

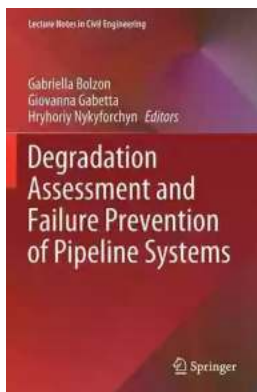
Degradation Assessment And Failure Prevention Of Pipeline Systems

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Pipelines play a crucial role in transporting various substances such as oil, gas, and water over long distances. Their reliable and efficient operation is essential for the smooth functioning of industries and the economy as a whole. However, over time, pipelines can undergo degradation due to various factors, increasing the risk of failures and accidents.

Understanding Pipeline Degradation:

Pipeline degradation refers to the gradual deterioration of its structural integrity over time. This degradation can occur due to several reasons, including corrosion, fatigue, stress, and external factors such as soil movements. It is vital to assess the extent of degradation to identify risks and prevent failures.



Degradation Assessment and Failure Prevention of Pipeline Systems (Lecture Notes in Civil Engineering Book 102)

by Neil T. Anderson (1st ed. 2021 Edition, Kindle Edition)

★★★★☆ 4.3 out of 5

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File size : 46453 KB
Text-to-Speech : Enabled
Enhanced typesetting : Enabled
Word Wise : Enabled
Print length : 434 pages
Screen Reader : Supported



Corrosion:

One of the primary causes of pipeline degradation is corrosion. When pipelines come into contact with corrosive substances or environments, the metal surface begins to corrode, leading to thinning and weakening of the pipe walls. Corrosion can be caused by chemical reactions, moisture, and the presence of certain microorganisms.

Preventing Corrosion:

To prevent corrosion, protective coatings and cathodic protection systems are commonly used. Regular inspections, maintenance, and the use of corrosion inhibitors also play a crucial role in preventing corrosion-related failures.

Stress and Fatigue:

Stress and fatigue can also contribute to the degradation of pipeline systems. Stress can accumulate due to factors such as high pressure, temperature changes, or external forces. Fatigue, on the other hand, occurs when pipelines undergo repeated loading and unloading cycles, causing cracks and fractures over time.

Managing Stress and Fatigue:

To manage stress and fatigue, engineers conduct thorough stress analysis during the design phase to ensure pipelines can withstand anticipated loads. Regular inspections and maintenance are essential to identify stress concentrations and address potential failure points.

Failure Prevention Techniques:

Effective failure prevention techniques are critical to maintaining the integrity and safety of pipeline systems.

Inspection and Monitoring:

Regular inspection and monitoring of pipelines are crucial to identify signs of degradation and potential failure points. Various techniques, such as inline inspection using smart tools and sensors, can be employed to assess corrosion, stress, and other forms of degradation.

Maintenance and Repair:

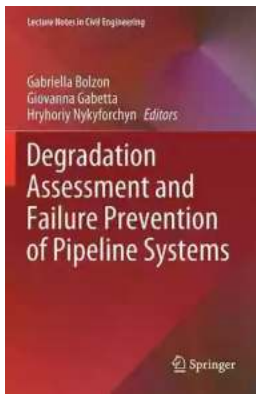
Prompt maintenance and repair of pipelines are essential to prevent catastrophic failures. Repair techniques may include the use of composite materials, weld overlay, or pipeline replacement, depending on the extent of degradation.

Integrity Management Programs:

Integrity management programs are comprehensive strategies aimed at preventing failure and ensuring the long-term integrity of pipeline systems. These programs involve risk assessment, monitoring, maintenance, and continuous improvement to mitigate potential hazards and improve system reliability.

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Degradation assessment and failure prevention are vital aspects of maintaining the integrity and safety of pipeline systems. Understanding the causes of degradation, implementing preventive measures, and conducting regular inspections are key to minimizing the risk of failures and accidents. With proper management and a proactive approach, pipeline systems can continue to serve as efficient and reliable transportation channels for various substances.



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This book presents the results of the research project G5055 'Development of novel methods for the prevention of pipeline failures with security implications,' carried out in the framework of the NATO Science for Peace and Security program, and explores the lifecycle assessment of gas infrastructures. Throughout their service lives, pipelines transporting hydrocarbons are exposed to demanding working conditions and aggressive media. In long-term service, material aging increases the risk of damage and failure, which can be accompanied by significant economic losses and severe environmental consequences. This book presents a selection of complementary contributions written by experts operating in the wider fields of pipeline integrity; taken together, they offer a comprehensive portrait of the latest developments in this technological area.



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