Acidification corrosion inhibitor technology requirements

1. Application range
The standard method evaluated the performance of a corrosion inhibitor for acid fracturing. The standard method evaluated the selection of corrosion inhibitors.

2. Product performance indexes (Quaternary-ammonium-salt based)

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Items</th>
<th>Standard requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Appearance</td>
<td>Dark brown evenly oily liquid</td>
</tr>
<tr>
<td>2</td>
<td>Solubility</td>
<td>Soluble in organic solvents, dispersed in water</td>
</tr>
<tr>
<td>3</td>
<td>Density/25°C/g.cm⁻³</td>
<td>1.03~1.05</td>
</tr>
<tr>
<td>4</td>
<td>Flash point/°C</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>Freezing point/°C</td>
<td>-20~25</td>
</tr>
<tr>
<td>6</td>
<td>Viscosity /Pa.s</td>
<td>≤50</td>
</tr>
<tr>
<td>7</td>
<td>pH (1% water aqueous)</td>
<td>2.0~3.0</td>
</tr>
</tbody>
</table>

3. Atmospheric static corrosion rate and corrosion rate determination method: metal weight-loss method

3.1 Method introduction
Take the being weighted metal specimens to the assay medium within and without addition of corrosion inhibitor. Soaking it under the provisions of the conditions, then remove the test piece, weighing it after cleaning and drying process, according to the test piece quality loss to calculate the average corrosion rate and corrosion inhibition efficiency. At the same time, the pitting corrosion rate was measured, and the pitting corrosion rate was calculated.

3.2 Reagents
A) hydrochloric acid (analysis of pure);
B) anhydrous ethanol (analysis of pure);
C) acetone (pure);
D) petroleum ether (60~90°C)

3.3 Instruments
A) Thermostatic box: temperature control accuracy is ±1°C;
B) Analysis of the balance: the amount of 0.1mg;
C) Pitting depth sounding instrument: the precision is 0.02mm;
D) Vernier caliper accuracy is 0.02mm;
E) Bottle: capacity 10L, 20L, the upper and lower mouth with a tube of rubber plug sealing.

3.4 Test conditions
Test temperature is based on the actual temperature of the site, and the general choice is 50°C;

3.5 Test blocks
3.5.1 The test piece of material should be the same as the actual application of the field, the general use of N80 steel.
3.5.2 The test piece is recommended to adopt a rectangle, and the shape size is 76mm*13mm*1.5mm or 50mm*13mm*1.5mm. A 4mm Diameter drill hole is needed at one end away from the sideline at 10mm, also name it. The same bitch of test should have the same shape and size.

3.6 Test procedures
3.6.1 In accordance with the requirements to configure the etchant solution by using the test flask, such as 20%...
hydrochloric acid solution or 15% hydrochloric acid solution and 3% hydrofluoric acid compound, shake spare. The
solution should be sealed on the same day or the day before.

3.6.2 First to wipe clean with filter paper, then placed in a boiling process for 60~90°C of petroleum ether or acetone in the
vessel, with the surface oil removed after the surface oil, and then put into ethanol in the immersion of about 5min, and
further to remove the fat and dehydration. To remove the test piece and put it on the filter paper, use the cold dry and then
package it with filter papers, storage in a dryer for about one hour, then measuring the size and weighing, accurate to 0.1
mg.

3.6.3 Take the prepared acid solution to the test vessel respectively.

3.6.4 Using the nitrogen to purge the test vessel, excluding the air, and then add the test medium to the test vessel by rub-
ber tube. In the process, the rubber tube should be inserted into the liquid level and close to the wall of bottle to prevent
the entry of the air, and then gradually increase the rubber tube with the rising level, when the liquid to the bottleneck,
hang into the test piece, and sealed it with the rubber stopper. At the same time, the blank test is done without the inhibitor.

3.6.5 Each test was done at least three parallel tests, and each test vessel was suspended in three test pieces. The
specimen is not allowed to be in contact with the vessel wall, and the spacing between the specimen should be above 1
cm, the upper end of the specimen should be above 3cm.

3.6.6 The test device is placed in a constant temperature box with a test period (about 0.5~1h) in the setting temperature.

3.6.7 Take the test piece out, observe it, record the surface corrosion state and corrosion product adhesion, immediately
rinse off the test medium with water, and then wipe it using the filter paper.

3.6.8 Take the test piece into the oil ether or acetone in the 60~90°C of the 5min, and then remove the oil from the
surface of the test piece, and then put it into the water. To remove the test piece and put it on the filter paper, storage in a
dryer for an hour after weighing, accurate to 0.1mg.

3.6.9 The corrosion of the surface for the specimen was observed and recorded, if the pitting corrosion is occurred, record
the unit area of pitting corrosion, and the pitting depth was measured by the pitting depth.

3.7 Expression and calculation of test results

3.7.1 Corrosion speed calculation formula

\[ V = \frac{(m_2-m_1)}{A_0} t \]

And: \( V \)—Corrosion rate,g/(m²·h);

\( (m_2-m_1) \) — Loss of the specimens,g;

\( A_0 \) — Surface area of specimens,m²;

\( t \) — Corrosion time,h.

3.7.2 The method of inhibition efficiency: inhibition efficiency = \( \frac{V_0-V_1}{V_0} \)

The corrosion rate of \( V_0 \) and \( V_1 \) in the test piece are based on the adding and without corrosion medium.

3.8 Precision: take three parallel test results. Take the average value of the results as the test results, the relative
deviation of the results should not exceed 10%.

4 Storage and Package

Use 25KG, 50KG or 200KG plastic bucket packaging, according to the non-dangerous goods transportation.

Stored in ventilated, dry, cool storage, at room temperature for a period of one year.