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(JSSA/JSA)

**Testing method for corrosion
and scale inhibition performance
of water treatment additives
in cooling water system**

ICS 71.100.80; 77.060

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from the Japan Stainless Steel Association (JSSA)/the Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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In the event of any doubts arising as to the contents,
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Testing method for corrosion and scale inhibition performance of water treatment additives in cooling water system

1 Scope This Japanese Industrial Standard specifies a testing method for evaluation of prevention effect on corrosion and scale sticking of water treatment additives on the metallic heat transfer surface of an open circulation cooling water system using fresh water.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall apply.

JIS G 3141 *Cold-reduced carbon steel sheets and strip*

JIS G 3445 *Carbon steel tubes for machine structural purposes*

JIS G 3459 *Stainless steel pipes*

JIS K 0101 *Testing methods for industrial water*

JIS K 0116 *General rules for atomic emission spectrometry*

JIS K 0119 *General rules for X-ray fluorescence spectrometric analysis*

JIS K 0121 *General rules for atomic absorption spectrochemical analysis*

JIS R 6252 *Abrasive papers*

3 Test apparatus The test apparatus shall be as follows.

- a) The whole of the test apparatus shall be an open circulation cooling water system comprising a cooling tower, a water temperature controller, a water tank, a liquid surface controller, an injection apparatus for water treating additives, a circulation pump, an apparatus for measurement and control of electric conductivity, a flowmeter, a heat exchanger and a test piece holder, which can control the water temperature in the water tank and the electric conductivity.
- b) For an outside tube of the heat exchanger, the glass tube as given in Attached figure 2 is used, into which a test heat transfer tube is inserted. The dimensions of the glass tube shall be as follows.

Dimensions of glass tube: outside diameter 25.0 ± 0.1 mm

inside diameter 20.2 ± 0.1 mm

length 310 ± 5 mm

- c) For a heating apparatus, the electric heater as given in Attached figure 3 is used. The electric heater is used by being inserted into the test heat transfer tube specified in 4.1. Dimensions and a heating capacity of the electric heater shall be as follows.

Electric heater dimensions: outside diameter $10.0^{+0.3}_0$ mm
heating length 300 ± 5 mm

Heating capacity: That conforming to the condition of 5.1 c).

- d) For the cooling tower, that of an induced draft counter flow contact type is used, and the cooling capacity shall be 6 kW or higher (1.5 refrigerating tons).
- e) For materials for the water tank and the piping, stainless steel (SUS304 of **JIS G 3459**) or corrosion resistant organic material is used. When the organic material is used, materials durable to 60 °C shall be used.
- f) The water capacity of the whole system including the water tank and the piping shall be 60 ± 5 L.
- g) A level controller is installed to keep a water level in the water tank constant.
- h) Variation of a water temperature is kept within ± 1 °C.
- i) The electric conductivity of circulating water is continuously measured. When the electric conductivity exceeds the set range, the width of variation is kept within ± 10 % by adding make-up water and the like.

4 Test material

4.1 Test heat transfer tube A test heat transfer tube shall be as follows.

- a) For the material, carbon steel (STKM11A of **JIS G 3445**) is standard. As occasion demands, other material (copper, copper alloy or stainless steel) may be used.
- b) The shape and the fixation condition to the heater shall be as follows.

Nominal outside diameter: 12.7 mm, wall thickness 1.2 mm

Length: 500 mm to 510 mm

The outside diameter of the heater is adjusted so that a difference between the inside diameter of the test heat transfer tube and the outside diameter of the heater becomes 0.6 or less.

- c) The surface is finished by polishing with No. 400 abrasive paper specified in **JIS R 6252**. However, the surface finish may be changed as agreed upon between the supplier and the purchaser.
- d) The test heat transfer tube is degreased and washed by a suitable solvent before testing, and dried after cleaning. The mass is obtained to the nearest of 0.1 mg and it is taken as the mass before the test (M_a).

4.2 Test piece A test piece shall be as follows.

- a) For the material, carbon steel (STKM11A of **JIS G 3445** or SPCC of **JIS G 3141**) shall be standard and as occasion demands, other material (copper, copper alloy or stainless steel) may be used.
- b) The dimensions are such that the surface flow rate of circulating water becomes the same as that for the test heat transfer tube.