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Guide for Sampling Program Development in Hydrocarbon Production, Transportation and Processing

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Foreword

This AMPP document has been provided to offer guidance on the development of sampling programs. This guidance is meant to cover all aspects of sampling and describes actions that may be taken to avoid some of the recurring pitfalls that have a negative impact on the collection of samples and their subsequent analyses.

A significant part of indirect corrosion monitoring, as detailed in NACE TR3T199, relies on a very good, ongoing understanding of process fluid compositions. Consequently, samples of those process fluids will be required to allow for detailed analyses. If it is not possible for a sample to be collected or if the sample obtained is not adequately representative of the fluid or the fluid phase that is to be analyzed, overall corrosion control may be adversely impacted.

While this document was developed to address sampling as it pertains to corrosion management, the guidance provided may be of use for other types of sampling programs, i.e., those that deal with product composition, product quality, or other operations that require collection of a process fluid sample.

Rationale

This document provides guidance to organizations that will assist with the definition of requirements related to process sampling programs. It emphasizes the importance of the assessment of each critical aspect of the sampling process so that a sample appropriate for the specific analysis required may be obtained in a manner that ensures sampling personnel safety and maintains overall process integrity.

Referenced Standards and Other Consensus Documents

Unless specifically dated, the latest edition, revision, or amendment of the documents listed in the table below shall apply.

AMPP/NACE/SSPC, www.ampp.org:	
NACE TR3T199	Techniques for Monitoring and Measuring Corrosion and Related Parameters in Field Applications
NACE SP21430	Standard Framework for Establishing Corrosion Management Systems
NACE SP0407	Format, Content, and Guidelines for Developing a Materials Selection Diagram
American Petroleum Institute (API), www.api.org:	
API RP 584	Integrity Operating Windows
ASTM International, www.astm.org:	
ASTM D4057	Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D8009	Standard Practice for Manual Piston Cylinder Sampling for Volatile Crude Oils, Condensates, and Liquid Petroleum Products
ASTM F307	Standard Practice for Sampling Pressurized Gas for Gas Analysis
International Organization for Standardization (ISO), www.iso.org:	
ISO 10715	Natural gas — Sampling guidelines
ISO 4257	Liquefied petroleum gases — Method of sampling
ISO 5667-1	Water quality - Sampling - Part 1: Guidance on the design of sampling programmes and sampling techniques

AMPP Guides present the user with information about alternative procedures, materials, or technologies that enable the user to select the best option for a specific use. They may contain recommendations to assist the user to make an informed decision based on the desired outcome. Information on health, safety, and environmental issues may be included, but the user is responsible for knowledge of and compliance with appropriate national and local regulations.

Section 1: Scope

1.1 The intent of this document is to describe the major aspects of the sampling process, from specific sample identification, determination of analytical requirements, through sample point design, to sample collection. Consideration of these aspects is necessary for the development of robust and safe sampling programs, protocols, and procedures to facilitate indirect corrosion monitoring.

This document is to assist end users in the development of sampling programs. The guidance is structured to provide an awareness of the major aspects of program design, which if not addressed, may have a significant negative impact on the overall performance of these programs. While this document has been primarily developed with a focus on sampling for indirect internal corrosion monitoring; the basic concepts have a broader applicability and may be of benefit to those developing sampling programs in other areas or for other requirements.

1.2 Similarly, whether an entire program is being developed for a new facility, yet to be designed, or whether a new sample is being considered within an existing facility, the concepts discussed may be successfully applied. The document is presented for the new facility case, as it will address the broader aspects that would not be required if a new point were to be installed within an existing facility with existing support programs. The document may also assist with assessments of existing sampling programs, by providing information that may be useful in the identification of contributing shortfall issues.

1.3 Several factors may influence the overall effectiveness of sampling programs. These factors include:

a) Sample Identification
b) Analytical Requirements
c) Sample Point Location Determination and Physical Placement
d) Sample Point Design
e) Safe Sample Collection
f) Training for Sampling and Laboratory Personnel
g) Process Integrity
h) Reporting
i) Inspection
j) Corrosion Monitoring Association
k) Documentation

These factors exhibit a very high degree of interdependence. Consequently, failure to identify or address seemingly insignificant issues within one component may result in major reductions in overall program efficiency or effectiveness.

1.4 Sampling programs are much broader in scope than simply obtaining a sample, performing a laboratory analysis, recording, and reporting results. To be effective, sampling programs will be structured to ensure that all facilities and procedures are in place to successfully enable sample collection and analysis, while at the same time maintaining process integrity.

This document will work with the project phases identified below and provide information regarding the actions that would be completed with respect to sampling within each phase.

Section 2: Project Development

2.1 During this phase, broad project scope details are developed. Sampling for indirect corrosion monitoring will be a component of the overall Corrosion Management Program (CMP) that will be developed for the facility, as documented in NACE SP21430. CMP discussion at this stage would normally identify possible damage mechanisms. A preliminary definition of Integrity Operating Windows (IOW), where they will be utilized, would be undertaken, as documented in API RP 584. This will allow for the determination of which samples may be required to provide information supporting IOW requirements.