

Pipeline Research Council International, Inc.

PHMSA Meeting – 3/27/2012 Improving Leak Detection System Effectiveness

*PRCI HL Leak Detection Research Activities
Past, Present, Future*

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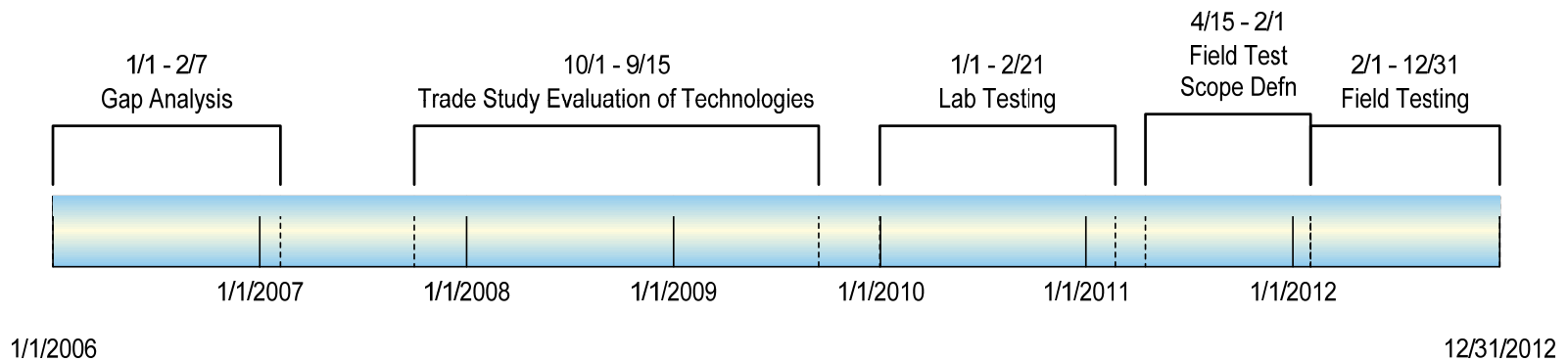


LEADING PIPELINE RESEARCH

PRCI Research Activities-Past

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- **Small Leak Detection in Liquid Pipelines – External Leak Detection Evaluation and Development**
 - Research objective
 - *Push the state of the art in the ability to detect small leaks in hazardous liquids pipelines*
 - Schedule of projects



PRCI Research Activities-Present - I

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▪ Field testing of Acoustic/Negative Pressure Wave Leak Detection Technologies

▪ Research objective:

- *Conduct a full-scale field test of several acoustic systems on a production pipeline to determine if they can detect such leaks while minimizing non-leak alarms.*

▪ Key deliverables:

- *A report of the testing results will be generated. Evaluation criteria:*

Leak location	Non-leak alarm rate
Smallest detectable leak	Response time
Tools/information provided to user	Perform under various pipeline conditions
Installation/configuration time	--

▪ Benefits:

- *Provide guidance to liquid pipeline operators on complimentary technology for detecting leaks that are smaller than those currently detectable with existing systems.*

PRCI Research Activities-Present - II

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- **A New Look at the Pipeline Variable Uncertainties and Their Effects on Leak Detection Performance**
 - Research objective:
 - *This research will focus on finding efficient algorithms for pre-determining the leak detection sensitivity performance for a given pipeline configuration, pipeline operation and known instrumentation characteristics.*
 - Key deliverables:
 - *A report documenting and quantifying the effects of pertinent variables on the operation of specific CPM algorithms during steady state and transient operations (which encompasses not only Crude, Refined Product fluids, but HVL fluids as well)*
 - Variables: fluid properties, instrumentation quality, time steps, update rate, loss of data, LDS presentation
 - *An off-line software tool which can be used by operators to conduct leak detection performance capability studies*
 - Benefits:
 - *Research will allow operators to determine upfront the expected leak detection sensitivity performance before committing to improvements*

PRCI Research Activities-Present - III

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- **Alternatives for small seep leak detection during hydrostatic testing**
 - Research objective:
 - *Alternatives to SF6 need to be determined as to their hydrostatic testing leak detection effectiveness and limitations including any possible environmental effects.*
 - Key deliverables:
 - *The deliverable will be a report on various methods of locating leaks during hydrostatic tests with the relative benefits and limitations of each technique including cost per mile and current or potential environmental limitations.*
 - Benefits:
 - *The benefits and limitations of various leak detection techniques needs to be determined to ensure hydrostatic testing continues to remain a viable integrity management technique into the future.*

PRCI Research Activities-Future

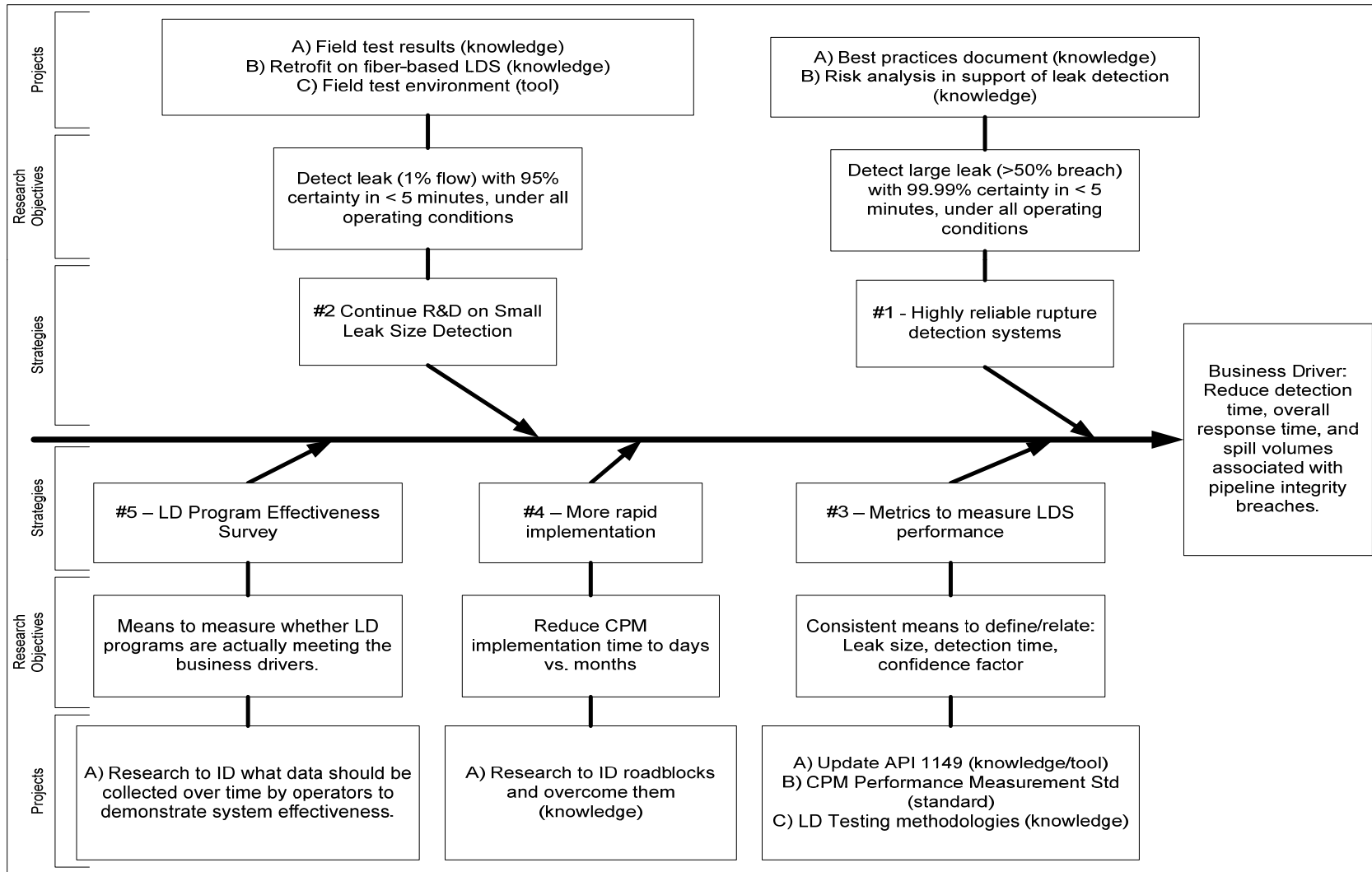
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- **PRCI Leak Detection Roadmap**

- A work in progress – under development since early 2011
- Being circulated for review and input by stakeholders
- Will continue to evolve as research takes place and industry advances
- Addresses both gas and liquids pipeline operations
- Five major strategic objectives presented in following slides

Leak Detection Roadmap Overview

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Leak Detection Roadmap - 1

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- **Highly reliable pipeline rupture detection – liquids & gas pipelines**
 - **Objective:** Develop a means to consistently and reliably recognize large leaks in either liquids or gas pipelines.
 - *The end point to this objective is to have an automated shut-in system on the identified pipeline segment when a rupture is detected.*
 - *A proposed research objective is: Detect a large leak (>50% leak rate) with 99.99% certainty in less than 5 minutes, under all operating conditions.*
 - **Required Research Outcome or Needs:**
 - *Best practices document (knowledge)*
 - *Risk Analysis in Support of Leak Detection (knowledge)*

Leak Detection Roadmap - 2

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- **Continuing R&D on small leak size detection on liquids pipelines.**
 - **Objective:** Develop a means to confidently identify smaller leaks in a shorter amount of time than is currently commonly achieved by industry today.
 - *A proposed research objective is: Detect 1% leak of current flow rate in less than 5 minutes, with 95% confidence level, under all operating conditions.*
 - **Required Research Outcome or Needs:**
 - *Field test results from promising technologies (PL-1-1 - Field testing on Acoustic/Negative Wave Leak Detection technologies. (knowledge)*
 - *Retrofit Techniques for Fiber Optic-based Leak Detection Systems (knowledge)*
 - *Field test environment (tool)*

Leak Detection Roadmap - 3

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- **Metrics to measure leak detection performance – liquids & gas pipelines**
 - **Objective:** Develop a means to consistently measure leak detection system performance by addressing: percent of flow that can be identified, in what timeframe, and with what confidence level.
 - *The methodology must include all aspects of a leak detection program including: the CPM system, layers of defense, SCADA system performance, and the human factor performance of the controller.*
 - **Required Research Outcome or Needs:**
 - *Updated API 1149 document and tool set. (knowledge & tool)*
 - *CPM Performance Measurement Standard (standard)*
 - *Leak Detection Testing Methodologies (knowledge)*

Leak Detection Roadmap - 4

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- **Facilitate more rapid implementation of CPM systems – liquids & gas pipelines**
 - **Objective:** Develop a means to be able to more rapidly implement CPM systems on new pipeline systems.
 - *Current systems can take on the order of months to implement (for a complex pipeline).*
 - *The research objective should be days versus months.*
 - **Required Research Outcome or Needs:**
 - *Research to identify roadblocks and methods to overcome them (knowledge)*

Leak Detection Roadmap - 5

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- **Leak detection program effectiveness survey - – liquids & gas pipelines**
 - **Objective:** A leak detection program is comprised of many interrelated parts (SCADA, CPM, field instrument maintenance, controller training, etc). It will be beneficial to industry to have a means to measure whether leak detection programs are actually reducing the detection, response times, and spill volumes associated with product releases over a given period of time.
 - **Required Research Outcome or Needs:**
 - *Research to identify data that should be collected over time by operators to demonstrate that their leak detection program is appropriate given the risk level of their pipelines (knowledge)*

Questions / Discussion

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