1 / 12 · Evaluation Techniques

Relevant, nonrelevant, false: what separates them?

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2 / 12 · Evaluation Techniques

Suspected false indication: first check?

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3 / 12 · Quality Control of Equipment Processes

Settling test vs water-break test: what does each show?

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4 / 12 · Equipment

Electromagnetic vs permanent-magnet yoke: key contrast?

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5 / 12 · Equipment

Duty cycle 10% with 3 s shots: minimum start-to-start time?

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6 / 12 · Types of Discontinuities

Inherent, processing, service: where does each arise?

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2 / 12 · Evaluation Techniques

Clean the area and reprocess the same way. Gone: likely residue, drainage or lint. Returns: leakage, or surface texture that holds particles. If it returns, change the field direction before deciding.

Topic: false indications, verification by reprocessing

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1 / 12 · Evaluation Techniques

Cause. Relevant: leakage field from a real discontinuity. Nonrelevant: real leakage, but from a design or permeability feature (thread root, keyway, section change, joint). False: no leakage field at all; particles held by residue, roughness, lint or drainage.

Topic: relevant, nonrelevant and false indications

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4 / 12 · Equipment

An electromagnetic yoke can be switched off before lifting. A permanent magnet cannot, so lifting can disturb indications and it draws loose steel. Its strength is also fixed.

Topic: portable yokes

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3 / 12 · Quality Control of Equipment Processes

Settling test: particle concentration, and any contamination layer. Water-break test: whether a water-based bath wets the part in an unbroken film.

Topic: bath checks, settling test and water-break test

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6 / 12 · Types of Discontinuities

Inherent: from solidification and primary forming (pipe, porosity, inclusions). Processing: from forming, welding, heat treatment, finishing (laps, quench and grinding cracks). Service: in use (fatigue, stress corrosion).

Topic: inherent, processing and service discontinuities

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5 / 12 · Equipment

Duty cycle = on-time / total cycle. 3 s / 0.10 = 30 s per cycle. Exercise numbers; real ratings come from the maker's data plate.

Topic: power pack duty cycle

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7 / 12 · Principles

Retentivity vs coercive force?

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8 / 12 · Flux Fields

Circular vs longitudinal field: which flaws does each find?

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9 / 12 · Effects of Discontinuities on Materials

Why can a discontinuity create a magnetic leakage field?

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10 / 12 · Magnetization by Means of Electric Current

AC, half-wave DC, three-phase full-wave DC: rank field depth and particle mobility.

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11 / 12 · Selecting the Proper Method of Magnetization

Head shot, central conductor, coil: which flaws does each show?

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12 / 12 · Demagnetization Procedures

Soft shaft versus hardened pin: which is harder to demagnetize, and why?

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8 / 12 · Flux Fields

Each field finds discontinuities that cross it. Circular (current through the part) finds flaws along the length. Longitudinal (coil or yoke) finds flaws across the part.

Topic: circular and longitudinal fields

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7 / 12 · Principles

Retentivity: how much magnetism stays when the field is removed. Coercive force: the reverse field needed to bring it back to zero. High values of both make a part harder to demagnetize.

Topic: hysteresis loop terms

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10 / 12 · Magnetization by Means of Electric Current

Depth: AC shallowest, half-wave DC deeper, three-phase full-wave DC deepest. Mobility runs the other way: AC best, half-wave DC very good with dry powder, three-phase full-wave DC lowest.

Topic: current types, field depth and particle mobility

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9 / 12 · Effects of Discontinuities on Materials

A discontinuity changes the magnetic path. Part of the flux can take an air path near the surface and attract particles. Leakage does not require the surrounding steel to be saturated.

Topic: reluctance and the leakage field

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12 / 12 · Demagnetization Procedures

The hardened pin. Its coercive force is higher, so a stronger reversing field is needed to bring its flux to zero. The setting that cleared the soft shaft may leave a field in the pin.

Topic: coercive force and demagnetizing effort

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11 / 12 · Selecting the Proper Method of Magnetization

Head shot and central conductor give circular fields, so they show flaws running along the part's axis. A coil gives a longitudinal field, so it shows flaws running across the part. Pick the setup whose flux crosses the expected crack.

Topic: matching field direction to flaw direction

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