

ENERGY

Driving Efficiency in Pipeline Maintenance: Trends, Challenges and Transformation Opportunities

Executive Summary



Maintenance and repair (M&R) activities for midstream pipelines have surged over the past five years, driven by an evolving regulatory environment and aging infrastructure.

Regulatory changes led by the Pipeline and Hazardous Materials Safety Administration (PHMSA), including expanded requirements for inspections in moderate consequence areas, have significantly raised the integrity burden on pipeline operators. These regulatory changes have necessitated broader deployment of in-line inspection (ILI) tools to ensure compliance and safety. At the same time, maintenance costs are rising, driving cost performance for pipelines down.

Peer benchmarking reveals considerable variation in cost efficiency, with top-performing companies often spending significantly less than peers on a maintenance expense basis that considers nominal pipe size (NPS) and mileage (\$/NPS-mile). These discrepancies highlight the influence of company-specific processes, practices, and operating models. Despite widespread confidence among operators that their maintenance programs are optimized, Alvarez & Marsal (A&M) has repeatedly identified substantial savings opportunities through data-driven assessments and structured transformation efforts. Typical results include a 10–15 percent reduction in maintenance expenses and an over 20 percent reduction in repair program scope.

This white paper explores the drivers behind these trends, shares key insights from industry data, and outlines A&M's proven five-stage approach to maintenance transformation. By implementing a structured, data-driven strategy, midstream executives can reduce costs, ensure compliance and enhance reliability.





1. Introduction



Recent regulatory rulings from PHMSA, particularly those expanding the scope of moderate consequence areas (MCAs) and enforcing tighter inspection mandates, have dramatically increased the inspection and repair workload for pipeline operators. These regulations, implemented beginning in 2020, have been pivotal in driving the surge in ILI-based integrity activities.

Concurrently, inflationary cost pressures and labor shortages have compounded the financial burden of performing maintenance, with inspection and repair costs climbing steadily. A&M recently conducted an analysis using natural gas as a proxy for the broader midstream sector. The study draws on data from a peer set of seven major natural gas transmission operators, covering 20 pipelines across North America, and is supported by A&Ms proprietary analysis.

In this environment, midstream companies must enhance five primary levers to drive performance improvement: defect identification, defect criticality assessment, planning and scoping, preparation and procurement, and execution. PHMSA rulings, expanding the definition of moderate consequence areas (MCAs) and imposing stricter inspection requirements, have greatly increased the inspection and repair tasks for pipeline operators.

2. Maintenance Activity Trends



Figure 1: ILI Number of Anomalies Excavated, Number of Repairs, & Miles Inspected (2019–2023)

From 2019 to 2023, the number of anomalies repaired for peers due to ILI inspections doubled, while the total mileage inspected via ILI grew by approximately 40 percent.

This surge is largely attributable to a combination of expanded regulatory scope, the aging of pipeline infrastructure, and advancements in ILI tool sensitivity that are identifying defects earlier and in greater numbers. These developments have led to a dramatic rise in integrity workload.



Management decisions and organizational discipline significantly impact cost outcomes, even in a tightly regulated and restricted sector.

3. Maintenance Expense Trends

To allow for meaningful comparison across pipeline systems of different lengths and diameters, pipeline maintenance cost performance is normalized using a ratio based on the product of pipeline mileage and the peer pipeline's weighted nominal pipe size (\$/NPS-mile). This approach offers a consistent view of expense performance across peer pipelines.

Between 2019 and 2023, maintenance expense performance declined, with median spend / NPS-mile increasing by approximately 28%. Meanwhile, bottom quartile performers saw a significantly higher increase of 46 percent. This indicates that while overall costs are rising, efficiency improvements have not been able to fully negate the impact of rising overall costs, particularly for bottom-quartile companies.

Figure 2: Mains Maintenance Expense Performance Quartiles (2019–2023)



Source: PHMSA Form 7100, FERC Form Annual Form 2, A&M Analysis

4. Company Performance



Performance varies significantly between operators, with bottom-quartile companies demonstrating markedly lower cost performance. These differences reflect a variety of internal factors, including level of conservativeness in assessments, inclusion/focus on noncritical work, less competitive supplier agreements, overly stringent construction specifications, and inefficient execution processes. Companies that right-size workloads, set aggressive execution targets, exercise supply-chain best practices, and minimize value-leakage in execution often outperform others.

These findings suggest that even in a highly regulated and operationally constrained sector, management decisions and organizational discipline have a powerful influence on cost outcomes.

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When gaps are addressed, typical results are a 10-15% reduction in maintenance expense, more than 20% reduction in the scope of excavation and repair activities, and superior predictability of maintenance costs.

5. A&M Insights

Many operators believe their M&R programs are already optimized, yet A&M has observed that key areas often remain unaddressed. Deficiencies appear in one or more of the five core areas of M&R activity: defect identification, defect criticality assessment, planning and scoping, preparation and procurement, and execution. Through improvement projects with midstream operators, A&M has observed that while operators believe that they are exercising best-practices in these areas, clients often do not employ supply chain best-practices, allow noncritical work to creep into scopes, are inefficient in crew deployments and work organization, and do not rely on performance data to evaluate performance and set expectations for future execution.

Through structured assessments and transformation engagements, A&M has identified these gaps with clients, developed approaches to bring significant improvements to their operations, and executed those approaches to realize improvements. Typical results include 10–15 percent reductions in total maintenance expense, more than 20 percent reductions in the scope of excavation and repair activities, and improved predictability of costs across budgeting cycles.

Many operators believe their M&R programs are optimized and they are exercising best practices, but A&M observes that key practices often remain unaddressed.

6. A&M's Transformation Approach

A&M's transformation methodology comprises five core stages. Scoping defines the focus areas, asset classes and timeframes for analysis. Baselining assesses historical spend and maintenance data. A detailed gap analysis then identifies inefficiencies by benchmarking performance against peers. Future state design involves aligning performance goals, tools and resource models, which is followed by implementation, where A&M works with clients to execute the transformation plan and track key performance indicators.

This approach typically delivers results within six to eight weeks and includes field data reviews, cost modeling, and repair prioritization workshops. Most importantly, it ensures a disciplined, replicable process that drives sustainable improvement.











7. Conclusion

As integrity-related maintenance activity increases and cost performance continues to decline, midstream companies must act decisively. Standardized performance metrics, predictive analytics and centralized maintenance planning can dramatically improve outcomes. Executives should prioritize understanding today's performance, evaluate the completeness and visibility of their internal M&R data, and involve cross-functional teams in designing the future state of their maintenance operations. With the right tools and guidance, companies can operate safely, enhance reliability, reduce costs and meet the growing demands of regulatory compliance.

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