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

Selection of the principles, methods, techniques will become the framework of the company’s Leak Detection Systems (LDS’s)
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)

Apply this selection process to validate and ensure this part in the LDP meets industry best practices
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.

If more or enhanced leak detection capabilities is a viable option, consider possible improvements
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

Leak detection reduces the consequence portion of a Loss of Containment (LOC) but does not reduce the likelihood of a leak.
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.

An operator should know / understand all the leak detection related requirements of 49 CFR Part 195
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

The leak detection strategy can be satisfied in part by selection of LDSs that best fit the requirements of the strategy.
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 seepage 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

Develop a list of selection criteria considerations and select the LDSs that satisfy those considerations.
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.