

**MATERIAL AND EQUIPMENT STANDARD**

**FOR**

**INHIBITOR FOR HYDROCHLORIC ACID AND HCl+HF**

**AS**

**DESCALING AND PICKLING SOLUTION**

**FOR**

**OIL AND GAS WELLS**

**ORIGINAL EDITION**

**DEC. 1997**

This standard specification is reviewed and updated by the relevant technical committee on May 2001. The approved modifications are included in the present issue of IPS.

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## 1. SCOPE

This Standard Specification covers the minimum requirements for inhibitors used with HCl and HCl + HF solutions in order to minimize attack on metal. The inhibitor must not interfere with the removal of either oil side deposits or corrosion products present on the surfaces. These inhibitors shall be in liquid form.

### Note:

**This standard specification is reviewed and updated by the relevant technical committee on May. 2001. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 145 on May. 2001. These modifications are included in the present issue of IPS.**

## 2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

### ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

ANSIZ 129.1 "Precautionary Labeling of Hazardous Industrial Chemicals"

### ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

D 3263 "Standard Test Method for Corrosivity of Solvent Systems for Removing Water-formed Deposits"

### IPS (IRANIAN PETROLEUM STANDARDS)

[IPS-E-TP-780](#) "Chemical Control of Corrosive Environments" (Not Applicable for Procurement)

### ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

ISO 2859-1 "Sampling Procedures for Inspection by Attributes"

## 3. UNITS

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

## 4. REQUIREMENTS

The inhibitor shall meet the requirements of 4.1 through 4.6 inclusive.

### 4.1 Weight Loss

When tested as specified in 5.2, the weight loss shall not exceed 5.440 g per square meter per hour by all methods specified.

**4.2 Staining and Filming of Metal**

The inhibited hydrochloric acid or HCl + HF solution shall not cause filming, staining, or deposit on metal surfaces. These effects will be ascertained from visual observation of specimens following the test specified in 5.2.

**4.3 Arsenic**

The inhibitor shall contain not more than 0.01 percent of arsenic when tested as specified in 5.3.

**4.4 Inhibitor Effectiveness**

Inhibitor use concentrations (dosage) shall be within 0.1 to.2 percent by volume and its optimum dosage must limit metal loss as specified in 4.1.

**4.5 Compatibility**

The inhibitor at concentrations required in 4.4 must be compatible with the acid solution as formulated in 5.1.1. No adherent deposits shall form on the metal specimen surfaces and copper plating shall not occur. It shall be capable for using in sour gas wells and shall not give precipitates with hydrogen sulphide.

**4.6 Miscibility**

The product shall be completely miscible in HCl and HCl + HF in order to provide maximum metal protection.

**5. TEST PROCEDURES**

**5.1 Preparation of Inhibited Acid Solution**

5.1.1 The inhibited acid solution shall be formulated as follows:

Hydrochloric acid, 23 Baume	(Sp. 1.19, Assay 37 percent)	240 ml
Ferric chloride hydrated	(FeCl <sub>3</sub> . 6H <sub>2</sub> O)	50 g
Cupric chloride hydrated	(CuCl <sub>2</sub> . 2H <sub>2</sub> O)	0.62 g
1, 3 Diethylthiourea	(DETU)	10.4 g
Inhibitor, concentration		0.2 percent by weight (of total solution)
Distilled water		Sufficient to obtain 500 ml of solution not to exceed.

**5.1.2 Specimen composition and size**

The alloy used for preparation of specimen shall be N-80 oil well tubing. The size and preparation of specimen shall be in accordance with ASTM D 3263-82.

**5.2 Weight Loss Determination**

Tests shall be conducted in accordance with methods A, B, of ASTM D 3263 using solution and alloy specified in 5.1.1 and 5.1.2. The tests shall be performed at temperature 93.3°C (200°F).

### 5.3 Arsenic Content

This test shall be conducted as follows:

Place 10.0 grams of the sample in a 500 ml, flask. Add 5 grams cuprous chloride and 75 ml HCl (sp. gr 1.09). Mix well, insert a thermometer and arrange the flask and condenser for downward distillation. Distill approximately 35 ml of the solution into a 400 ml beaker containing 150 ml of cold water placed in an ice or cold-water batch. (The condenser tip shall dip below the surface of the water in the beaker. The distillation shall be watched carefully to avoid such-back.)

The temperature of the vapors during distillation, shall remain below 108°C, otherwise halt the distillation, cool the flask, and add 34 ml of concentrated HCl before continuing the distillation.

Neutralize the distillate carefully with 25 weight percent NaOH solution, then add 1:1 HCl until just acid with the aid of pH indicator add 15 to 20 ml. of cold-saturated NaHCO<sub>3</sub> solution. Add 1 gram of KI crystals and 5 ml of 1 percent starch solution. Stir until the KI is dissolved and titrate with 0.01 N iodine solution.

$$\text{Percent arsenic} = \frac{3.75 AN}{W}$$

Where:

- A** is ml. of iodine solution used.
- N** is normality of iodine solution.
- W** gr. weight of sample.

## 6. STORAGE LIFE AND PREPARATION FOR DELIVERY

### 6.1 Storage Life

The product shall meet the requirements of Clause 4 after storage for 12 months from the date of delivery in a tightly covered container at temperatures between -20 to +60°C.

### 6.2 Preparation for Delivery

#### 6.2.1 Packaging

The material purchased according to this Standard specification shall be packaged in suitable new steel drums containing not more than 210 liters of materials.

#### 6.2.2 Packing

Packing shall be accomplished in a manner which will insure acceptance by common carrier, at lowest rate, and will afford protection against physical or mechanical damage during shipment.

#### 6.2.3 Marking

Shipment marking information, in addition to the labeling required (see 8) shall be provided on each package.

## 7. INSPECTION AND TESTING

7.1 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.

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

**7.3** 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.

**7.4** 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.

**7.5** 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 7.8) 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 7.7 and 7.9) collected by the Purchaser and/or his authorized representative shall be properly identified with each lot (see 7.8) of product.

**7.6** Prior to acceptance of the supplier's material, samples of material collected by the Purchaser and/or nominated inspector (see 7.5) 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 7.3), material represented by such sample will be rejected.

**7.7** The number of samples for testing shall consist of 10 percent of the lot or batch (see 7.8).

**7.8** 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.

**7.9 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.

**7.10 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 nonconforming containers.

**8. LABELING**

Refer to ANSI Standard Z 129.1 "Precautionary Labeling of Hazardous Industrial Chemicals".

**Marking of Containers**

Each drum shall be legibly marked with the following information:

Product Name: .....

MESC No.: .....

Order No.: .....  
Flash Point °C: .....  
Lot (Batch) No.:.....  
Stock No.: .....  
Date of Manufacture: .....  
Quantity of Inhibitor in drum (net weight) .....  
Information and Warnings (If need) .....  
Manufacture's Name and Address: .....  
Design Guide: For the guidance on the usage of this inhibitor reference shall be made to [IPS-E-TP-780](#).

**9. DIRECTIONS FOR USE**

The manufacturer shall supply detailed directions for use including application procedures, technical and safety data sheet with each drum.