Eddy-Current Crack Detection Technology for Fasteners & Flanged Parts

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The new patent-pending RCD-9500 (Rotational Crack Detection) from Mectron Engineering Co., Inc., is an eddy-current crack detection system designed for a wide variety of fasteners and flanged parts. The RCD-9500 is capable of working as either a stand-alone machine or mated with a Mectron Qualifier, LT-series or MI8500 machine. The RCD-9500 includes an array of optical sensors to allow fully automated part separation, feeding, scanning and acceptance testing. The RCD-9500 utilizes a pair of servo-driven rollers to rotate the part in place, scanning the area of interest multiple times. This approach leads to greater accuracy and reduced signal noise without sacrificing speed.

Upgraded Eddy-Current Technology

The system is integrated with Mectron’s newly upgraded EC600. The EC600 is a digital eddy-current instrument with specially designed software for many diverse applications. It has a usable frequency range of 2 KHz to 2 MHz. It utilizes a touch-screen, 1280 x 1024, back-lit display, which allows for complete control of the impedance plane signature. The displayed eddy-current signal can be easily manipulated to alter frequency, phase, horizontal gain and vertical gain. A high and low threshold can be set and altered to determine differences between good and bad parts. Figure 1 displays a bad part with a signal that is above the set threshold, while Figure 2 shows an example of what a good part would look like. All setups are easily saved internally to the hard drive and can be recalled at a later date.

The system implements a differential eddy-current probe for the inspection, which uses two coils sending separate eddy-current signals. The first coil is the test coil and the second is the reference coil (Figure 3). If the part is free of defects, then the eddy-current signature of the test coil will always match the signature from the reference coil. When the coils run over a crack or defect, the eddy-current signal will register differently (as seen in Figure 1). This throws the two

Fig. 1 and Fig. 2 — Bad part with a signal that is above the set threshold (top) and example of good part (bottom).
coils out of phase to each other and this inconsistency will be registered in the EC600 and recorded as a defective part.

This type of probe allows some lift-off and increased accuracy for consistently moving parts. The differential probe coupled with Mectron’s proprietary software allows for speeds of up to 180 ppm, making the RCD-9500 one of the fastest machines on the market.

High-Resolution Camera/Proprietary Software

The torx detection of the part is done using a high-resolution CCD camera with Mectron proprietary software. It can check for consistency of the part or wording in the head using a master reference. The camera is triggered by an optic sensor and takes a few pictures for each part to ensure all defects are found. The custom lighting of the part makes little details easy for the camera to spot and the software to pick out (shown in Figure 4). This allows for quick and accurate decisions.

The RCD-9500 is fed by a vibratory in-line feed system (Figure 5). When an optical sensor detects a part ready for scanning, a sprocket separator wheel pushes a single part onto the rotating rollers. The part will fall into the center of the rollers in-line with the eddy-current probe. Once the part is spinning, the differential eddy-current probe begins to scan, collecting data for several revolutions and monitoring for defects. When the scan is complete, the rollers are driven apart, allowing the part to fall onto the pneumatically operated gate below, where it is either rejected or accepted.

The separator and roller systems are completely modular—rollers and separator wheels can be custom machined to suit unique parts without altering any other tooling. This makes changeover quick and easy, allowing for smooth transition between parts.

The RCD-9500 is capable of easily inspecting many different types of parts including ball studs, wheel studs and a variety of other fasteners. The rollers can also be contoured to correct for cosine angles of the parts. The unique split gate system allows for high-speed actuation when scanning small-diameter parts, while remaining robust enough to handle parts up to 10” long and over 1.5” diameter. The RCD-9500 is also fully compatible with the Mectron Qualifier for dimensional verification.

The versatility, accuracy and speed of the RCD-9500 make it a unique inspection system that will be very competitive in the industry. Its versatility is compounded by its ability to be mated with a variety of Mectron’s other systems, and the use of differential eddy-current probes mean quick and accurate defect detection. For additional details, visit the Mectron Engineering Co., Inc. website below.

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