Application Note

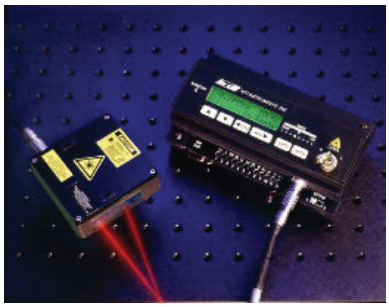
Determining Tire Tread Depth and Runout Using Laser Displacement Sensors

Introduction

With the recent rash of accidents attributed to tire failures, manufacturers are taking tire quality seriously. Customers are demanding safe, longer lasting tires that offer a smooth, vibration free ride. To satisfy their customers, and protect themselves from liabilities, manufacturers are moving to 100% tire inspection for defects and abnormalities.

The Problem

Defects not only cause potential safety issues but they can also introduce unwanted vibration into the vehicle suspension system. To avoid this, manufacturers are interested in determining tire runout, tread depth, tread evenness and overall tire quality. Each manufacturing step during the tire molding process is a potential area where quality can be jeopardized. Belts can be overlapped, or not cover the complete tire surface, causing weak or bubbled areas and imbalances. The tread depth can be too shallow, leading to decreased service life. An uneven tire can cause excessive runout and vibration. Keeping these within predetermined acceptable limits provides the consumer with a superior, higher quality product.



The Solution

MTII was approached by a major manufacture requesting a solution to measure tread depth, runout and blistering. They expected a non-contact sensor with a 40 mm (1.6") measurement range, a minimum standoff of 100 mm (4") and a frequency response greater than 5 kHz. The package needed to be capable of operating in a harsh manufacturing environment, 24-hours per day. MTII Application Engineers worked closely with the customer and provided the Microtrak II laser displacement sensor. After initial testing the customer was pleased to find that this one sensor was capable of making all three required measurements simultaneously.

The Results

The Microtrak II communicated with the customers DAQ system through the high speed RS-485 interface. Each signal was analyzed and tires found to be outside acceptable limits were rejected. The system obtained a measurement resolution of 20 microns (0.0008") with the adjustable filter set at 10 kHz. The standoff exceeded the customer's requirement, reducing the possibility of damage to the laser head.

MTII manufactures high precision laser, fiber-optic and capacitance systems with resolutions to 0.04 micro-inch (1 nm) and frequency responses to 500 kHz. Contact MTI's experienced Application Engineers for solutions to your difficult measurement needs.

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