**A WISE Strategy for Mandatory Wheel Inspection and Maintenance Operations**

Wheels continue to be a critical path item in the maintenance of high-speed trainsets, locomotives, freight cars, and passenger coaches. Mandatory wheel inspection and maintenance operations, including change-outs and wheel profiling, are time consuming and expensive.

Wheel management requires routine measurements of the wheel that typically have been taken by a significant labor force using mechanical gauges. Historically, this method is inherently affected by human error, climate and weather conditions, subjective measurements, transcription errors, etc.

International Electronic Machines Corporation has developed an automated **Wheel Inspection System Environment (WISE)** utilizing a modular approach to integrate subsystems for producing required wheel measurements, detecting flat spots and roundness, tread cracks and defects, as well as brake pad and shoe measurements. WISE encompasses patented designs combining laser scanning and high-speed imaging to provide a cost-effective and innovative solution.
WISE Modular Subsystems

**Wheel Profile and Diameter Measurement**

The Wheel Profile/Diameter subsystem incorporates multiple-line lasers and high-speed cameras providing the highest level of accuracy and repeatability for railway wheel measurements on moving trainsets at low and high speeds. This approach generates a computer model of each wheel and computes the measurements for flange thickness, flange height, rim thickness, flange angle, diameter, and back-to-back reading.

**Tread Crack Defect Detection**

The in-line Tread Crack Defect Detection system automatically detects cracks and defects in wheel treads by use of Electro-Magnetic Acoustic Transduction (EMAT) technology. Two ultrasonic probes in each rail induce signals that travel the circumference of the wheel and reflect off cracks and defects. A lack of signals indicates no defects. All reflected signals are transmitted back to the central processor and analyzed to determine the extent of the defect. If warranted, notification for action is made immediately.

With state-of-the-art machine vision technology, IEM’s Brake Pad / Shoe Measurement subsystem automatically locates and measures the thickness of brake pads and shoes on each wheel. Two towers, one on each side of the track, contain an LED light source for scene lighting and two cameras; one to image the top of the brake shoe, the other to image the bottom. Upon image capture, IEM’s proprietary software algorithms register and measure the images. The system then reports the freight car and wheel location requiring a change-out.

A series of impact detectors placed parallel to the rail comprise the Flat Spot and Roundness Detection subsystem. A rotating tread plate travels downward to the level of the wear on the wheel. Its movement is digitally measured and transmitted to the central processor for analysis. Excessive wear or defects are reported immediately. The number of detectors required is based upon wheel circumference.