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Wheel Test Method Used for Evaluation of Film-Persistent Corrosion Inhibitors for Oilfield Applications

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Foreword

NACE technical committee reports are intended to convey technical information or state-of-the-art knowledge regarding corrosion. In many cases, they discuss specific applications of corrosion mitigation technology, whether considered successful or not. Statements used to convey this information are factual and are provided to the reader as input and guidance for consideration when applying this technology in the future. However, these statements are not intended to be recommendations for general application of this technology, and must not be construed as such.

The current technology for assessing the effectiveness of corrosion inhibitors proposed for batch treatment of oil wells/continuous treatment of transportation pipelines is a subject of much discussion and, in many cases, disagreement. The purpose of this report is primarily to explain a test method that has been used to evaluate film-persistent corrosion inhibitors for a laboratory ranking of various inhibitors under specified conditions of oilfield environments and also to verify/assure that the best laboratory candidate and the field production test inhibitor are the same, they shall be both finger printed. An alternate procedure which combines dynamic and static components in a single test is also presented. The test methods described in this report are not uniformly accepted throughout the oil industry, but are outlined here to make information available on at least one commonly used type of wheel test, the variables involved, and some sources of variation and inaccuracy. All data contained herein are presented for informational purposes only.

This report is intended for use by professionals in the oil and gas industry (including producers, service companies, and testing laboratories) for the evaluation of corrosion inhibitors that are designed for batch applications.

This NACE technical committee report was originally prepared in 1982 by Task Group T-1D-8, a component of Unit Committee T-1D on Corrosion Monitoring and Control of Corrosion Environments in Petroleum Production Operations. It was reviewed by T-1D and reaffirmed in 1995 under the auspices of Group Committee T-1 on Corrosion Control in Petroleum Production and in 2005 by Specific Technology Group (STG) 31 on Oil and Gas Production—Corrosion and Scale Inhibition. It was revised in 2017 by TG 528 "Revise NACE Publication 1D182." This report is published under the auspices of STG 31.

Introduction

The test methods presented herein are based on the so-called "wheel test"[1-3] which is versatile in that it has often been adjusted to test a variety of inhibitors, and has been performed on various test specimens. Its versatility has also enabled modifications to specific test variables, such as temperature, film life, surface conditions, concentration of corrosive agents, and oil-to-water ratios. With respect to its versatility, the test is similar to other tests with the same general intent. The low level of reproducibility of test results is considered by some to offset the advantages of its versatility. Reproducibility problems seem to be encountered when the test is performed by more than one technician. A single technician appears to be more likely to reproduce his/her own results on a regular basis.

This report describes the wheel test and discusses the various conditions in which it has been used. The wheel test is a dynamic test performed by placing fluids (oil, water, and inhibitor) in a 200 mL (6.80 oz) beverage bottle with a metal test specimen, purging with a corrosive gas, and capping the bottle. The bottle generally has then been agitated for a period of time by securing it to the circumference of a "wheel" and rotating the wheel. After agitation, the test specimens have been transferred to another bottle containing no inhibitor (only corrosive fluids) and agitated for a longer period of time. At the end of this time, the metal test specimen has been removed and cleaned and the mass loss has been measured.

Techniques used in both test procedures are described.

Figures