ILI Related API Initiatives

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811 Know what's below. Call before you dig.

Outline

- ILI as an integrated system
- Context of API 1160, 1176 and 1179 relevant to ILI
- In process update of API 1163 In-line Inspection Systems Qualification Standard
- In ditch NDE data improvement initiatives
- NDE-4-12 Continuous Improvement of ILI Capabilities Joint Industry Project (Phase I)

ILI as an Integrated System

Quality of the deliverable from the ILI vendor
- Hardware
- Analysis

Ability of the operator to accurately discern ILI quality
- NDE data accuracy
- Sufficiently granular specification

Ability of the operator to transform ILI data into integrity knowledge
- Data integration
- Consider uncertainties
- Informed interpretation

The collection of API documents supporting Integrity

- **API RP 1173: Safety Management System**

- **API RP 1160: Integrity Management**

  - API TR 1179: Appropriate Uses of Hydrostatic Testing
  - **API RP 1176: Assessment and Management of Pipeline Cracking**
  - **API TR 1178: Integrity Data Management and Integration**
  - API RP 1133 Managing Hydro-technical Hazards
  - API 1163 In-line Inspection Systems Qualification Standard

Dispositioning the ILI calls by operator

For cracking per 1176

- Likely crack
- Possible crack – *significant portion of correlations are false positive*
- Unlikely crack – *stable features that do not grow in gas service and fail as a notch as opposed to a crack (plastic collapse vs fracture mechanics)*

API TR 1178 The Data Management and Integration Guideline

- **1178 empowers informed decisions by facilitating a dataset that is**
  - accurate, and
  - comprehensive
- **Addresses PHMSA's statement that**,

  "the ability to integrate and analyze threat and integrity data from many sources is essential for sustaining performance and a proactive IM program."
- **How that data should be interpreted is largely left to other industry documents such as API 1160, 1176 and 1163**

API 1164 - scope of 3rd revision

- Beyond a general update, 1163 will be the vehicle to drive a number of API initiatives

General

- Review and align where practicable with current industry documents, including POF, CSA Z662 and API 1176.
- Resolve references and terminology for dents/wrinkles/buckle and such
- Shopping list of feedback for industry solicitation in early 2017

Expand on Severity Based POD and Sizing

- Typically, the larger the feature the better detection
  - Not reflect in current specs
- Performance can be significantly influence by crack morphology/type
  - Typically limited to only delineating weld region and imbedded flaws today
- Increase discretization of features types and tool capabilities
  - severity based POD necessitates clarity on outliers and exceptions
- Clarify interplay of POD and POI
  - POx?
  - POI specific to feature type/subtype – critical in Likely/Possible/unlikely disposition

Provision for Developing Performance Spec based on Integration of Multiple Technologies

- Transparency of interpretation
- Impact of degradation of data from one of the integrated technologies
- Managing score/risk based detection grading that is not definitive

Standardize Deliverables

- Normalized format of performance spec – informative
  - Facilities raising the bar on POD and POI
- Possibly normalized data governance– informative
  - A normalized pipe tally would facilitate aggregation of industry data
  - Capture reporting updates to support dent assessment working group

In Ditch NDE Data Improvement Initiatives

- NDE techniques discussed in API 1176,
  - there was the intent to expand on it in API 1163 given its import in validating ILI data

- NDE techniques being addressed under API R&D working group as new qualification process and associated documentation
  - NDE in ditch techniques and qualification (design to augment current ASNT certification)
  - Blind test administered by a third party

NDE-4-12 Continuous Improvement of ILI Capabilities Joint Industry Project

- Initiated by API's R&D Working Group
- Purpose:
  - Develop testing protocols with an inventory of test facilities and test spools to better assess ILI tool performance and facilitate ILI performance improvements – initial focus is cracking in liquid service.
- Phase 1 executed as a joint industry project under the umbrella of PRCI
- DNV GL selected as the contractor

NDE-4-12 Continuous Improvement of ILI Capabilities Joint Industry Project (Phase I)

Phase I	Task Description	Deliverable
Task I	Research Available Test Facilities	Presentation of the identified pull test facilities, ranked according to determined feasibility, and the anticipated modifications to accommodate testing in a liquid medium
Task II	Research/Design Test Rig	
Task III	Research Methodologies for Manufacturing Cracks	Written Project Plan
Task IV	Research Real Defect Samples	
Task V	Design Defect Population	
Task VI	Design Test Matrix	
Task VII	Finalize ILI Vendor Participants and Vendor Buy-In	Presentation of the project plan to key stakeholders and ILI vendors

Defect Type Delineation for NDE-4-12 and API 1163

Crack Type	Examples	Crack Characteristics									Weld Type	Detect, Identify, Size?
		Single or Multiple	External, Internal, Midwall	Associated with Weld	Associated with Corrosion?	Associated with Dent?	Axial, Circum, Diagonal, Mixed	Tight, Open	Heavily Branched	Mostly Radial		
Isolated External Axial Crack in Pipe Body	Isolated (single or small group) near neutral pH SCC	S	E	N	N	N	A	O	N	Y	Any	D,S
Isolated External Axial Crack in Pipe Body	Rail fatigue due to stacking on rivets (not very common)	S	E	N	N	N	A	T	N	Y	Any	D,S
Isolated External Axial Crack in Pipe Body	Isolated (single or small group) high pH SCC	S	E	N	N	N	A	T	Y	Y	Any	D,S
Isolated external surface breaking parallel-to-wall crack	External slivers and laps (often shallow)	S	E	N	N	N	M	O	N	N	Any	D,I
Isolated External Axial Crack in Dent	With gouge, rerounding crack	S	E	N	N	Y	A	O	N	Y	Any	D
Isolated External Axial Crack in Corroded Area	Near neutral pH SCC	S	E	N	N	N	A	O	N	Y	Any	D,S?
Isolated External Axial Crack in Dent with Corroded Area	Corroded out rerounding crack or near neutral pH SCC	S	E	N	N	Y	A	O	N	Y	Any	D
Isolated External Axial Crack in Longitudinal Seam Weld Heat Affected Zone	External hook crack (ERW, FW)	S	E	Y	N	N	A	O	N	N	ERW, FW	D,I,S
Isolated External Axial Crack along Longitudinal Seam Weld Toe	Near neutral pH SCC (tape coated lines)	S	E	Y	N	N	A	O	N	Y	DSAW, SSAW	D,I,S
External sharp (V-notch) groove in weld	External selective seam weld corrosion	S	E	Y	N	N	A	O	N	Y	ERW, FW	D,I,S
Isolated External Axial Crack in Longitudinal Seam Weld Heat Affected Zone	Hydrogen cracking at seam weld (rare)	S	E	Y	N	N	A	T	N	N	DSAW, SSAW	D,I,S