

REVIEWER'S REPORT

Manuscript No.: IJAR-59478

Title: Risk-Based Leakage Detection and Incident Prevention in Large-Scale Saudi Industrial and Infrastructure Projects.

Recommendation:

Accept as it is

Accept after minor revision.....

Accept after major revision

Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity		✓		
Significance		✓		

Reviewer Id: JPR-386

Reviewer's Comment for Publication.

Strengths of the Study:

- The manuscript addresses an important topic related to industrial safety, pipeline integrity, and leakage prevention.
- It provides a comprehensive review of computational, acoustic, optical, and machine-learning-based leak detection technologies.
- The integration of risk-based inspection, digital twins, and lifecycle integrity management is a significant strength.
- The study clearly discusses the limitations of existing technologies and the challenges of transferring research findings to Saudi industrial environments.
- Practical recommendations for project owners, contractors, operators, and regulators are relevant and useful.
- The research gaps concerning field validation, data quality, model uncertainty, and cybersecurity are clearly identified.

Weaknesses of the Study:

- The review methodology lacks a fully reproducible search and screening process, including exact search dates, complete search strings, and database-specific results.
- The criteria used to select and evaluate the 30 references require further clarification.
- The proposed framework is conceptual and has not been validated through a Saudi industrial case study or quantitative analysis.
- The comparative evaluation of detection technologies would benefit from more quantitative performance indicators and clearly defined operating conditions.
- Some tables and figures require improved formatting and presentation for better readability.

Overall Assessment:

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The manuscript presents a well-organized and technically relevant review of risk-based leakage detection and incident prevention. It integrates different detection technologies with risk assessment, inspection planning, and lifecycle management in a coherent framework. The paper has practical significance for industrial and infrastructure projects in Saudi Arabia. However, improvements in methodological transparency, comparative evaluation, and framework validation would strengthen its scientific contribution. **The manuscript is recommended for acceptance after minor revision**, subject to satisfactory clarification of the review methodology and improvement of the presentation.