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Standard Practice

Control of Internal Corrosion in Steel Pipelines and Piping Systems

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Foreword

The purpose of this NACE standard practice is to describe procedures and practices for achieving effective control of internal corrosion in steel pipe and piping systems in crude oil, refined products, and gas service. Because of the complex nature and interaction between constituents that are found in gas and liquid (e.g., oxygen, carbon dioxide, hydrogen sulfide, chloride, bacteria, etc.), certain combinations of these impurities being transported in the pipeline may affect whether a corrosive condition exists. Identification of corrosive gas and liquid in a pipeline can only be achieved by analysis of operating conditions, impurity content, physical monitoring, or other considerations. Therefore, gas, liquids, and operating conditions must be monitored and evaluated on an individual basis in order to accurately assess the effects of their presence or absence in the pipeline. This standard presents general practices and preferences in regard to control of internal corrosion in steel piping systems. This standard is intended for use by pipeline operators, pipeline service providers, government agencies, and any other persons or companies involved in planning, designing, or managing pipeline integrity.

This standard was prepared by Task Group (TG) 038 on Control of Internal Corrosion in Steel Pipelines and Piping Systems. TG 038 is administered by Specific Technology Group (STG) 35 on Pipeline, Tanks, and Well Casings. This standard is issued by NACE International under the auspices of STG 35.

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, 4th ed., Paragraph 7.4.1.9. *Shall* and *must* are used to state mandatory requirements. The term *should* is used to state something good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

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Section 1: General

1.1 This standard presents recommended practices for the control of internal corrosion in steel pipelines and piping systems used to gather, transport, or distribute crude oil, petroleum products, or gas.

1.2 This standard serves as a guide for establishing minimum requirements for control of internal corrosion in the following systems:

(a) Crude oil gathering and flow lines

(b) Crude oil transmission

(c) Hydrocarbon products

(d) Gas gathering and flow lines

(e) Gas transmission

(f) Gas distribution

(g) Storage systems

1.3 This standard does not designate practices for every specific situation because the complexity of pipeline inputs and configurations precludes standardizing all internal corrosion control practices.

1.4 The provisions of this standard should be applied under the direction of competent persons who, by reason of knowledge of the physical sciences and the principles of engineering and mathematics acquired by education or related practical experience, are qualified to engage in the practice of corrosion control and risk assessment on carbon steel piping systems. Such persons may be registered professional engineers or persons recognized as corrosion specialists by organizations such as NACE, or engineers or technicians with suitable levels of experience, if their professional activities include internal corrosion control of buried carbon steel piping systems.

Section 2: Definitions

Coating: A liquid, liquefiable, or mastic composition that, after application to a surface, is converted into a solid protective, decorative, or functional adherent film.

Corrosion: The deterioration of a material, usually a metal, that results from a reaction with its environment.

Corrosion Inhibitor: A chemical substance or combination of substances that, when present in the environment, prevents or reduces corrosion.

Erosion-Corrosion: A conjoint action involving corrosion and erosion in the presence of a moving corrosive fluid or a material moving through the fluid, leading to accelerated loss of material.

Gas or Liquid: The material being transported through a pipeline.

Holiday: A discontinuity in a protective coating that exposes unprotected surface to the environment.

Iron Count: The quantity of iron, usually expressed in parts per million or milligrams per liter, contained in a sample of the liquid that may be indicative of corrosive activity within the equipment that contained the liquid. Some produced waters contain naturally occurring dissolved iron. This iron is detected when running iron counts in production systems can be mistaken for iron produced by corrosion. The presence of iron in produced water must be viewed along with the other indicators of corrosion to determine whether iron count values are significant. The probable occurrence of corrosion should always be confirmed by equipment inspection, downhole caliper surveys, and review of failure records before parameters for using iron counts as an indicator of corrosion are established.

Magnesium Count: The concentration of manganese in iron alloys used in oilfield downhole equipment is typically 0.5 to 1.5%. Therefore, the supposition is that the ratio of manganese to iron in produced water should be about 1:100 if all the iron and manganese result from corrosion and no precipitation has occurred from the water.

Pigging: The operation of transporting a device or combination of devices (scraper, sphere, or flexible or rigid plastic) through a pipeline for the purpose of cleaning, chemical application, inspection, or measurement.