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Corrosion Inhibition Selection and Management for Oil and Gas Production

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Foreword

This NACE Standard Practice aims to provide guidance for selection and application of Corrosion Inhibitors (CI) for upstream oil and gas processes conditions exposed to corrosive environments.

The content was developed as a collaboration between Oil and Gas operating companies as well as CI product developers and suppliers and CI test facilities.

This standard was originally prepared in 2021 by Task Group (TG) 550, "Corrosion Inhibitor Program Management for Oil and Gas Fields. TG 550 is administered by Specific Technology Group (STG) 31, "Oil and Gas Production-Corrosion and Scale Inhibition." This standard was issued by NACE under the auspices of STG 31. This standard is maintained by Standards Committee (SC) 14, Oil and Gas: Upstream.

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Section 1: Introduction

1.1 The application of effective CI in oil and gas production is essential to enable long term use of carbon steel in corrosive production environments. These chemical CI products can be applied continuously, or on a batch (BI) basis. The effectiveness of CI products that are applied must be assured for the range of conditions associated with the application and for the lifetime of the facility. The assurance is predominantly achieved through laboratory testing. However, field evaluation of CIs can be a significant part of the assurance process.

1.2 This standard outlines a management process that addresses all stages of CI application. This process starts at:

1. The definition of the requirements of the specific application (process conditions at which the CI needs to be effective)
2. Identification of functional requirements in testing and validation of the CI (reflecting its field application)
3. Operating the CI program and anticipating changes in process conditions.

1.3 This standard explains the concept of a CI Integrity Operating Window (CI-IOW, also known as the assured operating envelope). This concept is used to identify the limits of the CI application, resulting in requirements for CI qualification testing and assurance of its maintained effectiveness.[1-4] The CI-IOW can be defined as the operating conditions for which the CI has an identified and assured/verified performance.

1.4 CI laboratory testing methods have been developed that address many of the parameters that affect corrosion of carbon steels (CS). This includes the challenges that arise from field maturation, new oil and gas recovery concepts, increasingly corrosive and changing fluid compositions, and changing chemical and facility management regulations. The aim of this standard is to clarify the relation between field application, the required CI test methods, and propose a robust approach for corrosion mitigation using CI.

1.5 This standard is intended to guide those involved with the selection, qualification, and application of CIs, including operating staff managing field applications, laboratory personnel performing CI testing, and engineers that define the scope of work for CI selection.

1.6 Although the outlined approach in this standard is widely applicable, the scope and methods outlined are more generic. Details in particular in Section 6 might not be suitable for specific process conditions, and there is a drive towards expanding the applicability IOW of CIs, like high pressure, high temperature, or other specific severe conditions. The scope of this standard is to guide engineers with a standardized approach and methods for corrosion inhibition application. Extension of the applicable footprint (outside common oil and gas operations) is subject to future scope and requires further detailed research to find the appropriate solutions, which is not the scope of this standard. The mitigation of very rapid failure mechanisms like cracking and stress corrosion cracking are not part of the scope of this standard.

Section 2: Corrosion Inhibition Management

2.1 In order to achieve a successful CI application, all relevant management processes need to be addressed: the scope of the application, the validation approach, the validation itself, communication of the scope to operations, and the deployment of required operational activities and surveillance.[2-4] This suggested Corrosion Inhibition Management process is outlined in Figure 1.