

MATERIAL AND EQUIPMENT STANDARD
FOR
INHIBITING PACKAGE
FOR
COOLING WATER SYSTEMS

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1. SCOPE

This Standard specification covers the minimum requirements for an inhibiting package which will be used in the cooling water system to inhibit all types of corrosion, scale formation, fouling and biological activities.

2. REFERENCES

Throughout this Standard the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor:

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

ANSI Z 129.1 "Precautionary Labeling of Hazardous Industrial Chemicals Standards"

API (AMERICAN PETROLEUM INSTITUTE)

API RP 38 "Recommended Practice for Biological Analysis of Subsurface Injection Waters"

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

D 2688-83 "Standard Test Methods for Corrosivity of Water in the Absence of Heat Transfer (Weight Loss Methods)"

G 4-84 "Standard Method for Conducting Corrosion Coupon Tests in Plant Equipment"

G 31-85 "Standard Practice for Laboratory Immersion Corrosion Testing of Metals"

ISO (INTERNATIONAL STANDARD ORGANIZATION)

ISO 2859-1 Sampling Procedures for Inspection by Attributes:
 Part 1:
 "Sampling Plants Indexed by Acceptable Quality Level (AQL) for Lot-by-Lot Inspection"

NACE (NATIONAL ASSOCIATION OF CORROSION ENGINEERS)

NACE Std. TM-0169 "Laboratory Corrosion Testing of Metals for Process Industries"

NACE Std. TM-0374-74 "Laboratory Screening Test to Determine the Ability of Scale Inhibitors to Prevent the Precipitation of Calcium Sulfate and Calcium Carbonate from Solution"

MIL (US MILITARY STANDARD)

MIL-Std. 105 "Sampling Procedures and Tables for Inspection by Attributes"

3. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

4. SYSTEM DESIGN

The supplier and/or manufacturer shall design an inhibiting package to be able to inhibit all types of corrosion and scale formation, biological activity and fouling (if needed) in the cooling water system with reference to attached data sheet. The supplier and/or manufacturer shall give the full details of proposed package and specify the function(s) of the package inhibitor(s). The proposed package shall also meet the following requirements:

4.1 Qualification

4.1.1 Approved products

The approved products are those products which their approval test samples (see 5.1) have been tested and have passed the approval tests specified herein (see 5) and have been listed on or approved for listing on the approved samples. The supplier and/or Manufacturer of these samples will be known as the approved supplier.

4.1.2 Accepted products

The accepted products are those products which have passed the approval tests as well as acceptance operation tests (see 4.9).

4.1.3 Qualified products

The qualified products are those accepted products (inhibiting package) proposed with respect to this Standard specification and meet all requirements of this Standard specification.

The supplier and/or manufacturer of these product(s) will be known as the qualified supplier(s). The successful bidder is known as the final supplier.

4.2 Formulation Changes

The material(s) shall be accepted only for the formulation for which approval and acceptance operational tests are made.

Any change in formulation, shall cause for designating the material as a new material which shall not be considered accepted. The Manufacturer may submit the modified material for acceptance under this Standard specification, using a new Manufacturer's designation.

4.3 Products

Inhibitor(s) shall be made from such materials and by such processes as to assure compliance with this Standard specification.

4.4 Workmanship

All details of workmanship shall be in accordance with the best commercial practice covering these types of materials.

4.5 Corrosion Control

4.5.1 Uniform corrosion

The corrosion, rate of the proposed inhibiting package shall not be more than 0.051 mmpy (2.0 mpy) when tested by both methods specified in Subclause 5.2.1.

4.5.2 Localized and crevice corrosion

There shall be no evidence of pitting and crevice corrosion on the specimen when tested by both methods specified in Subclause 5.2.1.

4.5.3 Fouling

The proposed package inhibitor shall prevent fouling in the system when tested according to ASTM D2688-83 Method B (see 5.2.1).

4.6 Scale Control

The proposed inhibiting package, with reference to its function shall be best in preventing the precipitation of both calcium sulfate and calcium carbonate from solution when tested in accordance with Subclause 5.2.2.

4.7 Biological Corrosion Control

The proposed inhibiting package, with reference to its function, shall be able to control the microbial growth with as low concentration of products as possible when tested in accordance with Subclause 5.2.3.

4.8 Economical Characteristic

The proposed inhibiting package shall meet the requirements of Clause 4.1 at the lowest cost per year (see Data Sheet Clause 4). The Cost evaluation will be made by the Purchaser (Technical Evaluation Section in this case), with reference to the performance of the product(s) (see 4.1), including cost of product(s) per year and surplus costs such as cost for shipment, storage, operation and so on.

4.9 Acceptance Operational Tests

90 days continuous operational tests will be performed on approved products (see 7) in accordance with ASTM G 4.84. The products shall pass the operational tests.

4.10 Technical Services

The approved supplier shall furnish free of charge technical services including personnel, documentation, submission final reports, and furnishing tests instrumentations in accordance with the requirements of the acceptance operational tests. The final supplier shall supply free of charge and in time all necessary technical services during operation.

5. APPROVAL TESTS

Approval tests are those tests performed on samples submitted for approval. The approval tests of the inhibitor(s) will consist of the tests of this Standard specification (see 5.2).

5.1 Approval Test Samples

5.1.1 Approval test samples shall consist of sufficient amount of all material(s) proposed as an inhibiting package furnished under this Standard specification. Samples shall be forwarded to the Purchaser. Samples shall be plainly identified by securely attached durable tags marked with the following information:

- Brand Name.
- Sample for Qualification Tests.

- Name of Manufacturer (Plant where inhibitor is manufactured.).
- Description and Function(s).
- Material Designation.
- Date of Manufacture.

5.1.2 The Supplier and/or manufacturer shall also provide the operational information with each sample as follows:

- Base of Inhibitor(s).
- Analytical Control.
- Dosage in "Cost/Year" with reference to this Standard specification (see Data Sheet).
- Operational Instruction.
- Location of Feeding.
- Type of Injection System.
- Handling.
- Packaging.
- Storage.
- Shelf life.

5.1.3 The Manufacturer shall specify physical properties for the materials covering the following:

- pH.
- Color.
- Odor.
- Pour Point.
- Flash Point.
- Viscosity at 20°C.
- Specific Gravity.
- Density at 20°C.
- Solubility in water at 20°C.
- BOD five days (If the inhibitor is used as a "Bio-Dispersant").
- Others

5.2 Test Methods

The testing of the inhibitor(s) shall be performed as follows:

5.2.1 The ability of inhibitor(s) to control corrosion shall be determined according to ASTM G 31-85 and ASTM D 2688-83 Method B and "NACE Std. TM-01-69" (1976 revision) using either raw water taken directly from the plant or test solutions prepared from standard chemicals recommended by the test method.

5.2.2 The ability of scale inhibitor(s) to prevent the precipitation of calcium sulfate and calcium carbonate shall be determined in accordance with NACE Std. TM-0374-74.

5.2.3 The biological analysis shall be performed in accordance with API RP 38.

6. PRODUCTION TESTS

Production tests are those tests normally performed by the manufacturer on samples taken from production run during the production of inhibitor(s). The Manufacturer shall specify the production tests.

6.1 Affidavit of Compliance

The Manufacturer shall provide an affidavit of compliance stating that the system inhibitor(s) furnished complies with this Standard specification.

7. ACCEPTANCE OPERATIONAL SAMPLES

The approved supplier which their products meet Subclause 4.8 will be requested to supply sufficient amount of approved product(s) for a 90 days period of acceptance operational tests.

8. STORAGE LIFE AND PACKAGING

8.1 Storage Life

The inhibitor(s) shall meet all requirements of this Standard specification after storage for 24 months from the date of delivery in original containers at ambient temperature.

8.2 Packaging

The material(s) shall be suitably packed in approved containers and protected against all damages or defects which may occur during handling and shipment to site. The packaging shall also meet the relevant requirements of ASTM D 3951.

8.3 Compatibility with Container Material

The inhibitor(s) shall be compatible with container material to the extent that it shall not cause delamination, swelling, embrittlement, dissolution, or other deterioration such as to impair the usefulness of the container material.

8.4 Marking

Shipment marking information in addition to the labeling required (see 10) shall be provided an interior package and exterior shipping containers.

9. INSPECTION AND TESTING

9.1 All materials supplied under this Standard specification shall be subject to timely inspection by the Purchaser or his authorized representative. The Purchaser shall have the right to reject any material(s) supplied which is (are) found to be defective under this Standard specification. In case of dispute, the arbitration or settlement procedure, established in the procurement documents shall be followed.

9.2 The Supplier shall be responsible for the performance and costs for all laboratory test requirements as specified in this Standard specification (see 4).

9.3 Samples submitted to the Purchaser for his selection of material will be tested in the Purchaser's laboratory or in a responsible commercial laboratory designated by the Purchaser.

9.4 The supplier shall place free of charge at the disposal of the Purchaser's inspector(s) all means necessary for carrying out his (their) inspection, specification results of tests, checking of conformity of materials with this Standard specification, checking of marking and packing and temporary acceptance of materials.

9.5 The supplier shall furnish the Purchaser with a certified copy of results of tests made by the Manufacturer covering physical and performance characteristics of each batch (see 9.8) of product to be supplied under this Standard specification. The supplier shall allow the Purchaser to collect samples of the material representative of each batch of product. Certified test reports and samples (see 9.7 and 9.9) collected by the Purchaser and/or his authorized representative shall be properly identified with each lot (see 9.8) of product.

9.6 Prior to acceptance of the supplier's material, samples of material collected by the Purchaser and/or nominated inspector (see 9.5) will be tested by the supplier in the witness of purchaser's inspector. If any sample is found not to conform to this Standard specification and/or to the initial sample (see 9.3), material represented by such sample will be rejected.

9.7 The number of samples for testing shall consist of 10 percent of the lot or batch (see 9.8), but in no case shall be less than one or more than 10 drums.

9.8 A lot or batch shall consist of an indefinite number of drums offered for acceptance and filled with a homogeneous mixture of material from one isolated container, or filled with a homogeneous mixture of material Manufactured by a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in ingredient material.

9.9 Sampling for Examination of Filled Containers

A random sample of filled containers shall be selected from each lot in accordance with ISO 2859 Part 1, at inspection level I, with an Acceptable Quality Level (AQL) of 2.5 percent defective to verify compliance with this specification regarding fill, closure, marking and other requirements not involving tests.

9.10 Examination of Filled Containers

Each sample filled container (see 7.9) shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory lakings, each filled container shall also be weighed to determine the amount of contents. Any container in the sample having one or more defects, or under required fill, shall be rejected, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of ISO 2859 Part 1, the lot represented by the sample shall be rejected. Rejected lots may be resubmitted for acceptance tests, provided the Manufacturer has removed or repaired all non-conforming containers.

10. LABELING

Refer to ANSI Std. Z 129-1 "Precautionary Labeling of Hazardous Industrial Chemicals".

10.1 Marking of Containers

Each containers shall be legibly marked with the following information:

- Manufacturer Name and Address
- Purchaser Name and Address
- Standard Specification (IPS-M-TP-675)
- MESG No.
- Base of Inhibitor
- Application: Water Treatment for Cooling Water System
- Function of Inhibitor
- Handling
- Storage
- Date of Manufacturer
- Date of Delivery
- Batch Number
- Quantity of Inhibitor in Container, in kg (gross weight and net weight)

10.2 Direction for Use

Manufacturer shall supply complete instructions for use covering dosage, location of feeding, type of injection system and analytical control thoroughly.

10.3 Precautionary Markings

All individual containers shall be marked with the direction for safety.

DATA SHEETS

DATA SHEET

COOLING WATER SYSTEM

1. TYPE OF SYSTEM

- Open Recirculating System b
- Once-Through System b
- Closed Recirculating System b

2. MAKE UP SOURCE/ANALYSIS/CIRCULATION ANALYSIS

ELEMENTS	UNIT	MAKE UP		CIRCULATION
		RAW% b	SOF% b	
pH	ppm			
P alkalinity	ppm as CaCO ₃			
M alkalinity	ppm as CaCO ₃			
Ca hardness	ppm as CaCO ₃			
T hardness	ppm as CaCO ₃			
Silica	ppm as SiO ₂			
Chlorides	ppm as NaCl			
Conductance	Microhms			
TDS by meter	ppm			
TDS by weight ppm	ppm			
SRB		Yes b Nob	Yes b Nob	Yes b Nob
Iron oxide bacteria		Yes b Nob	Yes b Nob	Yes b Nob

3. DESIGN DATA

ELEMENTS	UNIT	QUANTITY
Recirculation rate (QC)		
Evaporation loss (QE)		
Make-up rate		
Temperature difference (ΔT)		
Return temperature		
Concentration ratio (CR)		
Blow down rate		

(to be continued)

DATA SHEET (continued)

4. PRESENT TREATMENT/INJECTION TYPE

FUNCTION	CHEMICAL		INJECTION	
	Yes	No	Batch	Continuous
Scale inhibitor	b	b	b	b
Corrosion inhibitor	b	b	b	b
Mineral dispersant	b	b	b	b
Biocides	b	b	b	b
Biocides dispersant	b	b	b	b
Anti Foulants	b	b	b	b
Acid	b	b	b	b
Degasification	b	b	b	b
Chlorine *	b	b	b	b

* The type of acid and chlorine materials shall be specified.

5. EXISTING PROBLEM (CORROSION/SCALING/FOULING, ETC.)

5.1 Present Condition of Unit (Clean, Unclean, Date of Cleaning, Cleaning Method)

6. DRAIN OF WASTE WATER

River **b**

Sea **b**

Others **b** to be described

7. ENVIRONMENTAL PROBLEMS WITH REFERENCE TO HARMFUL MATERIALS SUCH AS CHROMATE

8. AMBIENT TEMPERATURE (FOR STORAGE)

9. FURTHER INFORMATION