Pipeline Risk Assessments and Recordkeeping

Alan Mayberry
Deputy Associate Administrator

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Integrity Management Rule Retrospective

- **Need for accurate pipeline-specific risk assessment**
- **Underlying need for flexible regulations**
  - **Enhance operator systems and processes**
  - **Identify, prevent, and mitigate risks and threats specific to each pipeline**

Integrity Management Rule

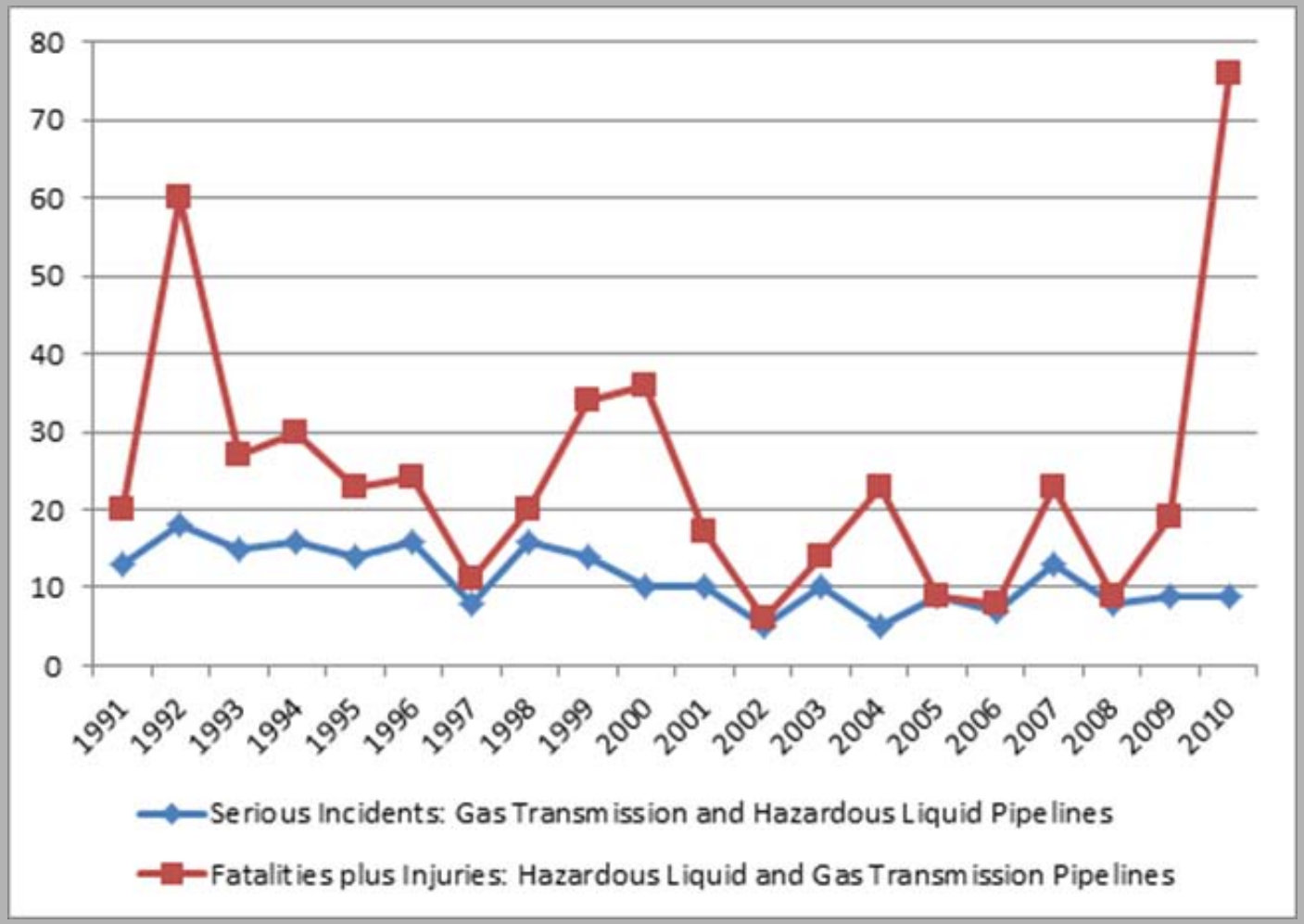
Success depends on OPERATOR

- Investigative
- Data-driven
- Analytical
- Integrity-related decision-making
- Prevention
- Mitigation

Challenges to Success

- Data validation
- Response to missing or suspect data
- Risk analysis methods suitable to support effective integrity-related decision-making
- Identify effective preventive and mitigative (P&M) measures
- Rigorous processes

Recent Events Illustrate Weaknesses in Risk Analysis



Recent Events Illustrate Weaknesses in Risk Analysis

- Effective risk analysis might have prevented or mitigated recent high consequence accidents
- Weaknesses include inadequate:
  - Knowledge of pipeline risk characteristics
  - Processes to analyze interactive threats
  - Evaluation of way to reduce or mitigate consequences
  - Process to select P&M measures
    - Lack of objective, systematic approach

Inspections Identify Weaknesses in Risk Analysis

- Current challenge is for industry to develop
  - More rigorous quantitative risk analyses
  - More investigative approach
  - Engineering critical assessment
  - Robust approach for P&M measures
    - Technically sound risk-based criteria
    - Including pipe replacement

PHMSA Risk Assessment Concerns

- Weaknesses of Simple Relative Index Models
- Records (Availability and Quality of Data)
- Data Integration
- Interacting Threats
- Vintage/Legacy Pipe
- Connection to Real Decision-Making
- Uncertainties

Limitations of Simple Index Models

- **Ineffective analysis of complex risk factor interactions**
- **Output not useful for identifying previously unrecognized threats/risks**
- **Not proven as adequate basis for evaluating P&M measures**
- **Poor capability to identify risk drivers**
- **Uncertainties (due to quantifying risk scores based on opinion) are not appropriately considered**

Records
Availability and Quality of Data

- **Key risk factor data not always available**
- **Bona fide risk assessment is data intensive**
- **Integrity-related decisions must be made**

Records
Availability and Quality of Data

- ***However…***
  - **Missing or inadequate data can introduce significant uncertainties into risk analysis**
  - **Efforts to validate, verify or obtain missing data have been weak relative to their importance**
  - **Decision-making based on missing or poor data do not adequately account for these uncertainties**

Accounting for Missing Data

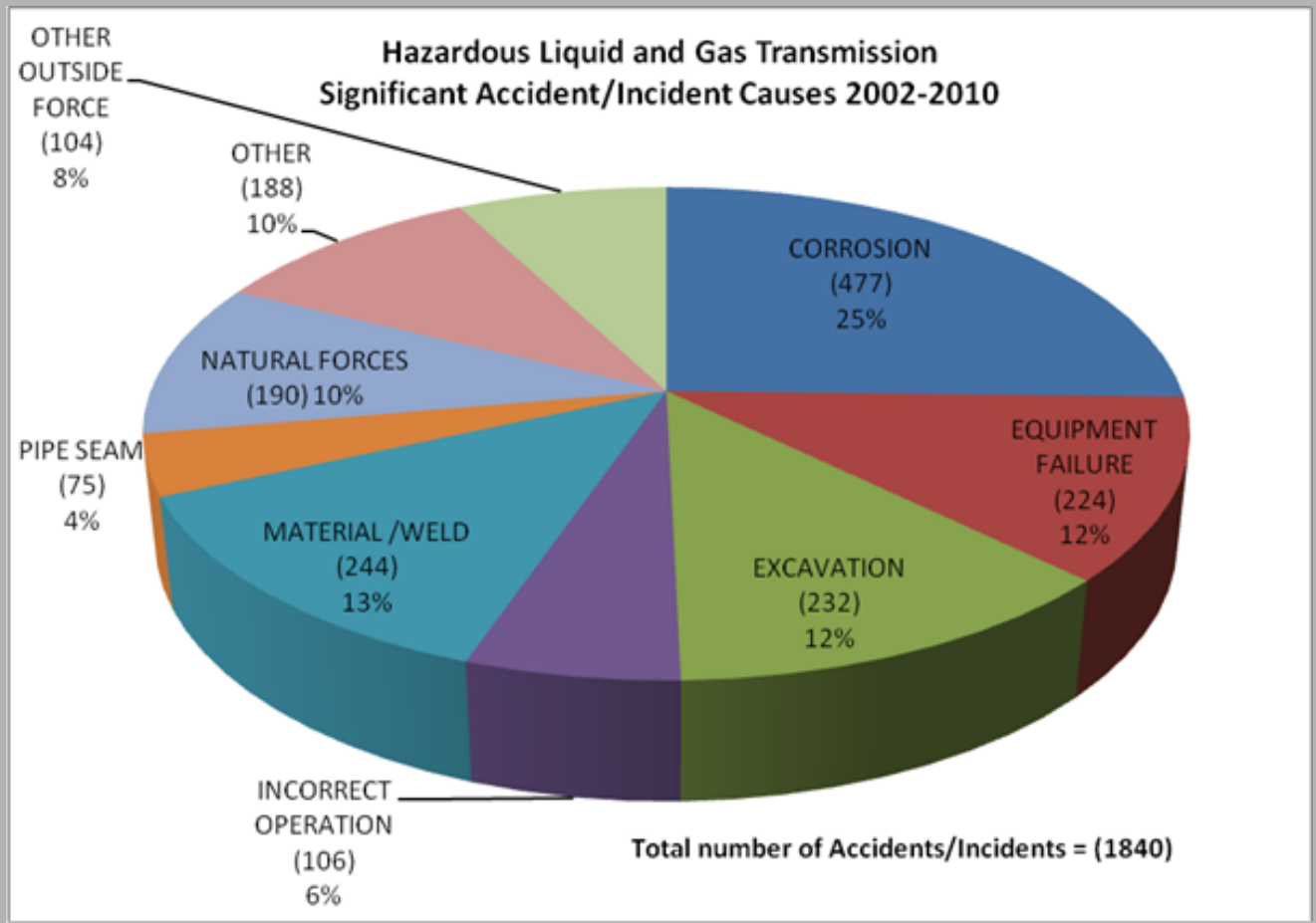
- **Merely defaulting to an "unknown" risk score within index model is inadequate**
- **If certain critical data is missing:**
  - **Risk analysis results should not be the basis for key decision-making, but should prompt**
  - **Strong and timely P&M measures:**
    - **Testing / inspection to reverse engineer missing data**
    - **High priority assessment activities, including excavation and direct exam**
    - **Operating pressure restrictions**
    - **Pipe replacement**

Data Integration

- **Process by which all known data pertinent to pipeline integrity is analyzed collectively to gain insights into threats and risks not obvious from individual data sources**
- **Effective data integration includes location referencing of all data & integrity findings**
- **Data aggregation is not data integration**
- **Simple index models cannot integrate data**
- **Effective data integration is a prerequisite to effective analysis of interacting threats**

Interacting Threats

- **Multiple discreet threats that endanger pipeline integrity by simultaneously degrading pipe**



Interacting Threats

- **Simple index models cannot analyze interactive threats**
- **Most catastrophic accidents involve the confluence of multiple threat factors**
- **Apply engineering critical assessment for interacting threats**
- **More sophisticated risk models should be applied to analyze interacting threats**

Vintage/Legacy Pipe

- Grandfathered Pipe (no pressure test)
- Pipe seam issues (LFERW, etc.)
- Older manufacturing quality issues
  - Hard spots
  - Laminations
  - Low toughness
  - Legacy coatings (CP shielding)
- Population growth

Connection to Real Decision-Making

- **Risk analysis results not used in consistent decision and mitigation framework**
- **Decisions not based on safety benefits and consequence reduction**
- **Minimal deployment of meaningful preventive and mitigative measures**

Uncertainties

- Subject matter expert opinion
- ILI tool accuracy / tolerance and reliability
  - Tool tolerance, excavations, usage of unity plots
- Hard-to-detect threats
  - SCC, girth weld defects, long seam defects, equipment failure, manufacturing defects
- Hydrostatic pressure test
  - Future growth of un-remediated defects
- Direct Assessment
  - Heavy reliance in inferred conclusions
  - Conclusions based on minimal excavations

Data Gaps Panel Addresses

- Process to validate data
- Practices to deal with missing, incomplete, unvalidated, or poor quality data
- Nature and urgency of response to data gaps
- Appropriate approaches for risk-based decision-making to account for uncertainties

Interactive Threats Panel Addresses

- Predictive modeling
- Effectively discovering interacting threats
- Improve risk analysis approaches
- Identifying interactive threats not addressed by common assessment methods (e.g., ILI, ECDA)
- Interacting threats not addressed by integrity assessment with current technology

Summary

Historic opportunity to improve risk analysis

Challenges

- Data validation
- Response to missing or suspect data
- Deploy more sophisticated risk analysis methods
- Integrity-related decision-making
- Serious P&M measures
- Overall execution of integrity management

Thank You