Testing Wire & Rod

by:
Jean Gould
Marketing Manager
Magnetic Analysis Corporation (MAC)
103 Fairview Park Drive
Elmsford, NY 10523-1544 USA
www.mac-ndt.com

Eddy current technology is the go-to wire and cable testing method for checking continuity, alloy and other conditions as well as for locating welds and splices.

Eddy current testing is generally the best choice to inspect wire in-line with cold heading operations such as spring making and other parts forming, and for checking continuity, alloy and other conditions. Eddy current tests are also frequently used to locate welds and splices in insulated cable.

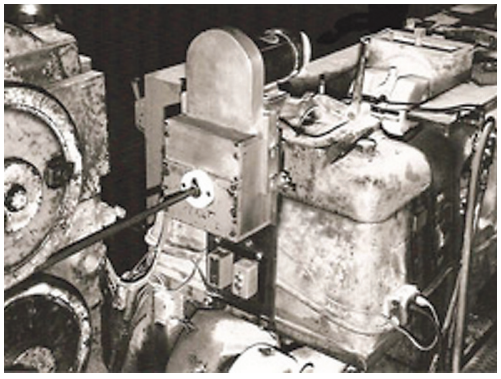
The choice of equipment depends on the nonconforming conditions you wish to detect and the size and characteristics of the material. **MAC** instruments can handle a range of metal wire including cut lengths, continuous production, stranded, multi-conductor and insulated cable. Carbon steels, stainless alloys, copper, aluminum, titanium and other nonferrous metals can be inspected. Additional items such as markers, controls, demagnetizers and components for mounting the encircling or segment test coils and saturation coils, and positioning and driving the material through the test, are combined with the instrumentation to make up a complete test system.

Typical flaws and conditions that can be detected using this equipment include chevron cracks, laps, seams, slivers, weld line faults, welds, butt welds, breaks, continuity checking, variations in heat treat, variations in grade, variations in alloy and other flaws and conditions.

Testing Wire

Testing Cold Drawn Wire

MAC eddy current systems are available to test cold drawn wire on a processing machine such as a bull block or cold header. Two methods are available, depending on the types of surface defects likely to occur. Encircling coils including DC saturation on magnetic steel wire are used to detect short defects, and rotating probes are used for longitudinal defects.



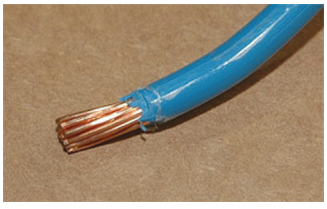
Inspecting cold drawn wire on a header.

Testing Fine Diameter Wire

MAC has eddy current systems with specially designed small test coils that operate at very high frequencies for inspecting ultra-small-diameter super conductor wire, tungsten filament wire and other exotic alloy wire sometimes used in critical medical applications.

Testing Insulated Wire & Cable

MAC eddy current systems for insulated wire and cable such as multi-conductor automotive and building wire, detect splices, welds and breaks at very high throughput speeds. Split coils are available to accommodate oversize splices.



Insulated multi-conductor copper wire.

Detecting Flaws & Conditions

Detecting Defects in Small Diameter Wire

MAC's Hi Frequency eddy current instruments are well suited for detecting small defects in wire including nickel-titanium and tungsten-rhenium alloys frequently used in critical medical and other high-performance applications such as guide wires. Test frequencies range up to 5 MHz and diameters as small as 0.0035" (0.089 mm) can be tested with special test coils at test speeds up to several thousand fpm.

Surface Cracks in Roller Bearings During Heading Operations

An eddy current tester such as the MultiMac® used with rotary test probes, can detect surface cracks in the wire as it is fed into the header for forming into a roller bearing or other part. The test output can be configured to activate rejection of the slug or finished part.

Seam-Type Defects in Wire for Cold Forming Applications

An eddy current tester such as the new MultiMac test equipment used with rotating probe-type sensors, is the method of choice to detect seam-type defects in cold drawn wire in conjunction with wire drawing, spring makers and other parts forming applications. By rotating multiple test probes at speeds to 6000 RPM around the wire, even relatively short, longitudinal surface flaws can be reliably detected in many applications, without sacrificing throughput speed. A range

of output options allows rejecting or accepting formed parts further down-line.

Short Surface and Subsurface Cracks

For detecting typical defects such as cracks, butt welds, inclusions and other defects in steel, stainless alloy or nonferrous wire, an eddy current instrument such as the MultiMac with encircling test coils is often selected. The MultiMac, with a high test frequency range, can also be used on small diameter material such as tungsten filament wire.

Short and Long Continuous Surface and Subsurface Defects

For applications that require the detection of both short and long continuous surface or subsurface defects, the new MultiMac, multi-mode eddy current tester would be the right choice. The MultiMac with up to eight test channels, allows simultaneous detection of both types of defects in magnetic or nonmagnetic material.

Detecting Breaks in Wire Rope

To detect broken wires in magnetic grades of wire rope, a flux leakage instrument similar to the Wirerope Tester is the appropriate choice. A split test coil can be used to eliminate the need to rethread the wire through the test coil.

Continuity Checking in Wire

To check for continuity in single or multi-conductor insulated wire and cable, the economic Minimac MAC 40 requires minimal operator time and can be installed directly on the production line. Split or segment coils can be used to allow clearance for intermittent dimensional changes in the outside diameter of the insulation.

Alloy and Hardness Detection

Variations in alloy, heat treatment, case depth and hardness can be successfully detected by MAC's comparators. The Varimac® eddy current comparator can be used on a range of product shapes and materials including nonmagnetic stainless steels. Variations in carbon steel wire can also be detected with the Production Comparator low-frequency electromagnetic comparator.

Combined Systems

For applications where more than one of the conditions described above must be met, Multiple Test Systems using several testers can be assembled. In these cases, each tester is used to find the types of defects or conditions that it is best suited to detect. The result is often a more accurate test and fewer rejects to allow more of your product to be shipped to your customer.

To learn more about the wire and rod testing equipment available from Magnetic Analysis Corporation, visit the company's website listed below.

www.mac-ndt.com

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A Closer Look at Two MAC Eddy Current Systems

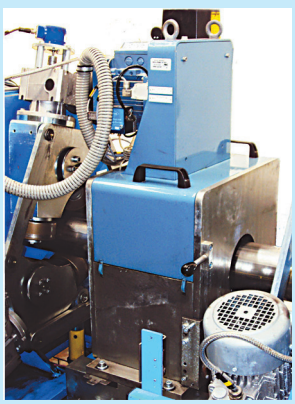
The MultiMac® eddy current instrument is designed for encircling coil, sector and rotary probe testing of tube, bar and wire. MultiMac features include simultaneous coil and/or rotary probe operation, differential and/or absolute mode operation, up to eight independent test channels and1 KHz to 5 MHz test frequency selection for each channel. The system's display is simultaneous polar and linear, and the system can store and recall setups as well as print and transfer data. Versatile threshold selection includes chord, half chord, sector and all phase.

MultiMac® eddy current unit for encircling coil, sector and rotary probe testing.

MultiMac applications include short surface and some subsurface defect detection, identification of seam-type surface defects and laps and magnetic or nonmagnetic testing of wire, bar and tube. Inspection can be in-line with continuous wire operations.

The Rotomac® eddy current rotary mechanism is designed for the detection of seam-type defects in tube and bar. These rotary systems use the qualities of eddy current rotary probe technology to detect long continuous surface flaws, which may not be detected by encircling test coils. MultiMac eddy current electronics provide the controls, processing and analysis for the Rotomac. MultiMac can also assign channels to an encircling coil test to detect short, intermittent defects, in combination with the rotary test, where needed.

The rotary probe technology requires relative motion between the probe and the test material. Two or more probes rotate around the test material, inducing eddy currents. When the induced eddy currents are disrupted by a surface defect, the change is sensed by the probe, and a flaw signal is sent to the instrumentation for processing and display. The amplitude of the signal for any surface seam is highly proportional to its depth. In general, either a higher rotational speed, or a greater number of test probes, at a given throughput speed, enables shorter defects to be detected. Rotomac applications include high-speed testing of wire, rod and bar. ***www.mac-ndt.com***



Rotomac® eddy current rotary system for detecting seam-type defects.