PHMSA Pipeline Data Public Meeting
Washington, DC

Strengthening Pipeline Safety Through Rigorous Program Evaluation and Meaningful Metrics

Alan Mayberry
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PHMSA's Long-Standing Position

- We have recognized and emphasized that improved safety performance relies upon:
  - Comprehensive and critical operator performance evaluation
  - Operator management fully understanding the implications of these evaluations and taking the steps to make necessary program improvements
- We have promoted and required the development and implementation of processes to evaluate effectiveness
  - Performance evaluation is a required program element in our IM regulations.
  - Executive certification of integrity management (IM) program performance information submissions

NTSB Recommendations

- 11-18 – revise protocols to:
  - incorporate a review of meaningful metrics
  - verify that the operator has procedure to ensure completeness and accuracy of information
  - review all IM performance measures reported to PHMSA and compare the incident measures to the operator's risk model
  - set performance goals for operators at each audit and follow up at subsequent audits.

NTSB Recommendations

- 11-19 - develop a standard for IM and other performance-based safety programs that requires operators to regularly assess program effectiveness using clear and meaningful metrics, and to identify and correct deficiencies.

  Make those metrics available in a centralized data base.

Evaluation is a Key IM Program Element

- Requirements:
  - §195.452 (f) (7) and §195.452 (k) for hazardous liquid pipelines
  - §192.911 (i) and §192.945 for gas pipelines
- Standards:
  - API-1160, Section 13 – Program Evaluation
  - ASME B31.8S, Section 9 – Performance Plan

PHMSA Expectations – Program Evaluation

- Scope, objectives, and frequency of IM program evaluations.
- Periodic self-assessments, internal or external audits, performance metrics analysis, etc.
- Performance goals and objectives.
- Assignment of responsibility.
- Management follow-up of findings and recommendations.

PHMSA Expectations - Metrics

- Clear and meaningful metrics are essential
  - Description of the performance measures to be used
    - data sources, data collection frequency,
    - data validation and quality assurance activities,
    - normalization factors, as appropriate.
  - Means to update the performance measures
  - Use metrics to check and calibrate risk analysis tools

PHMSA's Preliminary Approach

- Two Initiatives in Parallel
  - **Standard development**
  - **Oversight program improvement**

Standard Development

1. More comprehensive list of metrics
   - additional metrics to be reported to PHMSA
   - activities and programs for which metrics should be developed as part of an operator's internal program evaluation effort
     - Threat-specific metrics
     - Programmatic metrics

Threat-Specific Performance Metric Categories

An Illustration

	Leading ----------Indicators----------*Lagging*		
Failure Mechanism	**Threat-Specific Risk Control Processes**	**Deterioration Indicators**	**Failure Measures**
Corrosion			
Internal corrosion	● Coupon monitoring ● Commodity sampling ● In-line inspection program ● Dead leg monitoring ● Cleaning pig program ● NDT examination ● Inhibitor injection	Adverse trends in: ● Water content ● H_2S content ● Microbial activity ● Sediment levels ● Duration/frequency of low flow conditions ● ILI inspection & excavation results	● Release due to internal corrosion ● Dead leg failure due to internal corrosion

Threat-Specific Performance Me

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	Leading ----------	
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Internal corrosion	• Coupon monitoring • Commodity sampling • In-line inspection program • Dead leg monitoring • Cleaning pig program • NDT examination • Inhibitor injection	Adve • Wa • H_2S • Mic • Sed • Du lov • ILI exc

Threat-Specific Risk Control Processes

- Coupon monitoring
- Commodity sampling
- In-line inspection program
- Dead leg monitoring
- Cleaning pig program
- NDT examination
- Inhibitor injection

Threat-Specific Performance Metric Categories

Illustration

Deterioration Indicators

Adverse trends in:

- Water content
- H_2S content
- Microbial activity
- Sediment levels
- Duration/frequency of low flow conditions
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----------Indicators----------*Lagging*

		Deterioration Indicators	Failure Measures
		Adverse trends in: ● Water content ● H_2S content ● Microbial activity ● Sediment levels ● Duration/frequency of low flow conditions ● ILI inspection & excavation results	● Release due to internal corrosion ● Dead leg failure due to internal corrosion

Granularity is Critical

- Operator level metrics are useful, but not sufficient.
- Performance metrics should support evaluation of program effectiveness at a more localized level.

Programmatic Performance Metric Categories

An Illustration

	Leading ----------Indicators----------*Lagging*		
Program Element	**Processes Measures**	**Deterioration Indicators**	**Failure Measures**
Assessment			
In-Line Inspection	● Miles assessed by ILI tool type ● Assessment frequency ● Time period since most recent assessment ● Tool accuracy or other specifications ● Fraction of HCA pipe assessed for each threat	● Anomalies repaired by repair criterion + Features requiring repair per mile for each assessment type + Features requiring repair per mile by pipe age ● Number and size of anomalies remaining in pipe after assessment and repair	● Leaks and ruptures in HCAs by cause ● Leak or rupture occurring at locations where assessment was not done ● Leak or rupture following assessment and repair by detectable cause ● Leak or rupture following assessment without repair.

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Processes Measures

- Miles assessed by ILI tool type
- Assessment frequency
- Time period since most recent assessment
- Tool accuracy or other specifications
- Fraction of HCA pipe assessed for each threat

Programmatic Metric Categories

Illustration

Deterioration Indicators

- Anomalies repaired by repair criterion
  - + Features requiring repair per mile for each assessment type
- Number and size of anomalies remaining in pipe after assessment and repair

----------Indicators----------*Lagging*

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threat		

Programmatic Performance Metric Categories

Failure Measures
• Leaks and ruptures in HCAs by cause • Leak or rupture occurring at locations where assessment was not done • Leak or rupture following assessment and repair by detectable cause

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Standard Development

2. Standard will also address PHMSA expectations for operator performance measurement and improvement process:
    - Data collection and record keeping
    - Analysis of data and monitoring
    - Establishing performance goals and tracking against them
    - Program evaluation process in which these metrics are used

Oversight Improvement

- Inspection Process
  - Adjust inspection approach so a review of an operator's internal program effectiveness evaluation and metrics is part of the inspection screening/preparation
  - Identify potential improvements to inspection questions and guidance

Oversight Improvement

- Communication with Operators
  - Issue Advisory Bulletin reminding operators of the importance a comprehensive IM program evaluation and meaningful metrics (Nov 2012)
  - Gather insights from the work groups at this workshop
- Analyze Inspection Findings
  - Identify strengths and weaknesses
  - Use insights to inform the standard development, and improve the inspection questions and guidance

Oversight Improvement

- Enforcement
  - By now, operators should have fully mature IM programs.
  - Rigorously enforce IM program evaluation requirements
  - Conduct performance reviews with company executives of operators with poor safety programs and inadequate program evaluation processes.

Share IM Performance Metrics

- Improve accessibility and visibility of IM performance metrics currently submitted to PHMSA.
- When the new metrics required by the standard are available, display them in a clear, understandable manner.

We welcome your input on this important topic – at this workshop or later.

Any questions?