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Standard Practice

Internal Corrosion Direct Assessment Methodology for Liquid Petroleum Pipelines

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NACE International
1440 South Creek Dr.
Houston, Texas 77084-4906
+1 281-228-6200
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Foreword

This standard practice formalizes a methodology termed *liquid petroleum internal corrosion direct assessment (LP-ICDA)* that can be used to help ensure pipeline integrity. The methodology is applicable to pipelines that are normally fully packed with petroleum compound(s) existing in an incompressible liquid state under normal pipeline operating conditions, with basic (or bottom) sediment and water (BS&W) contamination normally lower than 5% by volume. This standard is intended for use by pipeline operators and others who manage pipeline integrity.

The basis of LP-ICDA is identification and detailed examination of locations along a pipeline in which water or solids can accumulate for extended periods, allowing informed conclusions to be made about the integrity of the nonexamined pipeline. If the locations determined to have the highest susceptibility for long-term internally corrosive conditions are examined and found to be free of significant corrosion, other less susceptible locations may be considered to be free of corrosion. This standard is not applicable to pipelines in which corrosion or leaks have occurred at unpredictable locations, and it may not present an economical alternative to in-line inspection for pipelines found to have moderate or higher rates of internal corrosion.

LP-ICDA methodology for liquid petroleum systems is described in terms of a four-step process: (1) pre-assessment, (2) indirect inspection, (3) detailed examination, and (4) post assessment. The LP-ICDA method provides the greatest benefit for pipelines that cannot be in-line inspected; however, the method is not limited to unpiggable pipelines.

This standard was prepared by Task Group (TG) 315 on Pipelines (Liquid Petroleum): Internal Corrosion—Direct Assessment. TG 315 is administered by Specific Technology Group (STG) 35 on Pipelines, 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*. 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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Section 1: General

1.1 Introduction

1.1.1 This standard is intended to serve as a guide for applying the NACE LP-ICDA process to liquid petroleum pipeline systems.

1.1.2 The primary purposes of the LP-ICDA method are (1) to enhance the assessment of internal corrosion in liquid petroleum pipelines, and (2) to improve pipeline integrity.

1.1.3 The LP-ICDA methodology assesses the likelihood of internal corrosion and includes existing methods of examination available to a pipeline operator to determine whether internal corrosion is actually present or may occur. This methodology may be incorporated into corrosion integrity and risk management plans.

1.1.4 LP-ICDA uses flow modeling results and provides a framework to utilize those methods.

1.1.5 LP-ICDA was developed for pipelines that are normally fully packed with petroleum compound(s) that exists in an incompressible liquid state under normal pipeline operating conditions, with BS&W contaminations that are normally less than 5% by volume.

1.1.6 One benefit of the LP-ICDA approach is that an assessment can be performed on a pipe segment for which alternative methods (e.g., in-line inspection [ILI], hydrostatic testing, etc.) may not be practical.

1.1.7 LP-ICDA has limitations, and not all pipelines can be successfully assessed with LP-ICDA. These limitations are identified in the pre-assessment step.

1.1.8 The provisions of this standard shall be applied by or 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 pipeline systems. Such persons may be (1) registered professional engineers, (2) recognized as corrosion specialists by organizations such as NACE, or (3) professionals (i.e., engineers or technicians) with professional experience, including detection/mitigation of internal corrosion and evaluation of internal corrosion on pipelines.

1.1.9 For accurate and correct application of this standard, it shall be used in its entirety. Using or referring to only specific paragraphs or sections can lead to misinterpretation or misapplication of the recommendations and practices contained herein.

1.1.10 This standard does not designate practices for every specific situation because of the complexity of internal conditions that may be present in various pipeline systems.

1.1.11 In the process of applying LP-ICDA, other pipeline integrity threats, such as external corrosion, mechanical damage, stress corrosion cracking (SCC), etc., may be detected. When such threats are detected, additional assessments, inspections, or both must be performed. The pipeline operator should utilize appropriate methods to address risks other than internal corrosion, such as those described in NACE standards (e.g., SP0204),[1] ANSI[(1)]/ASME[(2)] B31.4,[2] ANSI/ASME B31.8,[3] API[(3)] 1160,[4] ANSI/API 579,[5] and BSI[(4)] 7910,[6] international standards (e.g., DnV[(5)] RP-F101),[7] and other documents.

1.1.12 This standard does not address specific remedial actions that may be taken when corrosion is found; however, the reader is referred to ASME B31.4[2] and other relevant documents (e.g., API 2200)[8] for guidance.

1.2 Four-Step Process

1.2.1 LP-ICDA requires the integration of data from multiple field examinations and pipe surface evaluations, including the pipeline's physical characteristics and operating history.

1.2.2 LP-ICDA includes the following four steps, as shown in Figures 1 through 5.

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(1) American National Standards Institute (ANSI), 11 W. 42nd St., New York, NY 10036.
(2) ASME International (ASME), Three Park Ave., New York, NY 10016-5990.
(3) American Petroleum Institute (API), 1220 L St. NW, Washington, DC 2000-4070.
(4) British Standards Institute (BSI), 389 Chiswick High Rd., London, United Kingdom W4 4AL.
(5) Det Norske Veritas (DnV), Veritasveien 1, 1322, Høvik, Oslo, Norway.