

Current Regulatory Requirements for Evaluation of Risk

PHMSA Pipeline Risk Modeling Methodologies Public Workshop

**PHMSA - Office of Pipeline Safety
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Why Are We Here?

- Follow-up to July 2011 “Improving Pipeline Risk Assessments and Recordkeeping” public workshop.
- **Pipeline accidents and National Transportation Safety Board (NTSB) recommendations highlight the need** for continued diligence and improvements in risk analysis.



Why Are We Here?

- 2011 Workshop highlighted the opportunity we have to improve the overall approach to risk analysis.
- Risk analysis is an important part of Pipeline Safety Management Systems (SMS) effort.
- **Workshop will focus specifically on risk modeling as a subset of overall risk analysis.**
(which is also a subset of Risk Management)



Our Current World: Threat and Result



Santa Barbara, CA – 05/2015

Fallansbee, WV 01/2015



**Yellowstone River
01/2015**



**COASTAL CRISIS
CALIFORNIA OIL SPILL 5X BIGGER THAN FIRST THOUGHT
CNN**



Sissonville, WV – 12/2012



NTSB Recommendations

- **San Bruno, CA (P-11-18)**
 - Revise your Integrity Management (IM) inspection protocol to...
 - (3) require auditors to review all **integrity management performance measures** reported to the Pipeline and Hazardous Materials Safety Administration (PHMSA) and **compare the leak, failure, and incident measures to the operator's risk model...**



NTSB Recommendations

- **Gas Transmission (GT) IM Safety Study (P-15-9)**
 - Establish minimum criteria for eliminating threats, and provide guidance to gas transmission pipeline operators for **documenting their rationale for all eliminated threats.**



NTSB Recommendations

- **GT IM Safety Study (P-15-10)**
 - Update guidance for gas transmission pipeline operators and inspectors on the **evaluation of interactive threats**.
 - Guidance should list - **all threat interactions that must be evaluated and acceptable methods to be used.**



NTSB Recommendations

- **GT IM Safety Study (P-15-11)**
 - Develop and **implement specific risk assessment training for inspectors** in verifying the technical validity of risk assessments that operators use.



NTSB Recommendations

- **GT IM Safety Study (P-15-12)**
 - Evaluate the safety benefits of the four risk assessment approaches* currently allowed by the gas integrity management regulations; determine whether they produce a comparable safety benefit; and disseminate the results of your evaluation to the pipeline industry, inspectors, and the public.
- * Subject Matter Expert (SME), Scenario-Based Models, Relative Assessment Models (“index” models) and Probabilistic Models



NTSB Recommendations

- **GT IM Safety Study (P-15-13)**
 - **Update guidance** for gas transmission pipeline operators and inspectors on critical components of risk assessment approaches.
 - (1) methods for setting weighting factors,
 - (2) factors that should be included in consequence of failure calculations, and
 - (3) appropriate risk metrics and methods for aggregating risk along a pipeline.



NTSB Recommendations

- **GT IM Safety Study (P-15-15)**
 - Revise Form F7100.1, **Annual Report Form**, collect information about which methods of HCA identification and risk assessment approaches were used.
- **GT IM Safety Study (P-15-16)**
 - Revise Form F7100.2, **Incident Report Form**,
 - (1) to collect information about both the results of previous assessments and previously identified threats for each pipeline segment involved in an incident and
 - (2) to allow for the inclusion of **multiple root causes when multiple threats interacted** .



NTSB Recommendations

- **GT IM Safety Study (P-15-17)**
 - Develop a program to use the data collected in response to Safety Rec. P-15-15 and P-15-16 to evaluate the **relationship between incident occurrences and (1) inappropriate elimination of threats, (2) interactive threats, and (3) risk assessment approaches used by the gas transmission pipeline operators.**
 - Disseminate the results of your evaluation to the pipeline industry, inspectors, and the public annually.



Risk Evaluation Requirements

- **Current regulatory requirements largely driven by Integrity Management rules**
 - GT IM (Part 192 Subpart O)
 - GD IM (Part 192 Subpart P)
 - HL IM (Part 195.452)
- **Risk evaluation requirements are well beyond the initial “pig & dig” aspects of the IM rules**

PART 195—TRANSPORTATION OF HAZARDOUS LIQUIDS BY PIPELINE

Contents

Subpart A—General

PART 192—TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STANDARDS

Contents

Subpart A—General



What is a risk assessment?

- **ANSI B31.8-S, §2.3.3**
 - “...the risk assessment process identifies the location-specific events and/or conditions that could lead to a pipeline failure, and provides an understanding of the likelihood and consequences of an event.”
- **49 CFR 192.917(c) and 195.452(i)**
 - Risk assessment is required
 - Purpose is to focus and prioritize integrity management activities



Integrity Management

- **Threat identification**
- **Data gathering and integration**
- **Risk analysis**
 - Assessment intervals
 - Preventive measure/mitigative measure identification and evaluation
 - Mitigative measures
 - Consideration of monitored pipeline defects
- **Periodic evaluations of pipeline integrity (Decision Making)**



Risk Evaluation Requirements

- **Successful Integrity Management**

- Investigative
- Data-driven
- Analytical
- Interacting threats
- Integrity decision making
- Prevention
- Mitigation



- **Risk modeling approaches need to reflect these attributes**



Risk Evaluation Requirements

- **Risk evaluation approaches need to be “investigative-oriented”**
 - **Approach must tell us what can be done to reduce risk** vs. simply knowing which parts of the pipeline represent the **highest relative risk**
 - Generating risk numbers is not the end goal; **a structured way to evaluate and reduce operational risk is the goal**
 - Past “index” models are generally not sufficient



Data/Data/Data

- **Data availability and validation**
 - Missing/inaccurate data results in unreliable risk evaluations/conclusions
 - **Efforts such as Integrity Verification Process (IVP) indicate that:**
 - “**gaps in basic pipeline data still exist**”
 - Keeping data up to date is an on-going challenge
 - Should be able to take risk model data into the field and not find discrepancies



Data and Risk Assessment

- A key reason for the failure of a risk assessment to lead to appropriate decisions is poor data quality.
- No risk assessment model can compensate for “bad” data (i.e. wrong data, missing data, or inappropriate defaults)
- B31.8-S, §5.6.2: “Inaccurate data will produce a less accurate risk result.”



Threats

- **Threat Identification**
 - Evaluate Existing and Potential Threats
 - Justify Elimination of Threats from Consideration
 - Time Dependent and Time Independent Threats
 - “Near misses”, Maintenance records
 - Known threats identified in Industry literature



Threats

- **Threat Identification**

- Understand how threats interact with each other

- **Consider that Interactive Threats (interaction of multiple threats) can be a potential threat.**

- Earth movement exacerbating construction-related imperfections such as wrinkle-bends or certain vintages of girth welds

- External corrosion and latent third party damage

- Disbonded coating, shielding coating, and corrosion, possible SCC

- PHMSA Advisory Bulletins, etc.



Risk Methods

- **Risk evaluation methods must be sufficiently analytical to be predictive**
 - Threats on a particular line segment increasing or decreasing?
 - Consequence potential increasing?
 - Interactive threat potential becoming a major issue?

$$P_{\text{(Threat 1 \& Threat 2)}} > P_{\text{Threat 1}} + P_{\text{Threat 2}}$$

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Risk Methods

- **Risk evaluation methods must be sufficiently analytical to be predictive**
 - **Results reflect year-to-year changes in risk levels?**
 - Operational
 - Environmental
 - Assessments/testing
 - **Does the overall risk profile adequately match operational experience?**

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Risk Methods



- **Risk evaluation methods must be sufficiently analytical to be predictive**
 - Approaches may need to vary between respective types of threats
 - **More complex does not necessarily mean better**
 - Interactive threats may need more sophisticated modeling than threats evaluated individually



Connection to Decision Making

- **Risk evaluation results must have a connection to real-life decision making**
 - Point of risk evaluations is not to do a risk evaluation
 - Risk insights must be integrated into routine integrity-related decision making
 - **Operators should be able to easily demonstrate how risk evaluation results influence operational work practices**



Preventive & Mitigative Measures

- **Decision making includes identification/evaluation of preventive and mitigative measures**
 - Risk evaluations are a primary way to evaluate potential preventive measures and mitigative measures
 - **If risk methodology is unable to reflect any change in results for meaningful candidate measures, the methodology is inadequate**



Preventive & Mitigative Measures

- **Preventive measures**
 - Are measures up to and including pipe replacement considered?
 - Are risk-based decision criteria consistent between different threat categories?
 - Can segments be isolated in a timely manner?



Pipeline Facilities

- **Pipeline risk is not limited to the right of way**
 - Facilities are also part of the pipeline system and need to be part of understanding and managing risk
 - Risk approach likely to be different than for line pipe
 - As for line pipe, emphasis should be on methods that can identify and evaluate potential reductions in risk to the public



Recent Inspection Issues

- **PHMSA continues to see issues with industry approaches to pipeline risk**
 - Data provided to the risk model vendor was not read properly into the model; invalidating the results
 - Inadequate evaluation of manufacturing threats with regards to increases in historical operating pressures
 - Recent leak was not assessed as having an impact on the re-assessment interval



Recent Inspection Issues

- **PHMSA continues to see issues with industry approaches to pipeline risk**
 - Unable to demonstrate evaluation of facility risks and what has been completed for each station
 - Using Subject Matter Experts (SME) for risk analysis, but the qualifications of the SMEs were not documented
 - Missing risk factors evaluated such as low frequency ERW seams, disbonded/shielding coatings, and shorted casings



Next Steps?

- **What can be done to improve the overall performance of pipeline risk models?**
 - **A major goal of today's Workshop is to identify the “next steps” for a process to define the selection and usage of Pipeline Risk Models.**



Workshop Goals

- **Learning**; both from outside and inside the pipeline industry
- Spur **creative thinking** to improve pipeline risk modeling
- Identify **potential “next steps”** for a process to define the selection and usage of pipeline risk models for all threat types including interactive threats





Know what's below.
Call before you dig.



Thank You

Steve Nanney and Ken Lee

US DOT / PHMSA

