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AEROSPACE MATERIAL SPECIFICATION

AMS 3042A
Superseding AMS 3042

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MAGNETIC PARTICLES
Wet Method, Dry Powder

1. SCOPE:

1.1 Form: This specification covers magnetic particles in the form of dry powders and, when specified, including the oil or vehicle to be used of the type and in the proportions required.

1.2 Application: Primarily as the inspection medium in a wet magnetic particle inspection system as defined in AMS 2640 or MIL-I-6868, using either an oil or an inhibited water vehicle.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2640 - Magnetic Particle Inspection
AMS 3161 - Inspection Oil, Odorless, Heavy Solvent

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D96 - Water and Sediment in Crude Oils
ASTM E11 - Wire-Cloth Sieves for Testing Purposes

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-I-6868 - Inspection Process, Magnetic Particle

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: The product shall be composed of durable magnetic particles, suitable for long-time use, which may have been dyed or otherwise treated to attain the color specified. This dry powder is designed for use with an aqueous vehicle or an odorless inspection oil conforming to AMS 3161, or equivalent odorless oil, and shall disperse evenly and thoroughly in the recommended vehicle.

3.2 Properties: The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified test procedures, using a test suspension prepared as in 4.3.1.

3.2.1 Contamination: The product shall show no evidence of foreign material, agglomeration, or scum, determined by visual examination of the test suspension at the following times:

3.2.1.1 During preparation of the test suspension as in 4.3.1.

3.2.1.2 After mixing the test suspension, allowing it to stand for not less than 30 min., and agitating it slightly.

3.2.1.3 During the tests to determine other characteristics of the product.

3.2.2 Color: The color of the magnetic particles in suspension shall be black, red, or as ordered, determined by observing a well-dispersed sample of the test suspension in a glass container under a white light of not less than 100 ft-candles (1075 lm/m^2) at the examining surface.

3.2.3 Particle Size: The magnetic particles shall be of such size that not less than 98% by weight shall pass through a 3-in. (75-mm) diameter U.S. Standard No. 325 (45 µm) sieve, as defined in ASTM E11, determined by passing a 1-qt (1-L) sample of stirred test suspension through the sieve. After the test suspension liquid carrier has completely passed through the sieve, rinse with 1 qt (1 L) of the original liquid carrier. Dry the sieve to remove all of the liquid and determine the dry weight of the residual particulate material not passing through the sieve as related to the original weight of the particulate material in the sample, expressed in percent.

3.2.4 Magnetic Extraction: The magnetic particles shall be attracted and removed from the vehicle with no more than a trace remaining in the bottom of the container, determined as follows:

3.2.4.1 Prepare an electromagnet consisting of an ingot iron core, 0.312 in. ± 0.031 (7.80 mm ± 0.80) diameter and 3.00 in. ± 0.13 (75.0 mm ± 3.2) long, with a 2-in. (50-mm) long nonmagnetic handle attached to one end, the core being wrapped with 25 turns of No. 12 (2.052 mm diameter) enameled copper conductor, or use an equivalent electromagnet.

3.2.4.2 Place 100 mL of freshly-stirred suspension prepared as in 4.3.1 into a 150 mL glass container (approximately 2 in. (50 mm) in diameter). Lower the magnet, energized with 15 A of direct current, into the suspension and progressively extract the particles by carefully removing the probe from the sample, shutting off the current, and removing the particles from the electromagnet. Repeat the extraction operation until all possible magnetic particles have been removed from the vehicle. Allow the liquid in the container to stand undisturbed for not less than 30 min. and examine the container over a white surface under a white light of not less than 100 ft-candles (1075 lm/m^2) at the examining surface.

3.2.5 Sensitivity: The product shall show a five-hole indication of the ring test specimen defined in MIL-I-6868, determined as follows:

3.2.5.1 Place the ring on a 1-in. (25-mm) diameter copper bar and circularly magnetize in a standard magnetic particle inspection unit by passing 2500 A of direct current through the bar immediately before flushing the ring with the agitated test suspension that has passed the concentration, contamination, and magnetic extraction tests. Examine the ring under a white light of not less than 100 ft-candles (1075 lm/m^2) at the examining surface.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all Ø required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as Ø preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, on each lot, when a change in material or processing, or both, requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data and, when Ø requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Sufficient product shall be taken at random from each lot to perform all required tests in triplicate. A lot shall be all product produced in a single production run from the same batches of raw materials under the same fixed conditions and presented for vendor's inspection at one time. A lot may be packaged in smaller quantities and delivered separately under the basic lot approval provided lot identity is maintained.

4.3.1 Sample Preparation: The test suspension for determining conformance to the technical requirements of this specification shall be prepared by adding sufficient dry powder solids to distilled water or odorless inspection oil, to produce a suspension concentration of 0.2 - 0.5 mL of Ø magnetic particles in 100 mL of suspension. The concentration shall be verified by mixing the suspension thoroughly, filling a 100-mL pear-shaped calibrated centrifuge tube as specified in ASTM D96, allowing the tube to stand undisturbed for at least 30 min., and reading on the calibrated tube the volume of the particles settled from the suspension.

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived by purchaser. Results of tests on production material shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample material. Production material made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, AMS 3042A, vendor's material designation, lot number, date of manufacture, color, and quantity.

4.6 Resampling and Retesting: If any sample used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification: