PHMSA Leak Study Update

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PHMSA R&D Forum

Working Group #2

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Kiefner Applus RTD

Agenda

Provide an update on objectives and progress related to the PHMSA Leak Study:

- Study mission, team and timetable
- Components and tasks of the study
- Current activities and status
- Requirements and synergy with the PHMSA R&D Forum
- Some preliminary observations

Introduction

Objectives

- Analyze the technical limitations of current leak detection systems (LDS)
- Determine the ability of LDS to detect ruptures and small leaks that are ongoing or intermittent
- Identify any leak detection technology gaps
- Analyze the practicability of establishing technically, operationally, and economically feasible leak detection standards

Background

Kiefner Applus RTD

- Assist the PHMSA successfully to report to Congress on the status of leak detection for hazardous liquid pipeline facilities and transportation-related flow lines per Section 8 of the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011.

- Provide input to help PHMSA address NTSB recommendation P-11-10:
  - Require that all operators of natural gas transmission and distribution pipelines equip their supervisory control and data acquisition systems with tools to assist in recognizing and pinpointing the location of leaks, including line breaks; such tools could include a real-time leak detection system and appropriately spaced flow and pressure transmitters along covered transmission lines.

Timetable

- Project was assigned to Kiefner and Associates
  - Project Manager is Martin Phillips, and the team includes pipeline operations, engineering and economics specialists
  - The PHMSA Project Manager is Max Kieba
- Project kickoff was 22 March 2012
- Draft Report is due 28 September, for a Final Report after comments and review by 31 October

Review and assess previous pipeline incidents

- Look-back study based upon PHMSA, NTSB and other incident databases.

- Conclusions as to whether implementation of further leak detection capabilities would have mitigated effects to the public and surrounding environment.

- Conclusions as to the adequate level of protection needed for appropriate mitigation.

Tasks

Technological feasibility

- Technical study of the state-of-the-art and current industry practices.
- Comparison of LDS methods to determine whether current systems (or multiple systems) are able to adequately protect the public and environment from pipeline leaks and incidents:
  - Legacy equipment currently utilized by operators
  - Ability to retrofit legacy systems
  - Benefits and drawbacks of LDS methods
  - Ability to detect small/intermittent leaks
- Technology gaps shall be identified and thoroughly explained.

Tasks

Operational feasibility

- Operational study of the state-of-the-art and current industry practices.
  - Visual inspection techniques, instrumented monitoring of internal pipeline conditions, and external instrumentation for detecting leaked hydrocarbons.
- A view of how many operators are protecting their infrastructure with leak detection systems, so that PHMSA can comment on adequacy.
- Procedures, protocols, best practices, workforce, etc.
  - Reliability, availability and maintainability system aspects
  - How further leak detection methods/system deployment would affect pipeline operations

Tasks

Economic feasibility

- The benefit that may be seen by the public and surrounding environment.
- The lifetime operational cost of the system
- A cost benefit analysis for deploying leak detection systems on new and existing pipeline systems.
- Both the entire pipeline infrastructure, and a separate analysis to include pipelines in HCAs only.

Tasks

Leak detection standards

- Draw together the technology gaps, operational capabilities, and economic feasibility
- Analyze the practicability of establishing technically, operationally, and economically feasible standards to provide adequate protection to the United States against pipeline leaks, where such standards don't already exist.
- Analysis is specific to:
  - The type of pipeline (gas distribution, gas transmission, hazardous liquid pipeline facilities, transportation-related flow lines etc.)
  - Pipeline locations (i.e. Class Locations, HCAs, non-HCAs, etc.)

Tasks

Data mining

- Look-back study based upon PHMSA, NTSB and other incident databases has to start with data mining and tabulation.

- Currently creating a database of incidents that includes LDS related information for larger incidents since 2000. This will be followed by a data analysis stage.

- Specific items collected include:
  - Pipeline, leak detection system, and leak category
  - Time to detection, validation, response and containment
  - Eventual size of spill
  - API 1149 factors

Status

Technical study

- Most of the study relies upon a systematic categorization of LDS methods, technologies and systems:
  - Visual, Inspection, Internal (computational), External (instrumented), and overlapping
  - Continuous vs. Intermittent
  - Point sensors vs. distributed sensors
  - General expectations of performance: Sensitivity, Reliability, Accuracy, Robustness
  - General expectations of API 1149 factors

- Current table includes some 29 different system categories and 23 corresponding parameters

Status

Pipeline Operator interviews

- Legacy equipment currently utilized by operators
- Ability to retrofit of aforementioned legacy systems
- LDS that are currently being used throughout the industry
- How many operators are protecting their infrastructure with leak detection systems, what kind, and what expected performance
- Operational aspects (i.e. procedures, protocols, best practices, workforce, etc.) and Human Factors, especially training
- Analysis of how further leak detection methods/system deployment would affect pipeline operations
- Lifetime operational cost of systems
- Benefit that may be seen by the public and surrounding environment

Status

Technology developer interviews

- Ability to retrofit legacy systems
- Benefits and drawbacks of methods
- Systems' ability to detect small/intermittent leaks
- Technology gaps
- Consideration of reliability, availability and maintainability
- Systems' capital cost and overall lifetime costs

Status

Current status

- Data mining is about 50% complete. It will be followed by analysis and reporting on the data.
- The Technology Study is complete, but is subject to modifications after the interviews and other feedback.
- Semi-structured interview for Operators created in collaboration with two liquids and two gas pipeline operators
- Semi-structured interview for Technology Suppliers created in collaboration with two developers

Status

Current status (2)

- Seven liquids operators agreed to interviews. Identifying a similar number of gas operators
  - About half are large transmission, and half smaller
- Twelve suppliers agreed to interviews.
- Collaboration with Professional Associations: API, AOPL, AGA, INGAA, SGA, NGA, ASME, GPTC, NAPSR

Status

Several purely technical issues are significant to the study, especially:

- Ability to retrofit legacy systems
  - Developments specifically aimed at simplifying installation / retrofit
- Benefits and drawbacks of methods
  - Improved ways of assessing requirements and specifying solutions
- Systems' ability to detect small/intermittent leaks
  - Is this possible? Conflicting opinions.
- Systems' ability to self-check
  - Assessment of availability, accuracy, and detection alarm confidence in real-time

R&D Issues

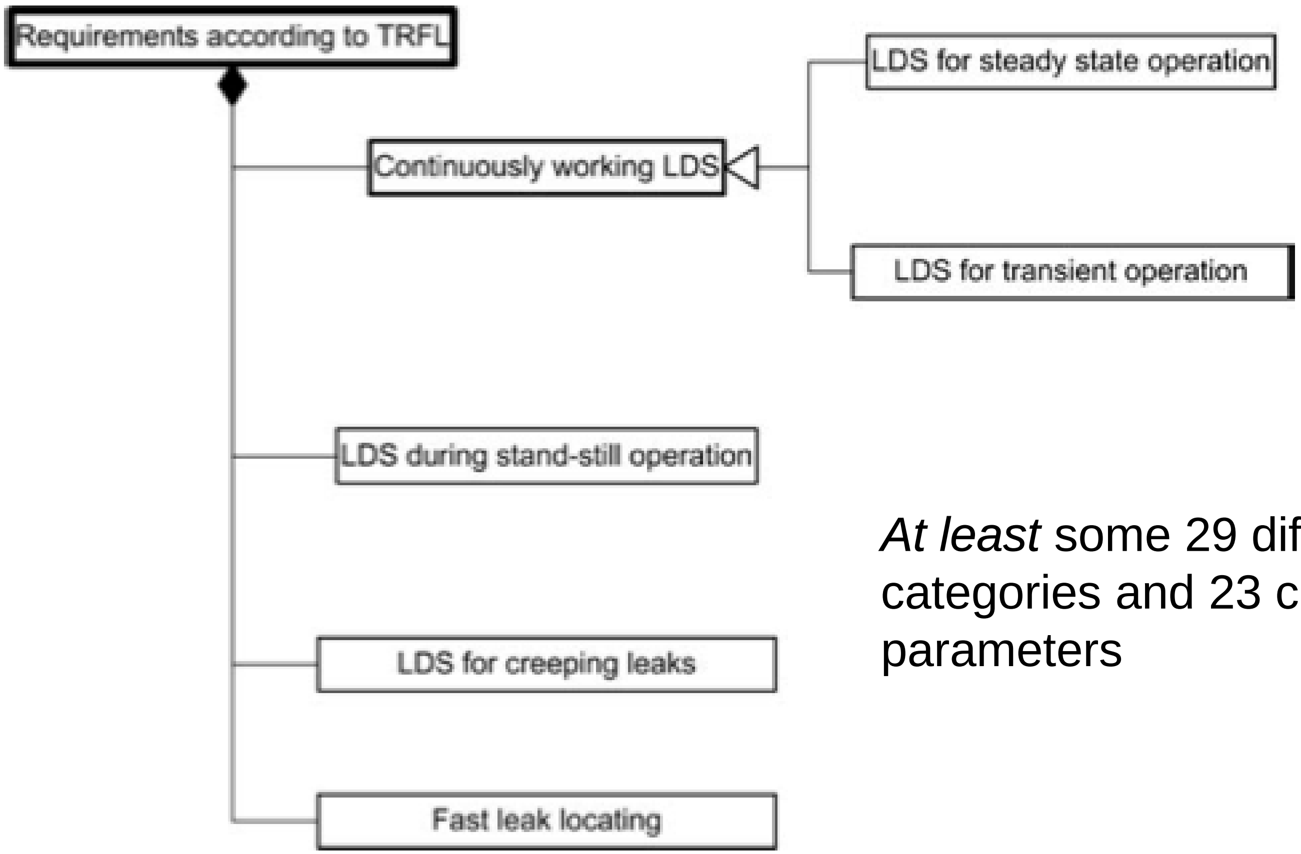
PHMSA R&D Forum (2)

- Technology gaps
  - Where should R&D be focused? What are the top R&D challenges from industry?
  - Current scientific / engineering progress towards solution

- Identify any systems not currently widely used but nevertheless ready for deployment and available to be installed today.

R&D Issues

Observations: (1) Industry confusion



At least some 29 different system categories and 23 corresponding parameters

Observations

Observations: (2) LDS as an afterthought

- Of those pipelines that actively operate an LDS, by far the most common method used is API 1149 1.b – "Regular or Periodic Monitoring of Operational Data by Controllers: b) Rate of pressure / flow change"
  - Natural Gas pipelines are not even required to do this, hence NTSB Recommendation P-11-10

- "Regular or Periodic Monitoring of Operational Data by Controllers: a) Volume balance (over/short comparison)" is often no more than a routine daily exercise.

- The risk potential for loss by utilizing no more than these methods is very large.

Observations: (3) LDS technology availability

- Especially smaller operators require guidance in assessment, selection, and deployment of LDS.
- Sources of supply for LDS are fragmented:
  - Very large EPC's and integrators
  - A handful of technology-oriented smaller companies
- Very few new entries in the supplier chain

Observations

Observations: (4) LDS performance myths

- Very few liquids operators utilize External LDS (unreliable, don't work, don't need them).
  - Yet, they are almost universally used in high-consequence parts of the liquids industry: chemicals, refining, etc.
  - External LDS provide much higher sensitivity than nearly any internal LDS

- Relatively, very few gas operators utilize Internal LDS (unreliable, don't work, don't need them).
  - Yet, large transmission gas pipelines routinely use Internal LDS
  - External LDS are costly (therefore, rarely used) for complete system-wide coverage

Observations

Questions ?

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