



API RP 1175 Pipeline Leak Detection

Selection of Leak Detection

Intent of this Section

- Help Operators select which leak detection principles, methods, and techniques to include in their leak detection program
- Can be used for the selection of new applications, additional applications, or re-examine existing applications
- Is a multi-step, multi-faceted, iterative process
- Should document each facet or step of the selection process

The Process of Selection

- The Process should:
 - Align with the Company Culture and Strategy
 - Link Performance Targets, Metrics, and Key Performance Indicators (KPI's)
 - 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)

Required Evaluation

- As outlined in 49 CFR 195.452 (i)(3):
 - ***A pipeline operator must have a means to detect leaks on its pipeline systems.***
 - ***A pipeline operator must evaluate the capability of its leak detection means and modify, as necessary, to protect the high consequence area.***
 - ***An Operator's evaluation must, at least, consider the following factors:***
 - *Length and size of the pipeline,*
 - *Type of product carried,*
 - *Pipeline's proximity to the high consequence area (**Assess layers of protection and verification of the intended functionality**),*
 - *Swiftness of leak detection (**Leak Detection Capability**),*
 - *Location of nearest response personnel (**Isolation Capability / Emergency Response Capability**),*
 - *Leak history (**Estimate probability of each leak scenario**), and*
 - *Risk assessment (**Overall Risk Analysis of the pipeline system**) results.*

The Risk Assessment – A Risk-Based Approach

- Overall risk analysis of the pipeline
 - Utilizes Integrity Management Program (IMP) risk assessment but refocus with selection of leak detection in mind
 - Likelihood vs Consequence,
 - Verify appropriate weighting is applied on relevant factors that are important to the selection process
- Leak Detection capability of the existing LDSs
 - Primary, complementary, alternative LDSs in place and their coverage
 - Performance targets, metrics, and KPIs: reliability, sensitivity, robustness and accuracy
 - Strong emphasis on consequence, estimate un-mitigated / mitigated consequence levels
 - Evaluate the likelihood of the occurrence of the various threats
- Leak Detection capability of the existing Leak Detection Program (LDP)
 - Strength of the leak detection culture
 - Strength and completeness of the strategy
- Annex A considerations of cause and threats
 - Worst case leak may not be biggest
 - Consider all possible leaks, meaning a representative sample of leak sizes in relation to probabilities
- Leak size reduction initiatives and any IMP risk reduction initiatives
- Compare against the pipeline operator's risk tolerance

Understanding Regulatory Requirements, Industry Publications & Recommended Practices

- Regulatory requirements for liquids pipelines are outlined in 49 CFR 195:
 - Section 195.134 – Comply API RP 1130 section 4.2
 - Section 195.402 - Procedural manual for O&M, and Emergencies
 - Section 195.412 – Right of Way (ROW) Inspections
 - Section 195.444 - Comply API RP 1130 section 6.0
 - Section 195.446 – Control Room Management (CRM)
 - Section 195.452 - IMP
- Requirement for Computational Pipeline Monitoring (CPM) in HCA's or as a condition of approval
- PHMSA Website FAQ 9.4 for should consider items
- There may be special conditions, state requirements or recommendations that must be considered as well.
- Other RPs and industry publications are noted in section 2.

Understanding the Requirements Imposed by the Leak Detection Strategy

- The approved leak detection strategy may set a number of goals and targets that must be understood and accommodated during the selection process.
- For example:
 - A LDP that exceeds the minimum regulatory requirements
 - Aligns with the Company's leak detection performance targets, metrics, and KPIs
 - A goal of having both primary, independent and complementary methods and even particular techniques (for example, CPM)
 - Focus upon continuous methods of leak detection
 - Provide resources require to positively identify a LOC
 - An alternative LDS can be used if the primary LDS is out-of-service
 - Designated redundancy within a LDS

Aligning the Selection with the Leak Detection Strategy and Regulatory Requirements

- This step is a quick check to ensure the techniques will comply with all requirements of regulatory and Company culture and strategy.
- This step may include undertaking a team review with Control Center and Field Operations and other directly involved stakeholders, then a presentation to senior management to obtain approval.
- An Operator should ask themselves:
 - Does the LDP have the capability of finding small leaks in a timely manner?
 - Does the LDP have the capability of finding big leaks, like ruptures, in a timely manner?
 - Does the LDP have the capability of finding seep leaks in a timely manner?

Evaluating the Best Available Technology for Leak Detection – List and Classification of LDSs

- The methodologies used to detect leaks cover a wide spectrum of technologies and are based on a number of different detection principles.
- These methodologies can be classified into internally-based and externally-based detection principles.
- Methodologies can be continuous or periodic (non-continuous).
- Each method has its strengths and weaknesses of leaks on liquid hydrocarbon pipelines or loss of containment.
- Dependent on the application and the complexity of the pipeline system to which the leak detection method is applied.
- Not all techniques are proven or appropriate for every pipeline system!
- It may be helpful to discuss application with other users or vendors (bring own grain of salt).

Selection Criteria Considerations

- Key areas of consideration in the criteria:
 - What features are needed?
 - What performance is needed?
 - What is the process of the selection criteria to vet the LDS?
- Annex B and API RP 1130 4.2 outline a list of selection considerations
 - List applies to CPM LDSs, but can be applicable to other non-CPM techniques
- Should consider regulatory, special permits, corrective action orders or safety orders within the criteria
- Should consider the physical environment, both capital and operational expenditures, and benefits of the LDS
- Maintain an overall system view and each component works with the others to provide the desired performance

Modifying the Selection to Cover Particular Requirements of Individual Pipelines

- Leak Detection Systems are engineered systems, meaning that the same technology applied to multiple pipelines can have different results.
- It is necessary to ensure that the particular operational conditions of a pipeline or its design can be accommodated by the same system used on other lines.
 - An additional technique or modification to the technique is necessary to accommodate system on other lines.
- Improvements or other changes occur from time to time as well.
- For example:
 - Availability of new leak detection technology, or extensions, to be evaluated by selection criteria

Periodic Review of Selection

- The purpose is to keep the leak detection program current
- It will be necessary to periodically evaluate the selection of leak detection systems to ensure they are meeting the requirements of the Company's leak strategy.
- Possible reasons for a review
 - New LDSs
 - Change of Service
 - New Connection
 - Application Update
 - Regulatory Change
 - Experience
 - Population / Environmental Change
 - Time Cycle
 - One approach to a timed cycle is to review the leak detection requirements based upon a five year cycle with 1/5 of pipeline being reviewed in one year, very much like through a baseline IMP.
 - The team may look at SA's, non-SA's that are pristine areas, leak detection alarms and any other performance related information.