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Standard Framework for Establishing Corrosion Management Systems

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ABSTRACT

A corrosion management system (CMS) for assets is described in this Standard. The framework is intended to be applicable to a wide variety of asset types and is not focused on a particular industry or sector. Non-mandatory guidance is provided throughout this Standard to aid users with implementing the Standard. The framework in this Standard can be utilized to develop a stand-alone CMS or to integrate corrosion management into an organization's existing management system. Additionally, some processes covered in this framework may already be implemented by an organization, for example, management of change (MOC). An organization may modify their existing processes to address the elements identified in this framework.

KEYWORDS

Corrosion management.

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General

A corrosion management system (CMS) for assets is described in this Standard. The framework is intended to be applicable to a wide variety of asset types and is not focused on a particular industry or sector. The CMS framework includes the following topics, which are discussed in more detail throughout this document:

- Defined asset corrosion management objectives and personnel accountabilities.
- Processes to establish and maintain the appropriate organizational structure to support the CMS.
- Processes to establish and maintain the appropriate competency of internal and contracted personnel.
- Processes to facilitate and verify corrosion management throughout the asset life cycle.
- Processes to prevent, detect, mitigate, and eliminate near misses and nonconformance with corrosion management procedures, specifications, regulations, and referenced standards.
- Assessment of the achievement of corrosion management objectives throughout the asset life cycle.
- Methods to measure each process's effectiveness and enact continual improvement of the CMS.
- Considerations for funding and risk, financial and otherwise.
- Recommendations for sustainability of the CMS.

Guidance

Non-mandatory guidance is provided throughout this Standard to aid users with implementing the Standard. The framework in this Standard can be utilized to develop a stand-alone CMS or to integrate corrosion management into an organization's existing management system. Additionally, some processes covered in this framework may already be implemented by an organization, for example, management of change (MOC). An organization may modify their existing processes to address the elements identified in this framework.

In NACE standards, the terms ***shall, must, should,*** and ***may*** are used in accordance with the definitions of these terms in the NACE Publications Style Manual. The terms ***shall*** and ***must*** are used to state a requirement, and are considered mandatory. The term ***should*** is used to state something good and is recommended, but is not considered mandatory. The term ***may*** is used to state something considered optional.

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Figures and Table

Section 1: Introduction

1.1 Why is a CMS needed?

1.1.1 Degradation resulting from various corrosion mechanisms can lead to failure of an asset and loss of use, along with other negative effects. If corrosion were better managed through prevention and monitoring activities, proper training and following of procedures, the likelihood of a corrosion failure would be reduced. It follows that improving the management of corrosion would reduce its likelihood and enable an effective response in the event that corrosion does occur - leading to a reduction in risk and extension of asset life. In general, the science and technology of corrosion prevention and control are well-established; it is the implementation of the knowledge and tools used for controlling corrosion that can falter, resulting in unintended consequences. A corrosion management system is essentially a means of improving the implementation of corrosion control knowledge and tools within an organization.

1.1.2 There are three key areas where the benefits of a CMS are prominent:

a) Risk Reduction - Reducing degradation due to corrosion helps sustain the operational integrity of assets; thereby reducing health, safety and environmental risks, increasing reliability, and extending the useful life of assets.

b) Cost Reduction - The NACE International IMPACT Study estimated the global cost of corrosion to be $2.5 trillion USD or 3.4% of the global GDP (2013).[1] The IMPACT Study also reported that a potential savings of between 15 to 35% of the cost of corrosion could be saved by using currently available corrosion control practices, which is between $375 and $875 billion USD in savings globally. Saving these costs allows resources to be used for other initiatives that can benefit society. Effective corrosion management can also improve return on investment (ROI).

c) Sustainability - Energy and raw materials are used to refine metals and create other materials that are subject to degradation and loss by corrosion. Reducing the corrosion not only reduces cost, but reduces the amount of materials and energy used to create replacement materials, which reduces carbon emissions.

1.1.3 A CMS can be developed using the framework described in this Standard; however, commitment of top management, as noted in the NACE IMPACT Study, is essential for successful implementation of a CMS. This commitment requires an acceptance that the CMS becomes an integral part of the overall management process in the organization.

1.2 Abbreviations, Terms and Definitions

The following terms and associated definitions are utilized throughout this Standard.

Audit: A systematic, independent and documented process for obtaining records or information and evaluating it objectively to determine the extent to which a set of policies, procedures, or requirements are fulfilled.

Audit Finding: A nonconformance, observation, or improvement opportunity identified during either internal audits or external audits conducted by auditors.

Corrective Measure: An action taken to respond to a condition or situation thereby limiting adverse consequences (i.e., actions taken to rectify an existing issue).

Corrosion: Degradation of materials due to exposure to the environment.

Corrosion Management System: A systematic approach designed to manage the threat of corrosion through the organization's objectives, policies, procedures, and processes.

Incident: An undesired event that adversely affects the organization or its stakeholders. This could include damages or failures; failures to meet corrosion management standards in the absence of damage, complaints that were caused by conformance to substandard procedures or specifications, or failures to comply with appropriate procedures or specifications.

Inspection: An evaluation for conformity by observation and judgment accompanied, as appropriate, by testing and/or measurement.

Lagging Indicator: A measurable factor of a process that changes after the process has started and is following a particular pattern or trend.

Leading Indicator: A measurable factor of a process that changes before the process starts to follow a particular pattern or trend.

Monitoring: A continuous or periodic, albeit not necessarily constant and complete, observation of parameters of a process. The intent of monitoring is to allow personnel, such as an inspector, to observe the activity or request performance data as needed.

Near Miss: An undesired event that under slightly different circumstances could have resulted in harm to people, damage to property, equipment or environment or loss of process.

Nonconformance: The failure to follow a standard, specification, procedure, plan, etc., or non-fulfillment of a requirement contained in such document.

Organizational Unit: A sub-part of an organization in which personnel, hardware, location or business purpose can be delineated from the entirety of the organization.

Preventive Measure: An action taken to eliminate the cause(s) of a credible corrosion threat in order to prevent its occurrence.

Qualification: A quality or accomplishment that indicates someone (or something) is suitable to perform a particular job or meets an intended purpose.

Supervise: To observe and direct the execution of a process, activity, or task.

Verification: An examination to confirm that an activity, product, service, or document is in accordance with specified requirements.

1.3 Acronyms

CMS Corrosion Management System

MOC Management of Change

PDCA Plan-Do-Check-Act

TOR Terms of Reference

Section 2: Scope

2.1 Scope of Applicability

2.1.1 This Standard is applicable to organizations that manage assets affected by corrosion threats. The Standard should be used to aid in the development of an organization-specific CMS. This Standard should also be referenced by service providers, consultants, and other professionals seeking to support CMS development and implementation for these assets.

Section 3: Corrosion Management System Elements

3.1 Framework Elements

3.1.1 The framework for a CMS is based on a series of central elements to ensure the effectiveness, consistency and communication of corrosion management processes. The main corrosion management elements described in this Standard are:

a) Policy and Strategy
b) Planning
c) Organization of the CMS
d) Operational Support
e) Management of Change
f) Performance Evaluation
g) Continuous Improvement

3.1.2 The implementation of these elements shall be done in a consistent manner in all stages of the asset life cycle in accordance with the organization's management system.