VpCI®-629 BIO, Patented

PRODUCT DESCRIPTION
VpCI-629 Bio is the only oilfield inhibitor product on the market which combines high level of corrosion protection, biodegradability, and low toxicity.

VpCI-629 Bio is soluble in crude oil and dispersible in fresh water and brine solutions. As a fast-acting and long-term inhibitor, VpCI-629 Bio forms an effective corrosion inhibiting barrier for both ferrous and non-ferrous metals in the presence of water, halogens, and corrosive gases such as dissolved oxygen, sulfur dioxide, carbon dioxide, and hydrogen sulfide.

Continuing protection between treatments is assured due to solubility, dispersibility in crude water mixtures, and long-term water displacing film formation provided by VpCI-629 Bio. In addition, the product provides vapor phase inhibition to protect areas inaccessible through direct solution contact. This unique characteristic protects internal parts during low fluid levels and combats atmospheric corrosion in production and storage tanks. Field applications and tests, performed by independent laboratories verify that VpCI-629 Bio is effective at a concentration level as low as 5-15 ppm.

FEATURES
• Biodegradable and non-toxic
• Environmentally acceptable in different regions
• Prevents stress corrosion cracking (SCC) and hydrogen embrittlement
• Effective for a wide range of refined hydrocarbons, crude, and oil/water mixtures
• Forms a corrosion inhibiting barrier with high film persistency to give continuous, long-term protection
• Vapor phase action provides protection against corrosion from atmospheric conditions for overhead units in processing production and storage tanks
• Available in diluted form for easy direct application without premixing
• Post-action inhibition effect

TYPICAL PROPERTIES

<table>
<thead>
<tr>
<th>VpCI-629 Bio</th>
<th>Appearance</th>
<th>Brown liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-volatile Content</td>
<td>65-70%</td>
<td></td>
</tr>
<tr>
<td>Post-action Effect</td>
<td>Up to 60 days</td>
<td></td>
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<tr>
<td>Pour Point</td>
<td>1°F (-17°C)</td>
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<tr>
<td>Protection Coefficient</td>
<td>93.99% (NACE TM-01-77)</td>
<td></td>
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<tr>
<td>Solubility</td>
<td>Dispersible to soluble</td>
<td></td>
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<tr>
<td>Crude oil</td>
<td>Dispersible</td>
<td></td>
</tr>
<tr>
<td>Fresh water</td>
<td>Dispersible</td>
<td></td>
</tr>
<tr>
<td>Brine</td>
<td>Dispersible</td>
<td></td>
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<tr>
<td>Density</td>
<td>7.5-7.6 lb/gal (0.90-0.91 kg/l)</td>
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</tbody>
</table>

DOSEAGE/USAGE

VpCI-629 Bio is oil soluble and water/brine dispersable product. It needs to be agitated before using.

<table>
<thead>
<tr>
<th>Type of System to be Protected</th>
<th>Type of Corrosive Medium</th>
<th>Application/Dosage Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipelines and collection systems for water-encroached crude oil</td>
<td>Separate crude oil/water mixtures with a level of encroachment up to 98% CO₂, varying concentration H₂S, up to 6,000 ppm</td>
<td>Continuous Application: Injection of the inhibitor into the clearance hole (5-15 ppm) Periodic injection of 400-1500 ppm every 2-2 1/2 months</td>
</tr>
<tr>
<td>Oil wells and equipment</td>
<td>Crude with a high level of water encroachment and high concentrations of CO₂ and H₂S</td>
<td>Continuous injection of 5-15 ppm Intermittent treatment: 1,700-3,500 ppm during a 48hr. period 4 times a year</td>
</tr>
</tbody>
</table>

TYPICAL APPLICATIONS
VpCI-629 Bio is designed for use in crude oil processing equipment, pipelines, refinery, and petrochemical plant equipment and systems. VpCI-629 protects against pitting, corrosive gases, and water intrusions.
**Performance Data for VpCI-609 Bio**

1. **Corrosion Test**
   - Wheel Oven Test @160°F (71°C) for 2 days
   - Concentration ppm | Effectiveness, %
   - 5 | 92.3
   - 25 | 92.5
   - 100 | 98.7

2. **Emulsion Tendency**
   - Condition of the test: Concentration of VpCI-629 Bio - 100 ppm
   - Water: Crude Oil = 80:20
   - Temperature = 180°F (82°C)
   - Product | % of Emulsion |
   - VpCI-629 Bio | 8 8 8 |
   - Corton IRN 181 (Champion) | 18 18 18 |
   - Blank | 6 6 6 |

3. **Dynamic Circuit Test**
   - Loop Operating conditions:
     - Temperature: Ambient
     - Velocity: 6-8 m/min
     - Pressure: 2-3 psi
     - Material: Carbon Steel 1010
     - Brine: NaCl 5%, CH₃OOH 0.5%, H₂S (saturated)
     - Test Timing: 24 hours
     - Inhibitor Dose: 50 ppm
     - Effectiveness (polarization resistance technique)

4. **Prevention of the Stress Corrosion Cracking**
   - NACE TM-01-77 Procedure
   - Condition of the test:
     - Concentration of VpCI-629 Bio - 200 ppm
     - Steel - ANSI 1045-1018 annealed
     - Load - 12000 psi (843 kg/cm²)
   - Product | Time of failure, days
   - VpCI-629 Bio | >30
   - Blank | 8

5. **Biodegradability, %**
   - 5 Days | 10 Days | 25 Days
   - 93% | 52.4% | >60%

*According to 40 CFR 136 and amendments

6. **Toxicity**
   - 48 hour Static-Renewal
   - Mysidopsis Bahia Definitive Toxicity Test Results
     - (EPA/600/4-90/027F) data
   - NOEC/LOEC, ppm CTS M. bahia
   - LC₅₀, ppm CTS, M. bahia
   - 1000 ppm / 3000 ppm 1511.6
   - 1 Test Result
   - Skeletonema constanum 100 ppm
   - Acartia Ionsa 135 ppm
   - Corophium volutator 10017 ppm
   - Scophthalmus maximus 347 ppm


7. **Packaging and Storage**
   - VpCI-629 Bio is packaged in 5 gallon (19 liter) plastic containers, 55 gallon (208 liter) metal drums, liquid totes, and bulk. Store product in tightly closed containers. Shelf life is 36 months.