The petroleum pipeline industry has undertaken a voluntary environmental performance tracking initiative, recording detailed information about spills and releases, their causes and consequences.

The pipeline members of the American Petroleum Institute and the Association of Oil Pipe Lines believe that tracking and learning from spills will improve performance, thus demonstrating the industry's firm commitment to safety and environmental protection by its results.

This is one of a series of fact sheets about the Pipeline Performance Tracking System, "PPTS," its evolution and its lessons.

Learning from PPTS: Illustrating Risks with Decade of Construction Data

The first report utilizing the pioneering data of the Pipeline Performance Tracking System (PPTS) was completed in 2001. *Oil Pipeline Characteristics and Risk Factors: Illustrations from the Decade of Construction* describes the technologies, materials and pipeline construction practices and their evolution over time, and analyzes the safety performance of the oil pipeline system by decade of original construction. Pipeline operators can use the report's Findings and Recommendations to assess their own pipeline's characteristics and develop strategies to reduce risk and thus improve performance over time. The report's authors are John F. Kiefner of Kiefner & Associates and Cheryl J. Trench of Allegro Energy Consulting.

Advancing Technology, Improving Performance

Over the decades, technological advances and changes in practices have reduced risks associated with specific aspects of pipeline operations, pipe materials and manufacturing technology, and installation practices. Pipelines constructed using these advances exhibit improved performance over those constructed before the advance. Furthermore, as these advances and new practices have been developed, they have also often been applied to pipeline systems already in place, as well as new systems, resulting in performance improvement across systems of any vintage. By understanding the advances, their application to pipeline systems, and the resulting enhancements to system performance, operators can better assess their own pipeline systems and tailor inspection and maintenance practices to mitigate risk and thus improve performance.

Some Findings

- Under ideal conditions, steel itself does not degrade over time. Thus, the operator's first step in preventing deterioration of the pipeline is addressing the "in-service conditions" – conditions in which the pipeline operates, both those inside the pipe and in its external environment.
- Since the modern pipeline era began in the late 1920s, there have been three major periods of technological advances. The *late 1940s* ushered in cathodic protection systems that significantly reduced the deterioration that can result from the corrosion of steel. The *late 1960s* brought new low alloy and low carbon steels, in tougher grades, resulting in steel pipe with few, if any, manufacturing defects, and also introduced the regular use of pre-service tests to expose those few defects that do exist. The *1980s* saw the growth in the use of sophisticated in-line inspection tools, allowing operators to evaluate the condition of a pipeline without having to stop the flow of product and take it out of service for the test.
- The oldest pipelines – those built before 1930, which account for only 2% of the nation's total mileage – were constructed before modern manufacturing techniques and construction practices were known. For instance, significant advances in forming the pipe with a reliable seam and in welding segments together were made in the late 1920s; methods to protect

buried pipelines from external corrosion matured in the 1940s. Hence, these pre-1930 pipelines tend to exhibit higher numbers of spills than more modern lines, and therefore require careful evaluation and, depending on the condition of the pipe, mitigative measures.

- Those pipelines constructed before cathodic protection and pipeline coatings were in wide use – those installed before 1930 (2% of the total mileage), and to a lesser extent during the 1930s (7%) and the 1940s (13%) – display a higher rate of incidents due to external corrosion. While pipelines constructed in the 1930s and 1940s require careful evaluation with respect to the risks from external corrosion, these pipelines do not generally exhibit a high rate of spills from causes other than external corrosion. Pipelines constructed since cathodic protections and pipeline coatings have been in use, even those that are now 50 years old, do not show a high rate of incidents from external corrosion.
- Prevention programs, monitoring, testing, and renovation (as required) keep pipelines of any vintage fit for service. Pipeline operators have embraced a new regime in the new API Standard 1160, "Managing System Integrity for Hazardous Liquid Pipelines," which prescribes a menu of options for comprehensively assessing and mitigating risk, and thus enhancing a pipeline's integrity and safety performance. Monitoring includes the use of state-of-the-art in-line inspection tools.

Applying the Findings

This report provides information that operators can use in assessing their own systems, evaluating potential risk and establishing mitigation programs. The detailed findings have been presented at meetings with industry operators, the National Transportation Safety Board and the U.S. Department of Transportation's Office of Pipeline Safety.

Oil Pipeline Characteristics and Risk Factors: Illustrations from the Decade of Construction is available online at http://www.api.org/ppts/filespdf/Decade Final.pdf.