



# Vapro VBCI-OP-532

## Corrosion Inhibition of Tubing Steel during Acidization of Oil and Gas Wells

**Passed German VIA (Vapour Inhibition Ability) Test TL 8135-002**

**NATO STOCK NUMBER: PENDING**

### Introduction

Acidization is an oil reservoir stimulation technique for increasing oil well productivity. Hydrochloric acid is used in oil and gas production to stimulate the formation. The acid treatment occurs through N80 steel tubes. The process requires a high degree of corrosion inhibition of tubing material (N80 steel).

Acidization of a petroleum oil well is one of the important stimulation techniques for enhancing oil production. It is commonly brought about by forcing a solution of 15% to 28% hydrochloric acid into the well through N80 tubing to open up near bore channels in the formation and hence to increase the flow of oil.

To reduce the aggressive attack of the acid on tubing and casing materials (N80 steel), Vapro VBCI OP-532 was developed as corrosion inhibitors for N80 steel in 15% HCl solution. The common inhibitors are added to the acid solution during the acidifying process are usually found in commercial formulations are acetylenic alcohols, alkenyl, aromatic aldehydes, nitrogen-containing heterocyclics, quaternary salts, and condensation products of carbonyls and amines. However, these inhibitors are effective only at high concentrations, and they are harmful to the environment due to their toxicity, so it is important to search for new nontoxic and effective organic corrosion inhibitors for N80 steel—15% HCl system. In this regard, amino acids have a promising alternative for the design of ecofriendly corrosion inhibitors which satisfy the environmental requirements.

The selection of effective corrosion inhibitors and their efficient applications is one of the most important and economic methods to minimize metallic corrosion in a hostile environment. Environmental issues have led to an increase in the use of organic inhibitors as replacements for the highly toxic inorganic inhibitors, such as chromium compounds. Protection from corrosive attacks on metallic materials has been successfully achieved by the use of oxygen, sulfur and nitrogen-containing organic compounds, which are commonly used in industrial acid cleaning, oil-well acid in oil recovery, acid descaling, acid pickling, and etching of metal alloys.



### Acidification Process of Oil Well

A matrix acid job is performed when acid is pumped into the well and into the pores of the reservoir rocks. In this form of acidization, the acids dissolve the sediments and mud solids that are inhibiting the permeability of the rock, enlarging the natural pores of the reservoir and stimulating flow of hydrocarbons.

While matrix acidizing is done at a low enough pressure to keep from fracturing the reservoir rock, fracture acidizing involves pumping highly pressurized acid into the well, physically fracturing the reservoir rock and dissolving the permeability inhibitive sediments. This type of acid job forms channels through which the hydrocarbons can flow. There are different acids used to perform an acid job on wells. A common type of acid employed on wells to stimulate production is hydrochloric acids (HCl), which are useful in removing carbonate reservoirs, or limestones and dolomites, from the rock. Also, HCl can be combined with a mud acid, or hydrofluoric acid (HF), and used to dissolve quartz, sand and clay from the reservoir rocks.

In order to protect the integrity of the already completed well, inhibitor additives are introduced to the well to prohibit the acid from breaking down the steel casing in the well. Also, a sequestering agent can be added to block the formation of gels or precipitate of iron, which can clog the reservoir pores during an acid job.

After an acid job is performed, the used acid and sediments removed from the reservoir are washed out of the well in a process called backflush.



## Description

Vapro VBCI-OP-532 is an aliphatic amine compound that retards the corrosive effect of acids on metals during acids pickling, process equipment cleaning and oil well acidizing operations. It is a free amber flowing liquid with ammoniacal odour.

Hydrogen embrittlement and corrosion of the tubing steel are the major problems acidification of oil well and during the pickling of mild steel. The addition of Vapro VBCI-OP-532 to the hydrochloric acid eliminates or reduces embrittlement. This embrittlement occurs when atomic hydrogen produced by the introduction of the acids, diffuses into the lattices of the metal and strains it. This results in brittleness at the molecular level, with no advanced indications such as visible pitting.

Hydrogen embrittlement is a major problem during the pickling of mild steel or tubing steel during acidification of oil well. This embrittlement occurs when atomic hydrogen produced by the introduction of the acids, diffuses into the lattices of the metal and strains it. This results in brittleness at the molecular level, with no advanced indications such as visible pitting. The addition of Vapro VBCI-OP-532 to the hydrochloric acid eliminates or reduces embrittlement. Oil and gas operators have safely and successfully used acid to improve productivity of oil and gas wells for nearly 120 years. Today, acidizing is one of the most widely used processes for stimulating oil and gas wells. Two types of acids are most commonly used; hydrochloric acid in all formation types and hydrofluoric acid in sandstones and certain shales.

Knowing the type of formation being acidized and details of its composition (mineralogy) is critical to achieving positive results. In carbonate formations, the acid job design is typically based on the use of hydrochloric acid (HCl). The objective when acidizing carbonate formations to dissolve carbonate-based materials to create new or clean existing pathways or channels that allow the formation fluids (oil, gas, and water) to flow more freely into the well. In sandstone formations, the acid job design is typically based on the use of hydrofluoric acid (HF), also known as mud acid, in combination with HCl.

Vapro VBCI-OP-532 has been developed to inhibit both hydrochloric acid and hydrofluoric acid from attacking the tubing steel during acidification process of oil well.

## Advantages

- Easy to Use
  - Liquid Form
  - Soluble in acid
  - Non-staining
  - Does not precipitate when standing
  - Advantages
  - Low-cost, dependable protection over a wide range of temperatures
  - Economical and effective: Only a small quantity of Vapro VBCI-OP-532 mixed with the acids will deliver the desired cleaning effect while retarding acid attack on metals.
- Corrosion performance-tested:  
0.25% Vapro VBCI-OP-532 in 15% hydrochloric acid at 200°F must show less than 0.022 lb/ft<sup>2</sup>/day corrosion of mild steel.

## Physical Properties

**Appearance**  
Amber Liquid

**Viscosity**  
Free Flowing

**Odour**  
Ammoniacal

**Color**  
Amber

**Specific Gravity**  
0.92

## Available Packaging

20 liter HPDE Pail or 209 liter Steel Drum

**Magna**

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