

# API RP 1175 Pipeline Leak Detection Overview

## 2015 API Pipeline Conference and Control Room Forum

April 28 - 30, 2015 | Savannah, Georgia

# Discussion Topics

- Why is this RP needed?
- Purpose
- Objectives – Table of Contents
- Details Within
- Upcoming Activities



# Key Messages

- High level of interest in pipeline leak detection
- Detect leaks quickly, with certainty, facilitate quicker shutdown, and minimize negative consequences
- To be Balloted July 2015
- PowerPoint Aids will be available around July

# Desired Outcomes/Decisions

- Report Out Status of RP initiatives/objectives and activities
- Focus on the being proactive and assist in industry Leak Detection Program (LDP) Management Initiatives

# Why is this RP needed?

## Leak Detection Task Force

Guidance Document to Address Concerns of Mandate

## Leak Detection Initiatives & Rulemaking Considerations

PHMSA presented to API Cybernetics Workgroup April 17, 2013 seeking feedback on path forward

## General Accounting Office (GAO) Study

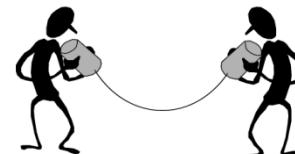
DOT should: 1) improve incident response data and use these data to evaluate whether to implement a performance-based framework for incident response times and 2) share guidance and information on evaluation approaches to inform operators' decisions

## NTSB Recommendation P-11-10

Require that all operators of natural gas transmission and distribution pipelines equip their SCADA systems with tools to assist in recognizing and pinpointing the location of leaks, including line breaks; such tools could include real-time leak detection system and appropriately spaced flow and pressure transmitters along covered transmission lines

## Congressional Mandate

Pipeline Safety, Regulatory Certainty and Job Creation Act of 2011 Section 8 Leak Detection required to analyze technical, operational, and economic feasibility aspects on leak detection systems...



## Reactive

### High-Level Interest

- 8 (a): Due by January 3, 2013; Finalized December 10, 2012  
API and AOPL filed comments to the draft October 26, 2012  
8 (b): Due as soon as practical after January 3, 2014



Focuses on management of Leak Detection Programs (LDPs), not the design of Leak Detection Systems (LDSs)

API  
RP 1175

## Proactive

### Comprehensive Integration

- Establishes a framework for leak detection program management for hazardous liquid pipelines
- Applies to Hazardous Liquids Pipelines regulated by the U.S. Department of Transportation



## Tactical

### Analyze

- Integrate Data
- Share Guidance
- Decision Support

- Provide conformity with regulations, only augment (not replace) existing standards and requirements

# Purpose of API 1175

- Provide holistic, high-level overview of **LIQUID** LDP management
  - Guidance on development, implementation, and management of a sustainable LDP to minimize the size and consequences of leak events
  - Enhanced guidance on selection and on establishing performance measures of LDSs
  - Address identified gaps and incorporating guidance into a comprehensive program document
- Focus on using a risk-based approach for LDPs
- All forms of LDSs used should be managed in a coordinated manner
- Encourage operators to “go beyond”

# Areas Detailed in 1175

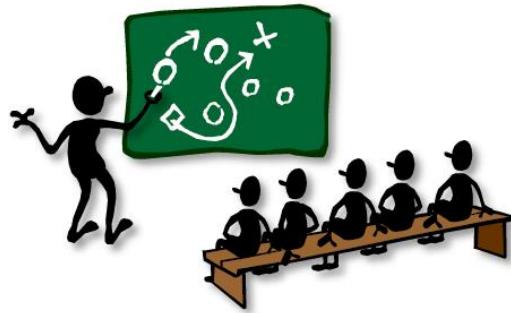
- Definitions
- Culture and Strategy
- Selection of LDSs
- Performance Targets, Metrics, and KPIs
- Testing
- CC Procedures for Recognition and Response Alarm Management
- Roles, Responsibilities and Training
- Reliability Centered Maintenance for Leak Detection Equipment
- Overall Performance Evaluation of the LDP
- Improvement Planning and Process

# Leak Detection Culture

- Management support for the LDP – Visible and Ongoing
- Employees understand the Leak Detection Strategy
- Recognition and integration of all methods of leak detection
- Ongoing support towards improving pipeline leak detection, (*even if the pipeline operator is meeting leak detection goals*)
- Promotion and endorsement of teamwork within departments and across the organization
- Coordination and collaboration between the different entities involved in the LDP
- Clearly defined roles and responsibilities; concise policies, procedures and processes
- Culture is maintained by having a healthy sense of vulnerability



# Leak Detection Strategy



- The technical component of the LDP and should be managed by the application to detect leaks
- A written document that promotes the company's Leak Detection Culture
  
- Sets goals and outlines the requirements of the LDP
- Should outline how the company will meet minimum regulatory requirements and go beyond the minimum to implement industry best practices

# Leak Detection Strategy Outline

- Visible Management Commitment and Leadership
- Company Goals and Requirements
- How Goals & Requirements Should Be Satisfied
- Employment of Risk Management
- Selection of LDSs
- Integration of All forms of Leak Detection Employed
- Consideration of Regulatory Requirements and Industry Standards
- Ongoing Measurement of Performance of the Program
- Training, Testing and Operations/Procedures
- Reporting
- Review and Approvals
- Management of Change
- Ongoing Improvement

# The Process of Selection of Leak Detection



- Align with the Company Culture and Strategy
- Link Performance Targets, Metrics, and KPIs
- Incorporate Regulatory Requirements, Best Practices, and Company Requirements
- Perform the Overall Risk Assessments
- Evaluate Best Available Technology(ies)
- Modify to Cover Particular Requirements of Individual Pipelines
- Periodic Review of Selection via Leak Detection Capability Evaluation (LDCE)

# Performance Targets, Metrics, and KPIs



- Operators should:
  - Establish performance targets, metrics, and KPIs for the Leak Detection Systems
  - Define and track to ensure the overarching goals are met.
  - Refine and Revise as part of a continual improvement process
- Performance Targets are part of the Operator's *Strategy*, and *Selection* process
  - Performance targets should be tailored to the level at which they are being directed
  - Performance targets should be determined by analysis using sound engineering expertise and judgment
  - Typically through Estimation or Observation
- API RP 1130 Annex C defines these metrics as: sensitivity, reliability, accuracy, and robustness, that may be applied to any LDS.
- The metrics may be applied to any LDS (e.g. externally-based LDSs)

# Testing

- All LDSs in a LDP should be tested when implemented and on a periodic basis as outlined in API RP 1130
- The testing process should include the requirements of LDS testing as outlined in API RP 1130
- The requirements of API RP 1130 should be tailored where necessary to accommodate the unique aspects of the LDSs and the specific assets upon which the LDS is implemented
- Wherever possible the testing should incorporate the testing recommendations of the LDS manufacturer or developers
- Consider methods to test Control Room staff that respond to leak alarms



Opportunity to improve the culture, procedures, & knowledge levels

# Control Center Procedures for Recognition and Response

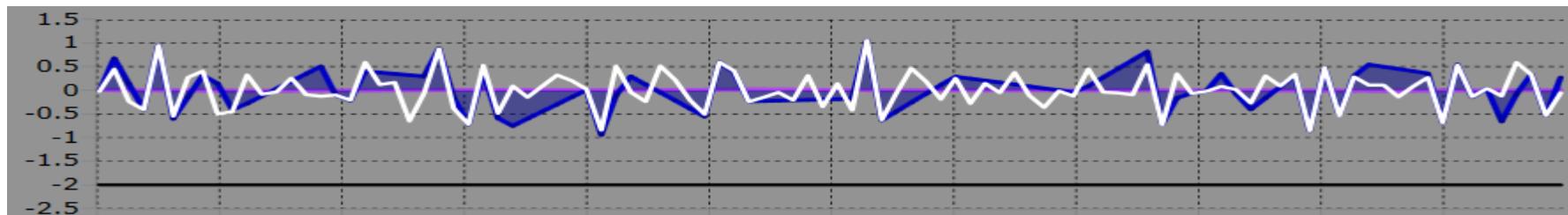
- The pipeline operator should
  - Have a documented leak response procedure that:
    - Outlines the processes, tools and actions to be used by the Pipeline Controller to recognize and respond.
    - Develop a description and action protocol for leak indications or combination of indications
- The procedures may specify different actions that are taken to analyze different potential leak indications.
- Validation of Potential Leak Indication
- Reporting and Documentation
- Pipeline Restart



Appropriate action based on the process, tools, analysis and understanding of the potential leak indication

# Alarm Management

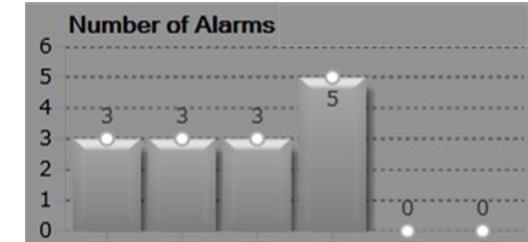
- Alarm management employs tuning and threshold setting methods
  - Driven by pipeline analysis, data collection, and review
  - Encompass a slate of methods aimed at increasing Controller responsiveness
- Clarity and credibility of leak detection alarms should be a primary factor in categorizing alarms
  - Alarms that required immediate action to shutdown the pipeline, or high credibility alarms
  - Alarms that required an immediate investigation and preparation to shutdown or lower credibility alarms
  - Alarms that were proven to be “false” or non-leak alarms



Alarm data collection should categorize the alarm as to cause and refine the category or confirm the category

# Alarm Management Continued

- Alarm data collection considers
  - Post alarm actions to capture the information recorded at the time the alarm occurred
  - Add additional information to create an accessible database of leak alarm information and build an alarm history that can be used for alarm review
- Alarm review is the process of analyzing alarms with the goal of increasing the confidence of the alarms
- Threshold setting considers, based on alarm review
  - Existing thresholds
  - Needed adjustments to maintain the performance per KPIs
- Tuning is adjusting the LDS for more precise functioning, or target performance per the culture and strategy



# Roles and Responsibilities

- Pipeline operators should have clear descriptions of their stakeholder's roles and responsibilities
  - Help the stakeholder(s) understand their areas of responsibility and
  - Expectation(s) for compliance

API-1175		Stakeholders							
		Management	Control Center	Analyst	Engineering	IT Group	SCADA Support	Field Operations	Public / Land Owners
Responsibilities									
Aerial Surveillance	A						R		
Alarm Management & Threshold	A	R, C, I	I	R		R, C, I	C		
Culture / Strategy	R, A	I, C	I	C, I	I	I	I	I	I
Design	A	I, C	I	R		C, I	I		
Emergency Response	A	R, C, I		R		I	R	I	
Performance	A	I	C	R, C, I		R, C, I			
Record Keeping & Reporting	A	R, C, I					R		
Restart Authorization	R, A	C, I		I			C, I		
Leak / Rupture	R, A	R, C, I	C	C, I			R, C, I		
Testing	A	C	C, I			R	R		
Training	A	R	I			R	R		



(R) responsible, (A) accountable, (C) consulted, or informed (I) about aspects of the LDP

# Training

Level of Training	Roles										
	Management	Control Center	Analyst: Leak Detection Staff	Engineering: Support Staff	IT Group	SCADA Support	Field Operations: Field Staff	Field Operations: ROW Staff	Field Operations: Connecting Facilities Staff	Public: External Response	Public: Government Agencies or Regulators
LDP Operational	X	X									
LDP Technical	X	X	X	X	X						
Internal LD Principles	X	X	X		X	X					
External LD Principles	X	X	X			X	X				
SCADA Deviation Alarms	X	X	X		X						
Pipeline Over/Short Calcs	X	X	X			X					
LDP Awareness	X					X	X	X			
LDP Basics	X					X	X		X	X	X
LDP Regulations/Standards	X	X	X	X							
LDP Strategy & Culture	X	X	X	X	X	X	X			X	
LDP Management	X	X	X								

- The level, content, method, frequency and testing/verification of the training should be based on the roles and functions of the individuals and to support the pipeline operator Culture and Strategy
- Training metrics should be established to ensure training effectiveness
- Employees should be trained to work together effectively as a team



An effective training program has the potential to greatly reduce the risk consequences of a pipeline leak

# Reliability Centered Maintenance (RCM) for Leak Detection Equipment

- Ensure that all components of the LDS and their supporting infrastructure components are designed for reliability and maintained appropriately
- Discuss the LDS and maintenance program with the users of the LDSs and/or with vendors
- Integrate the leak detection components into a pipeline operator's MMS or CMMS system or similar system to provide for automation of maintenance activity, schedule, and maintenance and failure tracking



## ■ RCM Process

1. **Function** of the component?
2. **Performance** standard?
3. How can it **fail**?
4. **Events** that **cause** failures?
5. What **happens after** the failures?
6. **Relates** to the LDS?
7. **Prevent consequence of failure?**
8. If **no preventive task** cannot be found?

## ■ DfRM Process

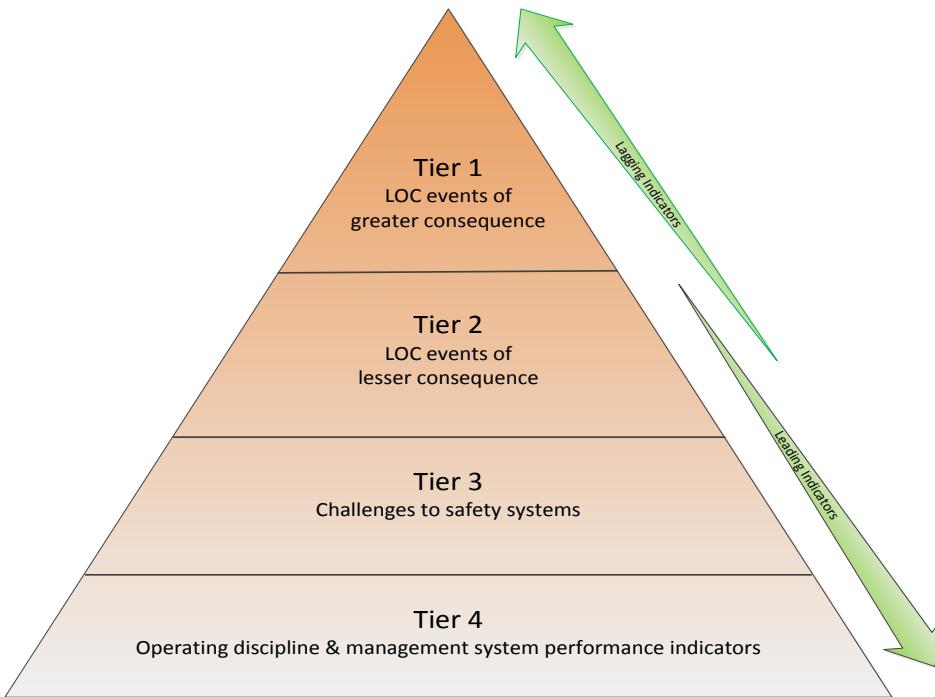
1. Design for Reliability and Maintainability (DfRM) goal: **Team approach**.
2. **Gather** maintenance **data** and develop into Reliability, Availability and Maintainability (**RAM**) models.
3. **Develop/identify maintenance concepts** using information from the RAM models.
4. **Design, analyze, test, and improve/optimize** the LDS using selected maintenance concepts.
5. **Finalize** the design through **Engineering**, and **Implement** the **DfRM**.
6. Collect field maintenance **data** and develop KPIs.
7. Make field **improvements** as required by safety, economics, and other factors.
8. Design rules may be **revised**, new tools developed, and design approaches validated or revised.

# Overall Performance Evaluation of the LDP

- Overall performance evaluation of the Operator's LDP should
  - Capture noteworthy results of operations of the LDP,
  - Look at company and industry performance,
  - Report to management the results of the overall performance monitoring on an annual basis
- Internally, looks at all performance aspects of API RP 1175
- Externally, looks at leak detection industry information (incident reports, databases, guidance provided by PHMSA, API PPTS, and other related sources), activities in the pipeline industry and changes to regulations



# Leading and Lagging Indicators



- Leading indicators are used to predict a future outcome of a process
- Lagging indicators are those KPIs which measure an event once it has already occurred
- Dual Assurance is a concept whereby a leading indicator at a lower tier is matched with a lagging indicator at a higher tier
- Data normalization refers to the effort to make data comparable over time or between different entities

# Improvement Planning and Process

- Identify and Define Opportunities to improve any part of the LDP
- Define the tasks needed to retain the interest or freshness of the LDP
- The opportunities should be planned, budgeted, and scheduled
- Consider the timeframe as to when the opportunities will be complete
- Tracked to completion
- Updated and improved on a regular basis
- LDP Strategy should be reviewed annually



The results of the improvement process will be a better LDP

# Upcoming Activities

## ■ API Timeline

- Final Draft Version – May 19 – June 19
- Issue for Ballot and Voting – June 19
- Expected Approval – July / August

## ■ Implementation (*A new API Approach*)

- Develop an industry implementation plan and schedule:
  - Stage 1: Industry Information and Training Sessions
  - Stage 2: Industry Survey and Site Visits
  - Stage 3: API RP 1175 Revision-2 Development
  - Stage 4: Ongoing KPI Review and Analysis Revision-3 Development
- May be basis for future DOT regulations on LDP Management



Time after RP is approved:

- Up to 2 years (parallel)
- Up to 2 years (parallel)
- Up to 3 years
- At least 3 to 5 years

Thank You for Attention

**Questions / Comments /  
Suggestions?**

