Is Leak Detection Possible?
PHMSA Perspective

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Interesting Statements in the News

• “[Company] has robust system integrity, inspection and maintenance programs that meet or exceed all federal regulatory requirements"

• We use robust, state-of-the-art leak detection technologies that can notify us in real-time

• We have invested billions of dollars in safety and integrity to make preventing leaks and spills our highest priority

• If there is a change in pressure or flow, [company] can remotely and automatically shut off flow within three minutes and activate trained responders.
Is leak detection possible?

- Often we need to ask a multi-part question
  - Is it technically possible?
  - Is it practical?
    - Operationally feasible
    - Economically feasible
- It’s not rocket science, but fluid dynamics can get complicated
- Cost vs. complexity: Higher cost and complexity does not necessarily translate to better performance
Putting Leak Detection Systems into Context

• One of many layers of defense in pipeline safety
• Includes technology, people, procedures, and operating environment
• Too much focus on any one discrete element without considering the others or how they interact, and system may fail
• Leak detection vs. rupture detection.
  – Some consider leak detection all encompassing and rupture detection a higher risk/consequence subset
  – Some consider them separate with their own unique challenges, but exact dividing line not always clear
Issues we often see

• LDS vendor claims don’t always perform as advertised even after testing and fine tuning within a system
• Users don’t always have true handle on capabilities and limitations
• Limited use of external systems as part of the overall umbrella of technologies in the toolbox
• Cultural and perception issues
  – Changing mindset from “it can’t be a leak, prove to me it is” to “it may be a leak, prove to me it’s not”
  – Public awareness and perception – goes both ways
  – Watch excessive marketing or PR spin: is real time, state-of-the-art really real-time, state-of-the-art?
Oil Spill Response plans - Worst Case Discharge

49 CFR Part 194 requires operators to compare

Historical Discharges
Breakout Tank Capacities
Pipeline Calculation

During a review we check all of these components to verify that the calculated volumes are correct and all three were taken into consideration.
Calculating the Pipeline WCD

\[ WCD \ (bbls) = [(RT + ST) \times FR] + DDV \]

Response Time (hours) \rightarrow Flow Rate (bbls per hour)

Response times and shutdown times less than 10 minutes raises red flags!
PHMSA Initiatives

- Rulemaking
- Research and Development
- Engagement in Standard Development
PHMSA Rulemakings

- Hazardous Liquid Rule (Final Rule Pending)
  - Would require all lines, including in non-HCAs, implement leak detection systems, but does not give specific performance metrics
- OQ Rule (Final Rule Pending) – Team Training and Roles and Responsibilities
  - Team training for both controllers and others who would reasonably be expected to interact with controllers (control room personnel) during normal, abnormal or emergency situations
  - Roles, responsibilities, qualifications of others who have the authority to direct or supersede technical actions of the controller
- Rupture Detection Rule (NPRM Pending)
  - Considering proposing performance metrics for response to ruptures and requirements for installation of automatic shutoff valves, remote controlled valves, or equivalent technology
  - The overall intent is that rupture detection metrics will be integrated with valve placement with the objective of improving overall incident response
PHMSA Leak Detection R&D – since 2012 (approx. $6.2M)

- INO Technologies Assessment of Leak Detection Systems for Hazardous Liquid Pipelines – HL - Closed
- Advanced Leak Detection LiDAR – HL - Closed
- Advanced Development and Technology Transfer of a Methane/Natural Gas Microsensor – Dist - Closed
- Improving Leak Detection System Design Redundancy & Accuracy – HL/GT
- Small-Scale DIAL for Methane Detection – GG/GT/Dist
- Emissions Quantification Validation Process – Dist
- Natural Gas Pipeline Leak Rate Measurement System – GG/GT/Dist
- Aerial Small Methane Leak Survey – GG/GT/Dist
- Framework for Verifying and Validating the Performance and Viability of External Leak Detection Systems for Liquid and Natural Gas Pipelines – HL/GT
Update to 2012 Kiefner Study?

• PHMSA is considering an update to the 2012 study, focusing on the technology and practicality aspects
  – anything that is more widely used today vs. 2012
  – assessment of the most cutting edge, innovative technologies that show some promise for leak detection in general but not widely used
  – update on efforts in both standards development and R&D that might tie into improving leak detection system design and management overall
Standard Development

• API RP 1168 (Control Room Management)
• API RP 11175 (Leak Detection Program Management)
• API RP 1130 (Computational Pipeline Monitoring)
• API TR 1149 (Pipeline Variable Uncertainties and Their Effects on Leak Detectability)
• Gas - ?
• External Sensors - ?
Questions?

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