Computational Pipeline Monitoring for Liquids

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Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Contents

Figures

Computational Pipeline Monitoring for Liquids

1 Scope

This recommended practice (RP) focuses on the design, implementation, testing, and operation of CPM systems that use an algorithmic approach to detect hydraulic anomalies in liquid pipelines. The primary purpose of these systems is to provide tools that assist Pipeline Controllers in detecting commodity releases that are within the sensitivity of an algorithm. It is intended that the CPM system provide an alarm and display other related data to the Pipeline Controllers to aid in decision-making. The Pipeline Controllers would undertake an immediate investigation, confirm the reason for the alarm and initiate an operational response to the hydraulic anomaly when the alarm represents an irregular operating condition or abnormal operating condition or a commodity release.

The purpose of this recommended practice is to assist the Pipeline Operator in identifying issues relevant to the design, implementation, testing, and operation of a CPM system. This RP is intended for pipeline controllers and operators, CPM system developers and engineers, and others interested in CPM system design, implementation, and operation.

This RP includes definitions, source and reference documents, concepts of data acquisition, discussion of design and operation of a pipeline as related to CPM, field instrumentation for CPM purposes, alarm credibility, Pipeline Controller response, incident analysis, records retention, maintenance, system testing, training, considerations for setting alarm limits, trending, and recommendations for data presentation. The relationship between the Pipeline Controller and the CPM system is also discussed.

This recommended practice is written for liquid onshore or offshore trunkline systems. CPM systems have typically been applied to steel pipeline systems. CPM applicability and performance may be limited by the characteristics of non-steel pipelines.

This recommended practice was written considering single phase, liquid pipelines. Many of the principles apply to liquid pipelines in intermittent slack line flow or liquid pipelines that may have permanent slack line flow. This RP may not apply to the special case of determining leaks during shut-in conditions that occur when the line is shutdown (sometimes called static conditions) unless shut-in leak detection is part of the deployed CPM solution.

It is recognized that no single CPM methodology or technology is suitable for all pipelines because each pipeline system is unique in design and operation.

This recommended practice complements but does not replace other procedures for monitoring the integrity of the line. CPM systems are one part of an operator's leak detection program. For further information on leak detection programs, see API RP 1175.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies (including any addenda/errata).

API RP 551, *Process Measurement Instrumentation*

API TR 1149, *Pipeline Variable Uncertainties and Their Effects on Leak Detectability*

API RP 1175, *Pipeline Leak Detection—Program Management*

Code of Federal Regulations, 49 CFR Part 195, *Transportation of Hazardous Liquids by Pipeline*