. These sensors are also used for other in-process manufacturing applications, such as tread profilers, splice monitoring on tire build drums, green tire lateral and radial runout measurement, and tread wear inspection on finished tires for R&D product safety verification.


Ethernet output simplifies the use of multiple sensors

Some applications measure thickness relative to a reference roller. In some applications, where there is no reference roller, or where the material location fluctuates, a differential approach is used, with sensors placed above and below the product. This approach measures product thickness, even when material vibration or pass-line variation occurs.

After sensor mounting, the next task in integration is to interface the sensor outputs to the system control PLC, PC or other device. To simplify the task, Smart Sensor technology is used. The optical calculations are carried out in a processor inside the sensor head. These calculations include applying the triangulation equations, applying factory-developed linearization factors, applying automatic gain control to ensure accurate readings independent of the rubber surface texture and color, and conversion of the measured values to engineering units.

The integrator does not need to apply any processing for sensor operation. The only task is to connect the sensor output to the system processor. Several sensor output options are available. An analog output can be used for high-speed data transmission, but is subject to errors due to externally generated electrical noise. The preferred approach is the use of digital output using an RS-485 multidrop configuration or dedicated RS-422 links for streaming data at the full sampling frequency.

The internal processor inside the sensor has extra computational capacity for specialized applications, and can host added software processing provided by the manufacturer, the integrator, or the end user. Some examples of unique application software include finding seams, radial run-out measurements, and applying texture adjustment. These unique software components provide the user with the flexibility to enhance the sensor's functionality to accommodate their specific needs.

With simple interfacing to the system controller, thickness information is readily available for process monitoring or implementation of automated closed-loop control. Some thickness applications, such as tread extrusions, require measurement of a complete profile. The conventional approach to these types of applications was to mechanically scan a single point-sensor across the profile. Mechanical scanning adds cost and complexity to the system, and requires maintenance of the moving components. To eliminate the need for mechanical scanning, recent developments have led to the introduction of laser line sensors, which measure a profile over the width of the laser line.

For sidewall measurement, dual-vision laser line sensors are also used to simplify mechanical mounting and eliminate data dropouts for both new and retrofit applications. In thickness measurement applications that require profile data, the laser line sensor provides unique capabilities for both easy retrofitting and simple implementation in new systems.

Laser line sensors generate large amounts of data at high speed, more data than can be practically communicated to the system controller by simple digital interfaces. For easy integration these laser line sensors are provided with commercially standard Ethernet output.

Simple mounting and communications make adding laser thickness measurement to new or retrofit applications an easy task for the integrator. Implementation simplicity provides the end user with maximum reliability with minimum maintenance, and ensures optimized material use and quality of product with automated in-process measurement. ***tire***