SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS4792

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WATER CONDITIONING AGENTS FOR AQUEOUS MAGNETIC PARTICLE INSPECTION

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE:

1.1 This SAE Aerospace Standard (AS) covers water conditioning agents used to facilitate aqueous wet-method magnetic particle inspection.

1.2 Such conditioning agents, in powder or liquid form, provide suitable corrosion protection, wetting, and particle dispensability properties when mixed in water for application of magnetic particles on the surface of an object for magnetic particle inspection as described in AMS 3042, AMS 3044, AMS 2640, MIL-STD-1949, and others.

1.3 Water conditioning agents can consist of varying combinations of such components as dispersants, surfactants, corrosion inhibitors, and anti-foaming agents. Individual components may be added to the bath of a system to develop specific properties. The user is referred to the manufacturer of the conditioning agent to develop the most suitable combination of ingredients for the user's requirements.

1.4 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this aerospace standard may involve the use of hazardous materials, this aerospace standard practice does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this aerospace standard to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2640 Magnetic Particle Inspection
AMS 3042 Magnetic Particles, Nonfluorescent Wet Method, Dry Powder
AMS 3044 Magnetic Particles, Fluorescent, Wet Method, Dry Powder

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 96 Determination of Sediment and Water in Crude Oil by the Centrifuge Method (Field Procedure)

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-1949 Inspection, Magnetic Particle

3. PREPARATION:

3.1 Bath Preparation:

The conditioning agent shall be first added to the water bath, followed by the dispersion of the magnetic particles in accordance with manufacturer's instructions.

3.2 Premixed Particles:

When using a product containing a premixture of water conditioner and magnetic particles, the premixed product shall be mixed with tap water in accordance with manufacturer's instructions.

3.3 Equipment:

Equipment used for evaluation of an aqueous magnetic particle suspension shall be clean and free from contaminants including dirt, oil, and other foreign substances.

3.4 Storage:

Conditioning agents shall be stored at room temperature in a sealed container away from heat, cold, and moisture. An acceptable shelf life shall be as recommended by manufacturer. Expiration date of the product, when applicable, shall be plainly marked on the package label by the manufacturer. Improperly stored or otherwise spoiled agents shall be disposed of in accordance with appropriate regulations.

3.5 Property Requirements:

3.5.1 Material: The conditioning agent shall be a water soluble or water dispersible compound conforming to the following requirements when tested in properly diluted form.

3.5.1.1 Fluorescence: The fluorescence of the conditioning water shall be not greater than that of a 10 ppm (1.27×10^{-5} molar) solution of quinine sulfate dehydrate in 0.1 N sulfuric acid (H_2SO_4), determined by visual comparison of the two solutions in 10 x 75 mm glass tubes. Minimum blacklight intensity shall be 1200 microwatts per cm^2 at the surface.

3.5.1.1.1 Determinations shall be made by visual comparison of the two tubes under blacklight of 365 nm wavelength.

3.5.1.2 Particulate Matter: The conditioning agent shall be readily and fully soluble in water. A solution of conditioning agent and water shall not display any particulate matter.

3.5.1.3 Basicity: Solution shall exhibit a pH of 7.0 to 10.0.

3.5.1.4 Odor: Shall not be offensive, objectionable, or disagreeable.

3.5.1.5 Toxicity: A solution shall have no adverse effect on the health of personnel when used for its intended purpose. The fluid shall not contain any components which produce vapors in such concentrations as to be an annoyance to personnel during use.

3.5.1.6 Surface Wetting/Adherence: An unbroken film shall be observed over the entire part when tested in accordance with 4.1.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Water Break Test:

A clean part with a surface finish the same as parts to be tested shall be flooded with the conditioned water. Note the appearance of the surface during flooding. Sufficient wetting agent is deemed to be present if a continuous film forms over the entire part. If the part shows a break in the suspension film during flooding exposing bare surface, insufficient water conditioner may be present or the part may not be adequately cleaned. Additional agents, such as anti-foaming agents, may be added to the bath so long as bath performance is not affected.

4.2 Preliminary Processing Evaluations:

An aqueous magnetic particle bath suspension shall be prepared by dispersing the recommended levels of magnetic particles and conditioning agent in water (preferably at room temperature).

4.2.1 Preparation: Identify the part of component to be inspected and ensure that it is free of oil, dirt, or any other foreign substance. Immerse, spray, or otherwise expose the object to the aqueous bath solution. Excess solution should be allowed to drain and the part shall then be placed in an environment representative of its usual processing and left undisturbed for sufficient time to allow complete drying of the surface.

4.2.1.1 Inspect the surface for any indication of corrosion. If an indication is observed that is deemed objectionable, the test may be repeated with an increased concentration of corrosion inhibitor in the solution. The tests may be continually repeated until a suitable concentration level is established, and that level shall be considered the standard concentration of corrosion inhibitor for that object or part of material.

4.2.1.1.1 Corrosion of Equipment and Materials: Inspection equipment and particles may be subject to corrosion when used with a water-bath system. Consideration of this probable effect should be taken when developing the requirements of the conditioning agent.

4.3 Fluorescence:

Place a 100-ml sample of the completely prepared magnetic particle aqueous bath in a pear-shaped centrifuge tube in accordance with ASTM D 96. Allow the tube to stand undisturbed for not less than 60 min and examine the liquid above the precipitate under blacklight. Fluorescence observed in the liquid should be visually compared to the fluid prepared as in 3.1 or 3.2.

4.3.1 Acceptance criteria shall be in accordance with ASTM D 96 and parameters of MIL-STD-1949.

4.3.2 Particles shall settle evenly in the ASTM D 96 tube and shall not exhibit an uneven appearance.

4.4 Deterioration: Water additives shall not cause any deterioration to the particles or their coatings when tested in accordance with AMS 3042 or AMS 3044.

5. RESPONSIBILITY FOR INSPECTION:

Quality assurance departments or individual inspection parties are responsible for protection from corrosion during storage or transit of parts/components after inspection.

6. REJECTIONS:

Water conditioning agents, when tested in accordance with provisions of this aerospace standard, that do not conform, will be subject to rejection or retesting as noted.