U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

Considerations for Hazardous Liquid Pipeline Leak Detection Systems

Federal Regulatory Perspective

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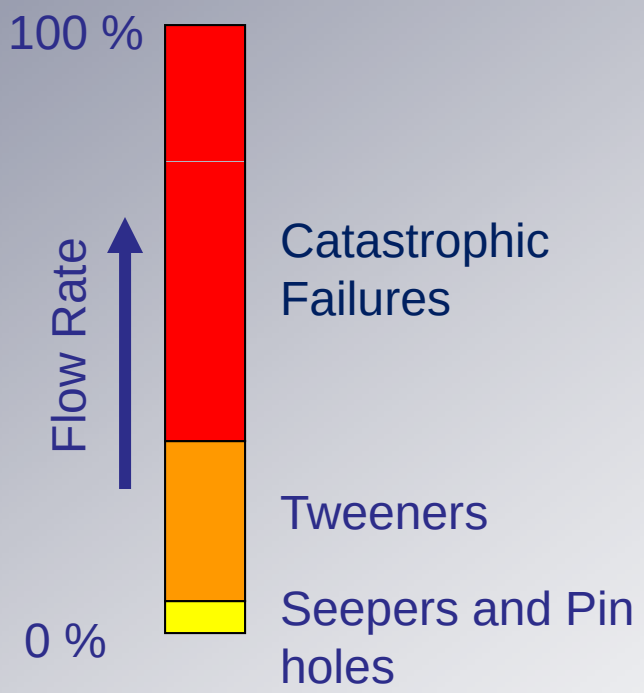
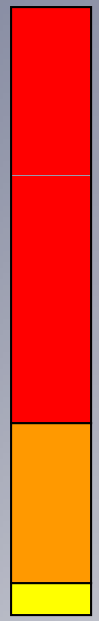
Outline

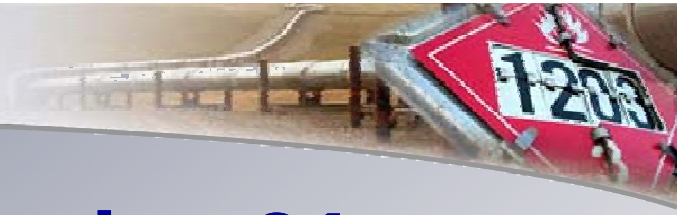
- General Perspective
- Congressional Report – PIPES Act 2006
- Current Regulations
- Implementation Considerations
- PHMSA's Recent Actions
- Questions

Leak Characterization



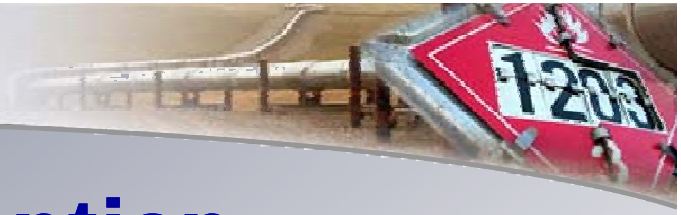
Leak Detection





PIPES Act of 2006, Section 21
Congressional Report

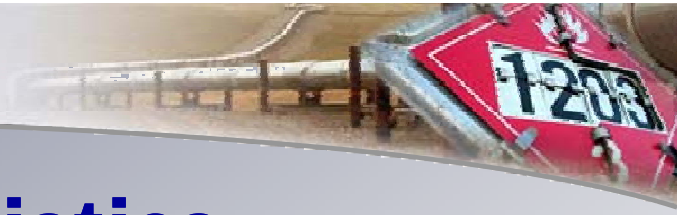
- Capabilities and Limitations
- Leak Volume Statistics
- Other Factors impacting Leak Volume
- Regulatory Requirements
- Inspection Findings
- Fostering Improvements



Emphasis on Prevention

Congressional Report

- Surveillance
- Cathodic Protection
- Pressure Control
- Relief Systems
- Damage Prevention
  - Line Marking
  - One-Call Systems
  - Public Awareness
  - Common Ground Alliance
- Pipelines and Informed Planning Alliance - PIPA



Pipeline Characteristics

Congressional Report

- Pipe Specs, Vintage, History
- Coatings
- Operating Parameters
- Transported Commodities
- Climatic Conditions
- Geologic Factors
- High Consequence Areas

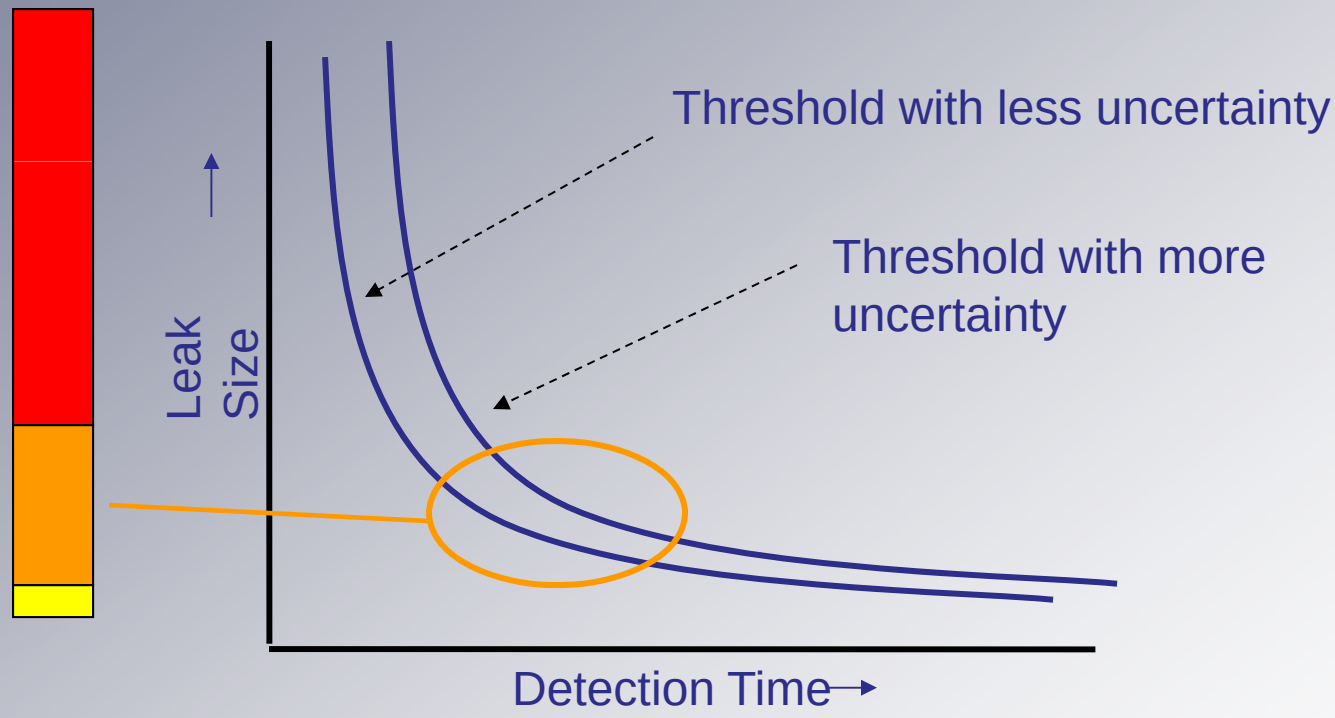
Leak Detection Methodologies

Congressional Report

- Visual Inspection / Observation
- Internal Instrumentation
- External Instrumentation

General Relationships

Congressional Report



Considerations: Evaluating Adequacy
Congressional Report

- Rate of Invalid (False) Alarms and Miss-calls
- Instrument Repeatability & System Robustness
- Personnel Training and Qualification Criteria
- Pipeline Size, Complexity, Batch Parameters
- Leak Size / Flow Rate
- Response Time Components
- Leak Volume and Location Estimation
- Detecting Pre-existing Leaks
- Operating Scenarios : Shut-in, Slack Line and Transients
- Multiphase Flow
- Adaptability (Retrofit) Feasibility
- Testing Regimes

49 CFR Parts 195.134 / 444

Computational Pipeline Monitoring Design and O&M

- 195.134
  - Design Criteria for CPM Systems
  - API RP-1130
- 195.444
  - Operations and Maintenance
  - Testing
  - Record Keeping
  - Controller Training
  - API RP-1130

49 CFR Part 195.402
Procedures

- (c)(2): Gathering data …. reporting accidents
- (c)(9): Facilities that control receipt or delivery, detecting abnormal operating conditions ….transmitting this data to an attended location
- (d)(1): Responding to, investigating, and correcting …. deviation from normal ….
- (e)(4): Taking necessary action …. to minimize the volume released

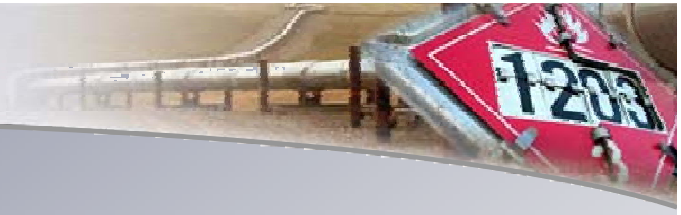
49 CFR 195.452(i)
Preventive and Mitigative Measures in HCAs

- (1) Engagement to improve P&M Measures
- (2) Risk Analysis to identify Enhancements
- (3) Assess Leak Detection Capabilities
- (4) Emergency Flow Restricting Devices

Preventive & Mitigative Measures for Leak Detection and EFRDs

Assessment …

- Documented, systematic process to identify, evaluate, and implement additional preventive and mitigative measures
- Review of the effectiveness of current processes and systems
- Consideration of alternative modes of operation
- Consideration, or documented exclusion, of all risk factors in (i)(2)
- Priority in schedule and scope for additional actions on the highest risk lines
- Documentation of candidate measures, even those not implemented



Leak Detection Capability

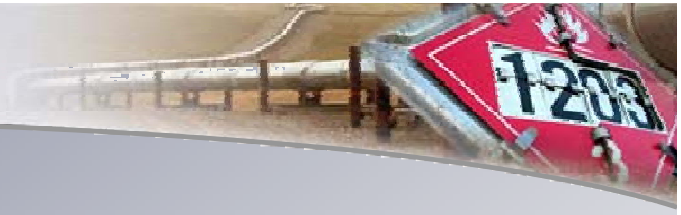
Evaluation …

- If all required factors (i)(3) are not considered, a documented basis for the exclusion of certain listed factors
- Consideration of additional evaluation factors such as:
  - Current leak detection method for the HCA areas
  - Use of SCADA
  - Thresholds for leak detection
  - Flow and pressure measurement
  - Specific procedures for lines that are idle but still in use
  - Additional LD provisions for proximity to sole source water supplies
  - Testing of leak detection (such as physical removal of product)

Leak Detection Capability

Capability Factors …

- Sufficient spectrum of leak scenarios to determine system effectiveness (e.g., “most likely” & “maximum possible”)
- Line operations including slack line, idled line, and static conditions
- Performance during transient conditions, and a strategy to manage any short-term reduced performance
- Operational availability and reliability of the leak detection systems, and the operator’s process to manage system outages
- Enhancements to existing leak detection capability, consistent application of a risk-based decision-making process for leak detection
- Consideration of computational pipeline monitoring and API-1130



Frequently Asked Questions

- http://primis.phmsa.dot.gov/iim/faqs.htm
- 9.4 : Criteria for consideration of leak detection enhancements
- 9.5 : Minimally acceptable leak detection for compliance
- 9.6 : Application of CPM systems
- 9.11 : Leak detection applied to the entire pipeline

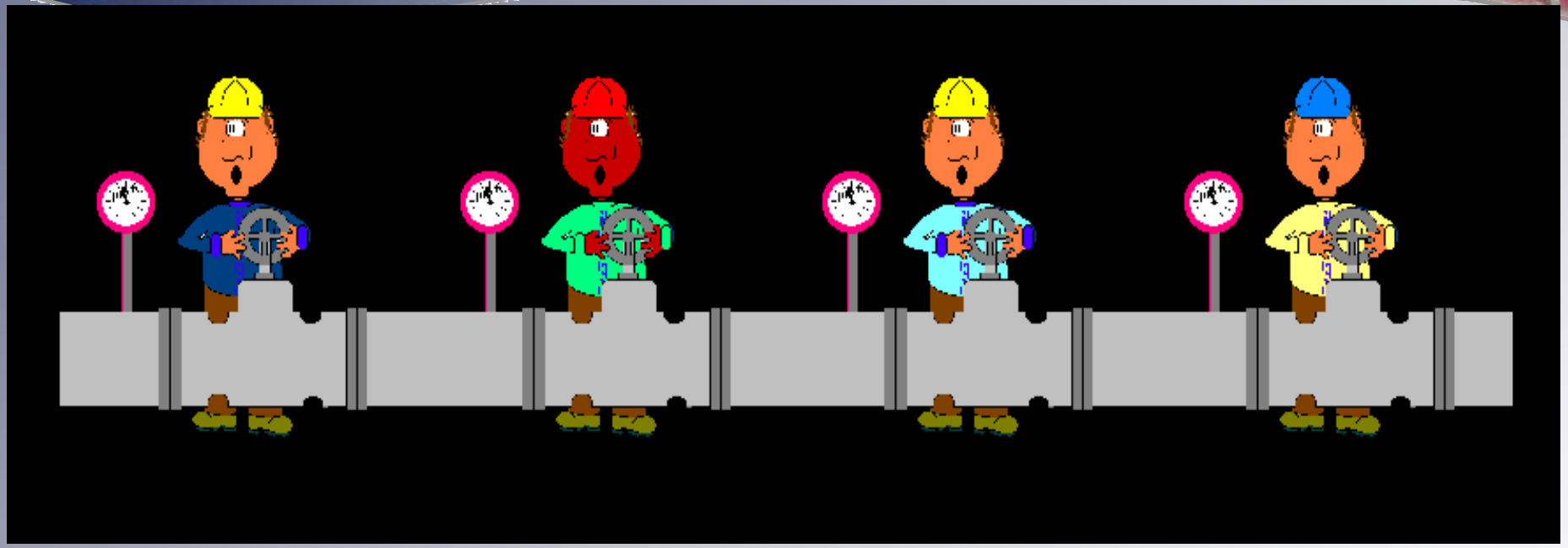
195.446 – Control Room Management

- **§195.446** – Control Room Management
  - Roles and responsibilities, adequate information, fatigue mitigation, alarm management, operating experience from incidents
  - All can have an impact on leak detection performance, prompt response, involvement by all stakeholders
  - Human Factors and Safety Culture considerations
  - http://primis.phmsa.dot.gov/crm/

Alignment with Resources

- Leak detection system complexity or high cost does not directly translate to better performance
- One size does not necessarily fit all
- Design choices need to be balanced with available and committed operating and maintenance resources
- After implementation, field crews will likely be impacted by a need for more instrument maintenance
- Controllers need to know the viable operating parameters and expected performance thresholds of applied leak detection system

Information - Knowledge



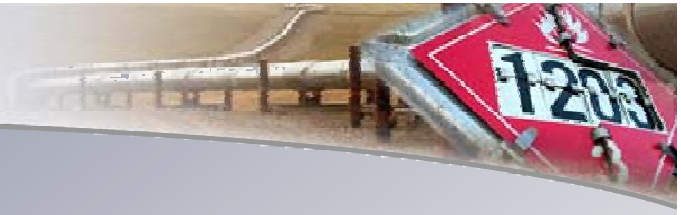
One has to have access to the right information
and the ability to understand it before safety can be maximized.

The responsibility to react, without adequate and structured knowledge, adds little safety value.

In fact, it can create a false sense of security.

Haz. Liq. Leak Detection Research

- Stakeholder input sought for Leak Detection (LD) improvements at 4 Pipeline R&D Forums
- Solicited for LD topics in 5 research solicitations since 2002
  - However not all LD topics successful in becoming new research
- HL LD Investment: 6 technology development projects using $1.5M (PHMSA)
- Success in 2 technology improvements to market addressing airborne and internal leak detection systems
- Research success reported at PHMSA's Pipeline Safety Research Program website



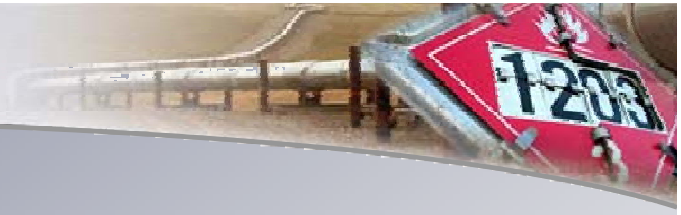
Active / New Research?

Fuelfinder: Remote Leak Detector for Liquid Hydrocarbons

Testing improvements to the Remote Methane Leak Detector for wavelength specific detection of gasoline blends and ethanol. Main objective is to develop a portable, hand-held sensor for detection of petroleum product leaks from buried pipelines at stand-off distances up to 30 meters or about 98 feet. Possible market penetration in early CY 2013.

Next R&D Forum July 2012 will provide for public input and gap analysis identifying new topics for PHMSA research solicitations.

http://primis.phmsa.dot.gov/meetings/



PHMSA Recent Actions

- Pipeline Emergency Response Forum: December 9, 2011
- Liquid NPRM: Intend to publish NPRM summer of 2012
- Addressing NTSB Recommendations
  - **P-11-8 –** *System-specific information to responders*
  - **P-11-9** - *Ensure controllers notify 911 call center(s)*
- Congressional Mandate in the 2011 Act
  - Leak Detection Study (hazardous liquid pipeline facilities and transportation-related flow lines)
  - Scope and path forward covered in other presentations
- This workshop

Questions?