TR1179

Pipeline SMS

GUIDELINES FOR USE OF **HYDROSTATIC TESTING AS AN INTEGRITY MANAGEMENT TOOL**

A Pipeline Safety Management System

Significance of the New Document

API Technical Report (TR) 1179 provides guidelines related to hydrostatic testing as a tool for integrity management in gas and liquids pipelines. The TR describes scenarios, supplemented by case studies to aid in determining when:

- Hydrostatic pressure testing is recommended,
- It might be damaging to the pipeline, or
- Another inspection technology will provide operators with greater safety benefit.

The case studies serve to provide valuable working knowledge regarding considerations and real-world challenges that must be addressed by pipeline operators when designing hydrostatic test programs.

The audience for API RP 1179 Includes

Operators, engineering service providers, and others involved in pipeline integrity management.

Focuses of the Document

- Hydrostatic test program decision processes and development;
- Selection of hydrostatic testing as an appropriate pipeline assessment tool;
- Subsequent technical design of a hydrostatic test program; and
- Necessary considerations to achieve integrity management plan objectives

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Elements of a Test Program – Key Definitions from TR 1179

- **Test Pressure Stress level**
  - Hydrostatic test stress levels are frequently discussed in the pipeline industry as being based upon the ratio of the minimum hoop stress during the test period in the limiting (usually nominal) pipe to specified minimum yield strength (SMYS) within the test segment (e.g. a test to 90 % SMYS).
- **Mill test pressure**
  - The test pressure applied in the pipe mill as part of the original manufacturing process of the line pipe.
- **Leak test**
  - A test that can be performed with hydrostatic (i.e., qualifying test) or flame ionization (i.e., gas) means, or any other method suitable for discovery of leaks on the right-of-way
- **Qualifying hydrostatic test**
  - A qualifying hydrostatic test establishes at least the minimum required safety factor for the Maximum Operating Pressure (MOP)/Maximum Allowable Operating Pressure (MAOP) of the pipeline based upon the achieved ratio between test pressure and MOP/MAOP as per accepted industry standards and regulatory requirements.
- **High pressure test**
  - A test undertaken at pressures potentially greater than necessary for qualifying test minimum requirements in order to address or assess for an identified or targeted pipeline threat.
- **Spike hydrostatic testing**
  - Similar in utility to high pressure testing, a test undertaken in order to address or assess for an identified or targeted pipeline threat and, when used to assess for manufacturing threats, additionally should establish test targets considering stress levels based on the pipe material properties.

Design of a Test Program as Detailed in the TR

- Development of test objectives
- Understanding stress levels
- Required test pressures
- Development of a hydrostatic pressure profile
- When to terminate a test
- Test acceptance and interpretation
- Determination of assessment intervals

Potential Detrimental Effects discussed

- Developing leaks following the hydrostatic test (e.g., at lack of fusion (LOF) defects in ERW pipe)
- Yielding and plastic deformation of the line pipe
- Damage to brittle coatings due to deformation of the pipe, leaving the pipe more susceptible to environmental conditions
- Crack extension of sub-critical cracks or other non-critical flaws to near failure during a hydrostatic test leading to pressure reversals (a failure at a pressure level lower than previously achieved)
- Reduced fatigue life of just-surviving flaws due to large pressures cycles from repeated hydrostatic tests
- Activation of resident flaws
- Low cycle fatigue failures due to testing of unrestrained mechanical damage within a dent, gouges, or deformations

Uses of Hydrostatic Testing— Understanding the Benefits

- Applied by pipeline industry to establish maximum operating pressures
- Management of specified threats to integrity
- Validate construction and pipe manufacturing practices prior to operation
- Re-qualification of a pipeline (e.g. following change of service)
- Integrity assessment to confirm reliability

Stakeholders Collaborating to Improve Safety

API documents standardize and disseminate best practices across the industry

- Developed via open, accredited processes, with formal review and comment periods;
- Provide all operators with the benefits of the industry's combined expertise in critical areas; and
- Once adopted and implemented, establishes standard practices across the industry.

America's Pipeline Industry:
Focused on Zero Incidents, Committed to Continuous Improvement