

TECHNICAL BULLETIN

USES OF EDDY CURRENT TO DETECT IMPERFECTIONS IN REFILLABLE HIGH PRESSURE VESSELS

Scope

This technical bulletin gives guidance on the general applications and functions of eddy current in the gas cylinder industry.

Background

Eddy current is a nondestructive evaluation (NDE) technique used for measuring conductivity, coating thickness, and detection of surface and subsurface discontinuities.

This test method lends itself very well to automation because test results are instantaneous. Test systems can also be designed for high-speed inspection in a “go/no-go” situation.

The effectiveness of this technique depends on the electrical conductivity of the material to be tested. Typically, the higher the conductivity of the material, the higher the sensitivity of detection. Aluminum alloys and stainless steels are usually appropriate for this kind of testing. It is sometimes difficult to test ferromagnetic material using eddy current. Testing composite materials is always impractical and most often not possible.

Applications

Before manufacture—eddy current may be used for the detection of surface and subsurface flaws in the starter material for fabrication of gas cylinders. Typically, this test procedure is suitable for testing starter stock in the form of drawn rods, bars, and tubes where potential discontinuities such as laminations and surface tears could result from the drawing operation. This test method may be used to complement other NDE techniques such as ultrasonic testing. It is especially effective for detecting and quantifying surface breaking discontinuities.

At time of manufacture—the application of eddy current for inspection of gas cylinders is limited by access to the area to be inspected as well as the surface condition. Rough surface conditions can cause a loss in sensitivity or erroneous interpretation of the signals. Conductivity measurement can be used in conjunction with hardness tests for verification of heat treatment response.

After manufacture—during service, eddy current may be used to test cylinders for discontinuities including cracks, inclusions, and broken threads in the threaded areas and other locations where discontinuities can develop. Testing is limited by access to the area to be inspected. Eddy current may be used to measure conductivity to determine exposure to elevated service temperature, which can affect the mechanical properties of aluminum alloy cylinders.

Additional references

ASNT-1611, *Level II Classroom Training Books: Eddy Current Testing*, American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228. www.asnt.org

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Hagemaier, Donald J., *Fundamentals of Eddy Current Testing*, The American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228. www.asnt.org

Mester, Michael L. (tech. ed.); McIntire, Paul (ed.), *Nondestructive Testing Handbook-Third Edition, Volume 5: Electromagnetic Testing*, The American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228. www.asnt.org

McMaster, Robert C. (ed.), *Nondestructive Testing Handbook, first edition*, The American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228. www.asnt.org

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NOTE—No technical information has been changed from the 2001 edition. This reaffirmed edition may include minor editorial changes.

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