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Standard Test Method

Methods for Determining Quality of Subsurface Injection Water Using Membrane Filters

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Foreword

Corrosion engineers in the oil- and gas-producing industry are often responsible for evaluating and controlling injection water quality. Water quality data may be inadequate, misleading, or difficult to interpret. This standard method is provided to improve available water quality data.

This standard was originally prepared in 1973 by NACE Task Group T-1C-12, revised in 1976, reaffirmed in 1983, and revised in 1984 and 1992 by T-1C-20, components of Unit Committee T-1C, "Detection of Corrosion in Oilfield Equipment." T-1C was combined with T-1D, "Corrosion Monitoring and Control of Corrosion Environments in Petroleum Production Operations." This standard was revised by T-1D-47 in 1999, reaffirmed in 2005 by Specific Technology Group (STG) 31, "Oil and Gas Production—Corrosion and Scale Inhibition," and revised in 2014 by Task Group (TG) 408, "Review and Revise as Necessary NACE Standard TM0173-2005." This standard is issued by NACE International under the auspices of STG 31.

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Contents

Section 1: General

1.1 This standard describes two methods for evaluating water quality for subsurface injection: Procedure A—rate versus cumulative volume test (for water-quality monitoring) and Procedure B—suspended solids test (for diagnosis or monitoring). The methods describe the apparatus required, test conditions, test procedures, reporting procedures, and supplementary tests. Interpretation of the results is beyond the scope of this standard. The bibliography supplies sources of interpretation methods.

1.1.1 Before a test program is selected, the user should determine an appropriate criterion for evaluating the test results. For example, if the intent is to use membrane filtration as a simple water control test, the control criterion might be a given slope of the filtration curve. If diagnostic information is required, more emphasis may be placed on qualitative information, such as the shape of the filtration curve, or spot tests on the filtered suspended solids as well as visual examination of the filter immediately after the test.

1.1.2 Membrane filtration may be used to monitor pickup of suspended solids from the formation, in which case quantitative determination of suspended solids on the filter may be the selected criterion. Each situation should receive an appropriate review of the parameters involved.

1.2 The injection behavior of subsurface formations varies widely, and results of water-quality tests apply only to the system being tested. Applying the results obtained by these tests, therefore, is influenced by the requirements of each subsurface injection project. This standard should be used for routine water quality monitoring problem diagnosing, evaluating system changes and upsets, and chemical treatment monitoring. The manner in which the test results are used depends on the specific injection system requirements.

1.3 This standard is applicable when the water sample is representative in the system of interest. This standard does not imply that any results or their interpretation may be arbitrarily applied to other water injection projects.

Section 2: Definitions

2.1 Suspended solids, as used in this standard, are defined as the nonwater-soluble, nondissolved substances suspended in injection water. These typically include, but are not limited to, iron sulfides and oxides, precipitated carbonates and sulfates, sands and silts, oils, paraffins and asphaltenes, and materials of biological origin. Suspended solids are further defined by particle or grain size (e.g., colloid, clay, silt, sand, etc.). The suspended solids may be considered as materials that cause plugging and loss of injectivity in injection wells. Fluid flow rates are also reduced as a result of suspended solids dropout in the pipe.

2.1.1 Oil carryover or hydrocarbon-soluble suspended solids are the portions that are soluble in a suitable hydrocarbon solvent. This standard is not intended to be an accurate quantitative test for oil or hydrocarbons. Other measurement methods should be used when quantitative data are desired. These methods are listed in the bibliography.

2.1.2 Primary suspended solids or in-line suspended solids are those substances that exist in the water at the time of sampling.

2.2 This standard uses membrane filters. Membrane filters are porous disks composed of pure and biologically inert cellulose esters. Unless specified to the contrary, the membrane filters have a mean pore size of 0.45 µm (0.01 mil) (±0.02 µm [0.0007 mil]), a diameter of 1.8 in (47 mm), a thickness of 15 µm (0.60 mil) (±10 µm [0.40 mil]), and an average total pore volume of approximately 80% of the total filter volume.

2.2.1 Preweighed membrane filters are those that have been weighed prior to the test.

2.2.2 Matched-weight membrane filters are those obtained from the supplier in pairs with identical weights ±0.02 mg (±20 Mcg).