PHMSA Update
Safety Management Systems
& DIMP

27th Annual Alabama
Gas Pipeline Safety Seminar
Montgomery, Alabama

Wednesday December 3, 2014
9:15-10:15 AM
Wallace Jones

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

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

Topics Areas for Discussion

- Safety Culture and Safety Management Systems
- Inspection Results and Findings
- Performance Measures
- Regulatory Update
- DIMP Inspection Forms - New PHMSA Form 24
- DIMP Website and Performance Measures Reporting
- Questions and Answers

Assessing Maturity

Moving from Compliance to Choice

- Our world must move from a "checkbox" mentality to understanding the health of our pipeline systems
- Operators must analyze and understand data and information and promptly acting to reduce risks

Safety Culture

- Safety Culture is defined by DOT as the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands. The following are critical elements of a strong safety culture:

1. Leadership is Clearly Committed to Safety;
2. There is Open and Effective Communication Across the Organization;
3. Employees Feel Personally Responsible for Safety;
4. The Organization Practices Continuous Learning;
5. There is a Safety Conscious Work Environment;
6. Reporting Systems are Clearly Defined and Non-Punitive;
7. Decisions Demonstrate that Safety is Prioritized Over Competing Demands;
8. Mutual Trust is Fostered between Employees and the Organization;
9. The Organization is Fair and Consistent in Responding to Safety Concerns; and
10. Training and Resources are Available to Support Safety.

Safety Management Systems

- API RP 1173 embodies the Best of a Dozen Other Approaches from Other High Hazard Industries
- Based on "Plan – Do - Check – Act" Continuous Improvement Model, but Organized Along More Traditional Lines
- Continuous Improvement is a DIMP requirement
- Adds Dimensions Missing from Integrity Management – Safety Culture Elements and Emphasis on the Largely Missing, but Vital Check-Act Elements
- PHMSA intends to continue to communicate SMS Through Webinars and Workshops

Gas Transmission ANPRM – Management Systems are NOT New

M. Quality Management Systems (QMS)

- Quality management includes the activities and processes that an organization uses to achieve quality including formulating policy, setting objectives, planning, quality control, quality assurance, [performance-based assessments], performance monitoring, and quality improvement.
- Should PHMSA establish requirements for QMS?
- Do gas transmission pipeline operators require their construction contractors to maintain and use formal QMS?

SMS in other Industries

- Both the FAA and NTSB have presented on the Aviation's SMS Process and its applicability and transfer to Pipelines
- NTSB Recommendations from Enbridge Marshall, MI (2012) accident included a finding of probable cause: The rupture and prolonged release were made possible by pervasive organizational failures:
  - Deficient integrity management procedures
  - Inadequate training of control center personnel
  - Insufficient public awareness and education

NTSB Recommendations

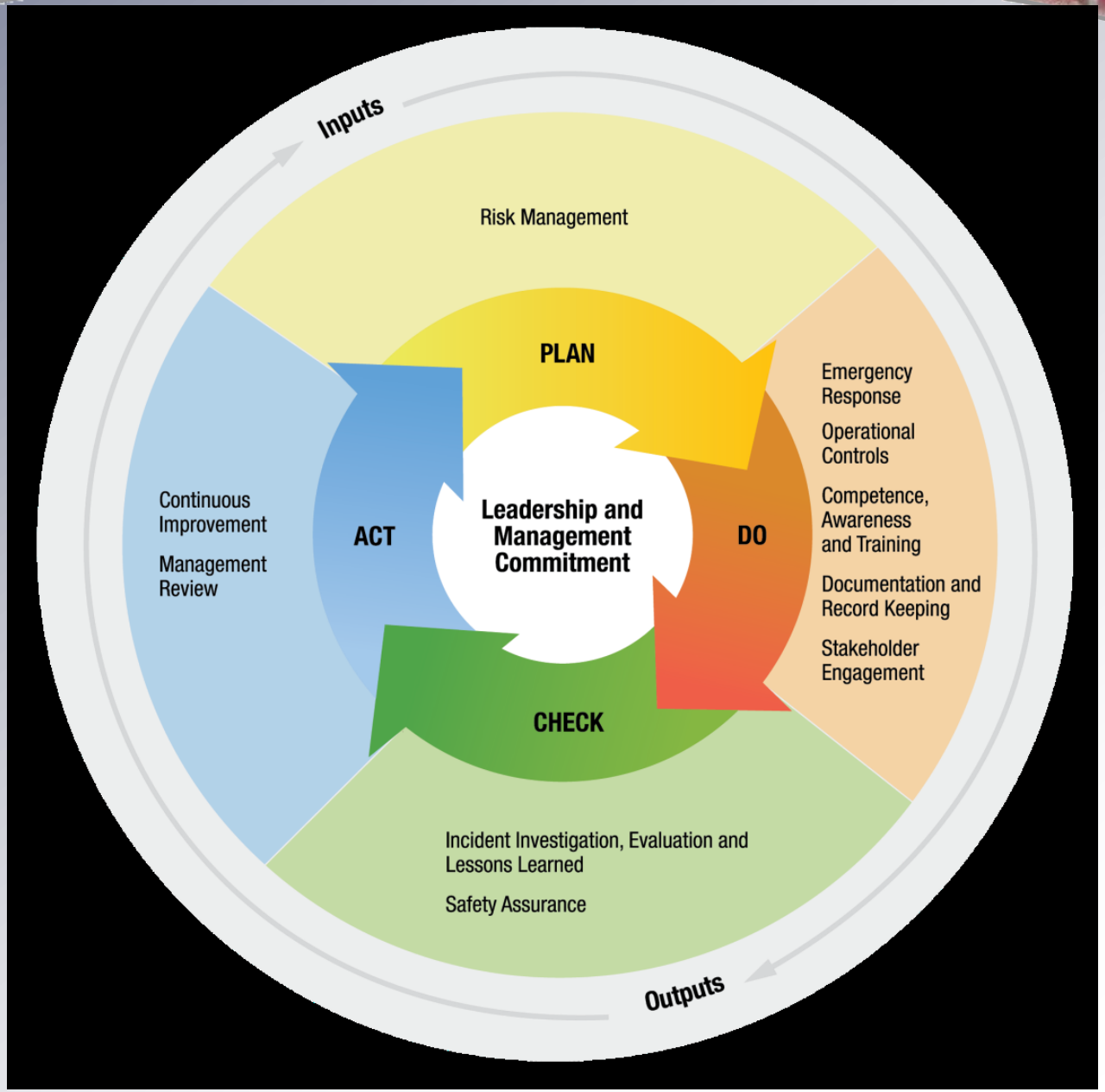
- Finding No. 28. Pipeline safety would be enhanced if pipeline companies implemented safety management systems
- Recommendation to API: Facilitate the development of a safety management system standard specific to the pipeline industry that is similar in scope to your Recommended Practice 750, Management of Process Hazards.

Safety Management Systems

- SMS has entered the discussion with the development of API RP 1173
- Public Meeting was held July 2, 2014 to preview the content of the current draft of API's RP 1173 and communicate the Path Forward
- This was the 2nd Public Meeting on SMS. 1st Public Meeting on SMS held discussed many of the underlying concepts of SMS
- https://primis.phmsa.dot.gov/meetings

Plan, Do, Check, Act The core of the standard

Continuous Improvement is the Goal of the standard



The components of the PDCA cycle

Plan: This step entails establishing the objectives and processes necessary to deliver results in accordance with the organization's policies and the expected goals. By establishing output expectations, the completeness and accuracy of the process is also a part of the targeted improvement.

- Policies
- Strategies
- Objectives
- Plans

The components of the PDCA cycle

Do: This step is the execution of the plan designed in the previous Plan step.

- Roles and Responsibilities
- Processes
- Training
- Information Management
- Risk Management
- Management of Change

The components of the PDCA cycle

Check: This step entails the review of the results compared with established objectives. Comparing those results to the expected goals to ascertain any differences; looking for deviation in implementation from the plan.

- Performance Measures
- Investigations
- Audits – Independence is the Key
- Records and Reporting

The components of the PDCA cycle

Act: The pipeline operator takes actions to continually improve process performance, including corrective actions on significant differences between actual and planned results, analyzes the differences to determine their root causes, and determines where to apply changes that will include improvement of the process or product.

- Formal Management Review
- Corrective Actions
- Revisions to QMS Processes and Controls
- Revisions / Updates to Risk Models
- Input to New Planning Cycle

Why is Leadership the Heart of PDCA? Leadership is everywhere

- Top Management- accountable for continuous improvement, routine review of safety performance and communications about safety
- Management- ensures process, procedures and training to meet objectives; assess, evaluate and adjust as needed to meet objectives; foster continuous improvement
- Employees– identify improvements, reveal risks
  - Consider employee, public and pipeline safety when stopping work for safety concern
  - Bring rigor of employee safety to asset protection

Conclusions

- SMS require More
  - Intentional and systematic actions
  - Diligence and oversight
  - Involvement at all levels – **Communication!**
  - "Go and Check" attitude
- The rewards of SMS are
  - Increased pipeline safety – risk reduction
  - Creation/Enhanced safety oriented culture
  - Broader organizational involvement

DIMP Inspection Results and Findings

High Level Observations

- DIMPs need to Mature and be Continuously improved
- The DIMP Rule was designed as a performance based regulation to be flexible and allow operators to implement their DIMP in the most efficient and effective manners to improve pipeline safety.
- Regulators have identified the need/requirement for operators to work with their DIMP on a continuous basis so that programs mature to fit the operator's unique operating environment.
- Findings indicate that operators need to do more work implementing DIMPs to reduce risks.

DIMP Inspections

- Plan development and implementation were required to be complete on August 2, 2011.
- First Round of DIMP Inspections is expected to be completed by the end of 2014.
- For inspections of performance based regulatory programs (Like DIMP), adequate time is required for drill downs of data sets to gather a comprehensive understanding of an operator's system.
- Vacancies created by an aging workforce (turn-over) have created voids in operating knowledge of pipeline systems, and trained personnel have not always been available.

IM Plans and Development Models

§192.1005

IM Plans and Development Models

- When a "Model" Program is used, documentation of how the "Model" Program works must be integrated or referenced.
- An Operator's O&M procedures may need to be integrated or referenced in the DIMP depending on program's structure.
- Procedures are required in 192.1007, and plans must contain adequate procedural documentation.
- Procedure means a fixed, step-by-step sequence of activities or course of action (with definite start and end points) that must be followed in the same order to correctly perform a task.

Other DIMP Plan Comments

- Treat DIMP as a tool to analyze needs and progress, not as a regulatory exercise or a book on the shelf.
- "To do DIMP right, all involved must understand and support the program. Proper safety culture will be the glue that will make DIMP work"
- The Plan should culminate in a ranked/prioritized list of threats, risk reduction measures, and performance measures.
- Risk Mitigation measures may include increased leak survey frequency for leaks (existing threats), but there are more threats that need to be accounted for than those identified by existing leaks

Knowledge of Gas Distribution System

§ 192.1007(a)

Knowledge of Distribution System

- Operators must specify how field information is to be relayed into DIMP. Some Operators have modified field data acquisition forms and internal processes to incorporate new information and correct inaccurate information.
- Plan must list data that the Operator has identified that is needed to fill gaps.
- Procedures for identification and collection of additional information must be included or referenced in DIMP to ensure consistent collection and processing.

Knowledge (continued)

- Data quality is a common concern;
  - Outdated, incomplete, obvious errors.
  - Outdated data systems difficult to use or sort.
  - Data cleanup and scrubbing is often required.
- To achieve adequate data quality, an appropriate level of resource allocation is required.
- QA/QC checks should be run to ensure incoming data is accurate (e.g., categorizing leaks, determination of probable cause, accurate pipe type and facility information)

Communication (again)

- Operators need to Inform/Train field personnel of what DIMP means to them and the company.
- What else to look for when performing O&M tasks
  - if field personnel are suppose to be working on polyethylene and they expose PVC—it must be noted and conveyed to management.
- Management's commitment to integrity and safety needs to be conveyed throughout company
- Non-punitive reporting has proven to improve safety by identifying inadequate procedures and operator error prior to a failure

Identify Threats to Integrity

§ 192.1007(b)

Threats from DIMP Rule

- §192.1007 What are the required elements of an integrity management plan? A written integrity management plan must contain procedures for developing and implementing the following elements:
- (b) Identify threats. The operator must consider the following categories of threats to each gas distribution pipeline: **Corrosion, natural forces, excavation damage, other outside force damage, material or welds, equipment failure, incorrect operations, and other concerns that could threaten the integrity of its pipeline**. An operator must consider reasonably available information to identify **existing and potential threats**. Sources of data may include, but are not limited to, incident and leak history, corrosion control records, continuing surveillance records, patrolling records, maintenance history, and excavation damage experience.

Identify Threats to Integrity

- A DIMP must provide adequate details and specificity to address specific potential and existing threats and risks in the Operator's unique operating environment.
- Consideration must be given to applicable operating and environmental factors affecting consequence (e.g., paved areas, business districts, hard to evacuate) relating to the Consequence of Failure (COF) when evaluating risk.
- Plan must include procedures to evaluate and obtain data from external sources that are reasonably available to identify existing and potential threats.

Threat Identification

- Threat categories are Time Dependent (corrosion) and Time Independent (excavation) threats
- Threats are **Potential and Existing** Pipeline Failure Mechanisms or Pipeline Failure Cause Categories
- Does Operator's plan define a near miss?
- Identifying Threats is key to Operator Integrity Decisions regarding measures to implement to reduce risk(s)
- Data Gathering, Threat Identification, Data Integration, and Risk Assessment are inter-related and dependent upon each other

Gas Distribution Threat Categories from GPTC G-192-8

- External Corrosion
  - Bare Steel Pipe (CP or no CP)
  - cast iron pipe (graphitization)
  - coated and wrapped steel pipe (CP or no CP)
  - Other metallic materials
- Internal corrosion
- Natural Forces
  - Outside force/weather: steel pipe
  - Outside force/weather: plastic pipe
  - Outside force/weather: cast iron pipe
- Excavation Damage
  - Operator (or its contractor)
  - Third-party
- Other Outside Force Damage
  - Vehicular
  - Vandalism
  - Fire/Explosion (primary)
  - Leakage (previous damage)
  - Blasting
  - Mechanical damage: Steel pipe, Plastic pipe, Pipe components

Gas Distribution Threat Categories from GPTC G-192-8 (continued)

- Material or Weld
  - Manufacturing defects
  - Materials/Plastic
  - Weld/Joint
- Equipment Failure
  - System Equipment
- Incorrect operation
  - Inadequate procedures
  - Inadequate safety practices
  - Failure to follow procedures
  - Construction/Workmanship defects
- Other Failure Causes that the Operator has experienced

Potential Threats

- Some Operators struggle with potential threats:
  - Threats the Operator has not previously experienced (from industry or PHMSA information)
  - Threats from aging infrastructure and materials with identified performance issues may need to be considered existing threats depending on the materials in question and the operating environment
  - Threats that endangered facilities but have not resulted in a leak (e.g., exposed pipe, near misses).
  - Non-leak threats (overpressure, exposure)
  - Manufacturing and Construction Threats
  - Maintenance history

Identified Potential Threats

Examples of potential threats commonly not being considered by operators:

- Over pressurization events
- Regulator malfunction or freeze-up
- Cross-bores into sewer lines
- Materials, Equipment, Practices, etc. with identified performance issues-problematic plastics
- Vehicular or Industrial activities
- Incorrect maintenance procedures or faulty components
- Rodents, plastic eating bugs/gophers, tree roots
- Other potential threats specific to the operator's unique operating environment

Some DIMP Threats for Plastic Pipe

- Century Utility Products—installed 1960-1980 — Susceptible to brittle like cracking
- Low Ductile Aldyl A Manufactured by Dupont prior to 1973—brittle like cracking due to low inner-wall ductility
- PE-3306 — Susceptible to brittle like cracking has been removed from ASTM 2513D
- Drisco 8000- High Density installed 1978-1999 in desert like areas
- Delrin insert tap tees
- Plexco service tee Celcon (polyacetal) caps
- Others?

Threat Identification

An Operator Must :

- Consider and Evaluate Existing and Potential Threats
- Justify Elimination of Threats from Consideration

So, there is more to do than account for just Time Dependent and Time Independent Existing Threats

- An Operator must look at “near misses”, known threats identified in Industry literature, PHMSA Advisory Bulletins, etc. and understand how threats interact with each other in their system

Interactive Threats

- Interacting threats are potential threats and include:
  - Slow crack growth in older plastics where pipeline was pinched during operational event or where over-squeeze occurred due to improper tools or procedure
  - Slow crack growth in older plastics where non-modern construction practices were used
  - Water main leakage areas or areas of soil subsidence with cast iron mains
  - Installation of mechanical fittings without restraint (category 2 & 3) in soils or conditions (excavation damage) that cause pipe to pull out of fitting

Evaluate and Rank Risks

§192.1007(c)

Evaluate and Rank Risks

- System subdivision for the evaluation and ranking of risks must be sufficient to appropriately analyze risk(s) present in the Operator's unique operating environment.
- Geographical segmentation may be appropriate when systems are separated by space or a specific, predominate threat exists (e.g., where flooding can be expected, earthquake prone area).
- However, different materials may be a predominate threat in a region, and segmentation may need to be refined to accommodate different failure rates in different materials.

Evaluate and Rank Risks (cont.)

- The risk ranking model results must be validated. The "COF" can be diluted by Frequency of Failure ("FOF") – a larger range for consequences may be needed to get reasonable results
- The Plan (or Model used) must address risks specific to services as well as mains
- When risk model changes are made, the risk ranking should be re-run and results incorporated into DIMP promptly
- Operators must consider non-leak failures in analyzing risk and address non leak events (e.g., near miss) as existing or potential threats.

Measures to Address Risks

§ 192.1007(d)

Measures to Address Risks

- The Plan must provide for a link between the specific risk (either a threat or consequence) and the measure to reduce risk that has been identified and implemented.
- DIMP Models must rank proposed projects and replacements based on risk and not the cost.
- The Plan must contain or reference an effective leak management plan unless all leaks are repaired when found.
- If an Operator repairs all leaks when found, that must be stated or referenced in the DIMP.

Measure to Address Risks (Threats)

- Table 1 in PHMSA DIMP Inspection Forms 22 & 23 provides a quick overview of risk reduction and monitoring methods

	Primary Threat Category	Threat Subcategory, as appropriate	Measure to Reduce Risk	Performance Measure
1	Corrosion	External Corrosion on Copper Service Lines	Replace approximately 100 copper service lines each calendar year	Track number of leaks caused by external corrosion per 1000 copper service lines annually
2	Excavation Damage	Third Party Damage	Conduct pre-construction meetings or Monitor locate for life of ticket	Track frequency of failures per 1000 excavation tickets annually
3	Equipment Failure	Mechanical Fittings, Couplings or Caps/Seals	Repair or replace problem materials as found	Track frequency of failures by equipment type annually

Performance Measurement

§ 192.1007(e)

Performance Measurement

- A DIMP must include procedures for establishing baselines for Performance Measures required in 192.1007(e)
- Operators must develop and monitor performance measures from an established baseline to evaluate the effectiveness of its IM program.
- Each Measure Implemented to Reduce Risk must have a Performance Measure established to monitor its effectiveness
- Operators may identify a single performance measure to evaluate the effectiveness of multiple risk control measures

Periodic Evaluation and Improvement

§ 192.1007(f)

Periodic Evaluation and Improvement

- A Plan must contain procedures for conducting periodic evaluations - changes would be handled with revisions to the original procedure.
- Plans should include procedures for notifying affected operator personnel of changes and improvements made to the plan or plan requirements.
- Plans must provide for the incorporation of pipe replacement programs in the DIMP as the future risk results will be affected by the removal of vintage pipeline facilities.

Periodic Evaluation and Improvement

- Operator's plan must have procedures that include criteria for when re-evaluations are to be done based on timing (< 5 years) or events (e.g., replacement program completed, goals achieved, new significant threats identified).
- Plan re-evaluations may generate changes to the results of the risk ranking and risk mitigation measures needed to address risk.
- Operators should be cognizant of changes that occur in the DIMP as a result of the periodic plan evaluation.

Reporting and Records

§ § 192.1007(g) & 192.1011

Report Results

- If a State agency exercises jurisdiction and requires reporting, a procedure must include instruction to send reporting information to the state pipeline safety authority.
- While Performance Measures 192.1007(e)(v) & (vi) are NOT required to be reported, **they must be monitored by the operator and maintained for inspections**. Operators are failing to collect and analyze these performance measures that address hazardous leaks eliminated or repaired categorized by material ((e)(v)) and performance measures developed to monitor actions implemented to control identified threats and reduce risks ((e)(vi)).

Records Required to be Maintained

- An operator must maintain records demonstrating compliance with the requirements of this subpart for at least 10 years (Including records not otherwise kept for 10 years).
- Plans must include an adequate revision log that includes: the Plan effective date, revision dates, and a description of each revision
- Only the records actually used to develop and implement the DIMP should be referenced; otherwise “all” records must be kept for 10 years.

MFFR Data Analysis

- Communication of Performance Data is through the DIMP web page. To view MFFR data, go to:
- **http://primis.phmsa.dot.gov/dimp/perfmeasures.htm**
- Total Report Submitted Numbers *(03/31/2014)*:
  - MFFRs submitted in 2011 – 8349
  - MFFRs submitted in 2012 – 7585
  - MFFRs submitted in 2013 – 9240
- Data submitted for 2013 shows similar trends to previous 2 years of data collection.

MFFR Data Analysis

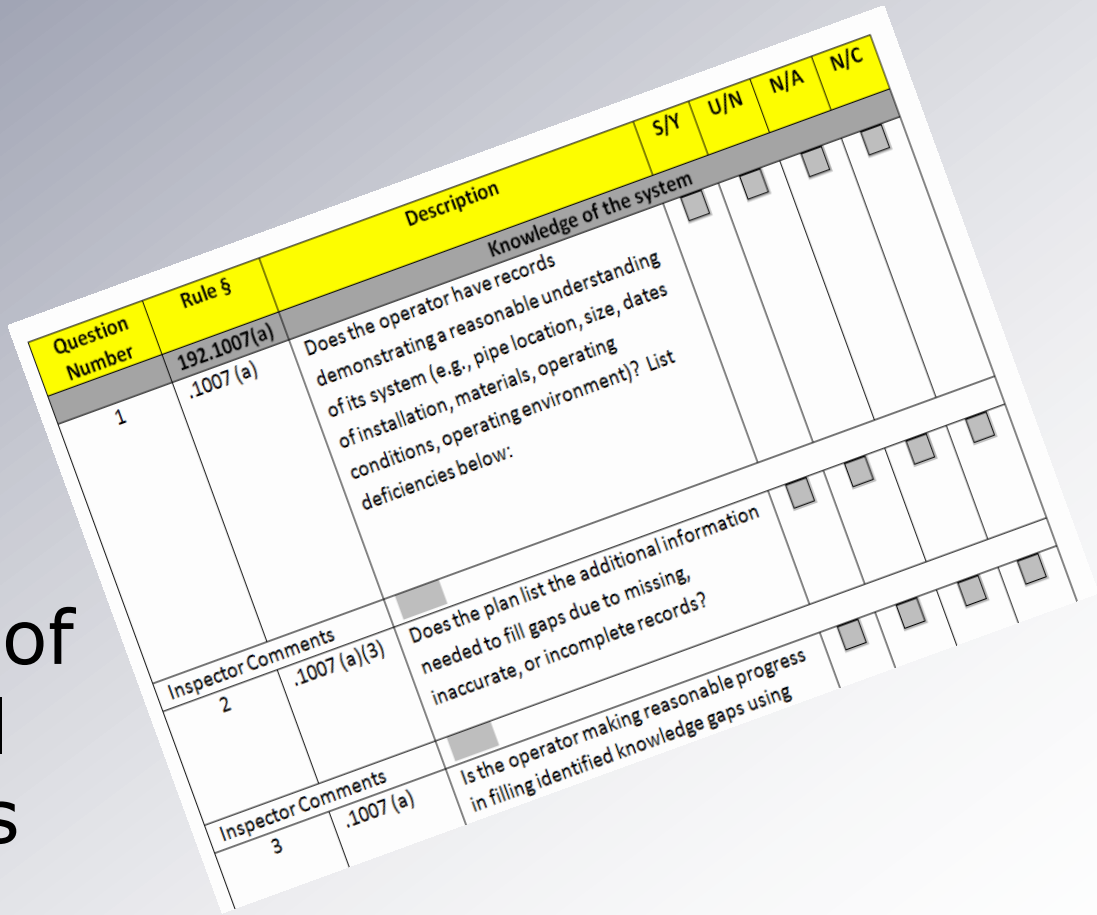
- The majority of mechanical fitting failures resulting in a hazardous leak involve nut-follower, coupling type fittings.
- Valves are involved in 14% of reported failures.
- Equipment failure is the leading reported cause of leaks (41%), and Natural forces is second (17%).
- The majority of leaks occur outside (98%), belowground (87%) involving service-to-service connections (60%).
- Steel fittings (62%) are involved the majority of reports, and plastic fittings are second (26%).

DIMP Inspection Forms

- PHMSA DIMP Inspection Forms for 192.1005 and 192.1015 distribution operators are available at http://primis.phmsa.dot.gov/dimp/resources.htm
- as well as the PHMSA Forms Library at http://phmsa.dot.gov/pipeline/library/forms
  These forms online are "IA" and are in a different format than what AL PSC uses—same questions in a different format. See Forms on DIMP website
- Recently, Question 19 on Form 22 has been approved by PHMSA Legal to be regulatory required rather than for information only.
  - Do the written procedures consider, in addition to the operator's own information, data from external sources…

Record and Field Inspection Form

- PHMSA Form 24 has been posted for use
- Intended for inspections of Implementation of DIMP after initial DIMP inspections



Question Number	Rule §	Description	S/Y	U/N	N/A	N/C
	192.1007(a)	Knowledge of the system				
1	.1007 (a)	Does the operator have records demonstrating a reasonable understanding of its system (e.g., pipe location, size, dates of installation, materials, operating conditions, operating environment)? List deficiencies below:				
Inspector Comments						
2	.1007 (a)(3)	Does the plan list the additional information needed to fill gaps due to missing, inaccurate, or incomplete records?				
Inspector Comments						
3	.1007 (a)	Is the operator making reasonable progress in filling identified knowledge gaps using				

PHMSA Form 24

- PHMSA Form 24 is for the evaluation of an operator's implementation of its DIMP through a review of its records and actions performed on pipeline facilities.
- Intended for inspections of Implementation of DIMP after initial DIMP inspections
- The form asks inspectors to review records and perform field observations regarding the implementation of the DIMP required elements.

DIMP Enforcement Guidance

- DIMP Enforcement Guidance is posted and publicly available on PHMSA's website with the other Enforcement Guidance documents at http://www.phmsa.dot.gov/foia/e-reading-room
- This posting allows Operators to understand Regulators' expectations with regards to the DIMP Regulation

Questions?

Thank you for your Participation

811
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