BURIED PIPE ABSTRACTS
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Evaluation of Torsional Guided Waves for Inspection of Service Water Piping

Product ID: 1000115
Date Published: 12/18/2000
Public Domain: No
Sector Name: Nuclear
Document Type: Technology Review
Cost: $250 (US dollars)

Abstract

Long-range guided wave inspection techniques are useful for obtaining a comprehensive view of the condition of piping systems quickly and economically, including areas which are difficult to access, by launching and detecting waves from a remote accessible location. Piping systems in electric power plants, particularly those for the service water, come in various configurations; for example, aboveground or buried, accessible or inaccessible, and bare, coated, or lined. One way to examine these pipes from an accessible location is to launch ultrasonic guided waves. Although guided wave technology has been available for some time, its application to service water piping systems has been limited because of the rapid attenuation of the longitudinal wave mode (L) currently used when surveying pipes that are water-filled and coated. Recent technology developments have made it possible to launch waves of torsional (T) mode that appear to be better suited for service water piping applications because they are not affected by the presence of water.

To evaluate the effectiveness of this new technology, its performance relative to the longitudinal mode was investigated experimentally in the laboratory on bare and bitumen-coated, 6-5/8-inch-OD, schedule 40 (0.28-inch-wall) pipe samples. The waves were launched using the magnetostrictive sensor (MsS) guided wave technology developed at Southwest Research Institute. The investigation found that the new T-waves exhibit better performance when surveying both bare and bitumen-coated pipes that are water filled. For these pipes the use of low-frequency waves (10 kHz or less) to overcome the wave attenuation caused by the coating is required. T-waves were found to be superior to L-waves because of (a) the lack of dispersion and associated flexibility in choosing operating frequency and (b) the absence of water effects on the T-wave. For long-range inspection of bare pipes that are empty, both L- and T-waves are equally suitable. The results also indicated that long-range global inspection of pipes, including bitumen-coated pipes, is viable using the guided waves. For routine field implementation and commercialization, further development and field evaluation of the long-range guided wave piping inspection techniques are recommended.

Cathodic Protection System Application and Maintenance Guide

Product ID: 1011905
Date Published: 12/23/2005
Public Domain: Yes
Sector Name: Nuclear
Document Type: Technical Report

Abstract

Typically, cathodic protection system equipment includes rectifiers, anodes, anode junction boxes, reference cells (electrodes), and test stations. The scope of this guide includes addressing the maintenance and testing of the system, its components, and providing appropriate recommendations. These recommendations will provide the basis for a suitable preventive (PM) and predictive (PdM) maintenance program.

Condition Assessment of Large Diameter Buried Piping: Phase 1 – Feasibility

Product ID: 1008186
Date Published: 11/23/2004
Public Domain: Yes
Sector Name: Nuclear
Document Type: Technical Report

Abstract

This report describes a technology for examination of large-diameter buried piping in nuclear power plants. The project assessed the feasibility of performing this examination by designing a proof-of-concept prototype based on near- and remote-field eddy current techniques and evaluating the effectiveness for detecting various corrosion scenarios in a full-scale mockup.

Condition Assessment of Large Diameter Buried Piping, Phase 2: Vehicle Design and Construction

Product ID: 1011829
Date Published: 12/8/2005
Public Domain: Yes
Sector Name: Nuclear
Document Type: Technical Report

Abstract

This report describes a technology for the condition assessment of large-diameter buried piping in nuclear power plants. The project describes the design and construction of a field-deployable vehicle that delivers either remote-field eddy current or low-frequency electromagnetic techniques for detecting various corrosion scenarios under actual power plant conditions.

Condition Assessment of Large Diameter Buried Piping Phase 3 - Field Trial

Product ID: 1013468
Date Published: 12/20/2006
Public Domain: Yes

Sector Name: Nuclear
Document Type: Technical Report

Abstract

This report presents a technology developed for the examination of large-diameter buried piping in nuclear power plants. The project describes the field trial of a field-deployable vehicle that delivers either remote-field eddy current techniques (RFET) or low-frequency electromagnetic techniques (LFET) for detecting various corrosion scenarios found in buried plant piping.

Examination of Large Diameter Buried Piping for Small Pit Detection and Preferential Weld Corrosion Attack

Product ID: 1015056
Date Published: 12/21/2007
Public Domain: No

Sector Name: Nuclear
Document Type: Technical Report
Cost: $25,000 (US dollars)

Abstract

This report presents the technology developed for the examination of large-diameter buried piping in nuclear power plants. The project developed new sensors for the detection of piping and preferential weld corrosion damage with improved resolution.

Recommendations for an Effective Program to Control the Degradation of Buried Pipe

Product ID: 1016456
Date Published: 12/8/2008
Public Domain: Yes

Sector Name: Nuclear
Document Type: Technical Report

Abstract

In May 2007, EPRI conducted a Nuclear Power Plants Piping Integrity Workshop in which the integrity of buried pipes was identified as one of the top priorities. In October 2007, EPRI conducted a follow-up Workshop on Buried Pipe attended by more than 40 representatives from utilities and EPRI. At the conclusion of the October 2007 meeting, the utility attendees unanimously recommended that EPRI sponsor the development of a recommendations document for buried pipe to help plant engineers prevent and mitigate degradation and leaks in buried pipes. This report has been prepared to address that need.

Nondestructive Evaluation: Further Developments of Guided Wave Examination Application

Product ID: 1016675
Date Published: 12/22/2008
Public Domain: No

Sector Name: Nuclear
Document Type: Technical Update
Cost: $15,000 (US dollars)

Abstract

Guided wave examination is a relatively new nondestructive examination (NDE) technology that has some significant advantages over more traditional NDE technology. Guided waves can travel significant distances within components such as piping, tubing, plate, cable, or rod. The technology can be used to remotely examine relatively large inspection volumes quickly. Despite these benefits, guided wave examination has not been widely applied in the nuclear industry due in part to the complexity of applying the technology and interpreting the results. However, recent industry inspection needs such as examination of buried pipe cannot be met with traditional NDE technology.

Catawba Field Trial of EPRI's Large-Diameter Buried Pipe Instrumented Vehicle

Product ID: 1016676
Date Published: 12/22/2008
Public Domain: No

Sector Name: Nuclear
Document Type: Technical Report
Cost: $25,000 (US dollars)

Abstract

This report presents the evaluation results of the Electric Power Research Institute's (EPRI's) instrumented vehicle for the examination of large-diameter buried piping. The trial demonstrated the performance of new sensors for the detection of pipe wall corrosion and preferential weld corrosion damage.

Fatigue Testing of High-Density Polyethylene Pipe and Pipe Components Fabricated from PE4710 - 2008 Update

Product ID: 1016719
Date Published: 12/16/2008
Public Domain: Yes
Sector Name: Nuclear
Document Type: Technical Report

Abstract

For corroded piping in low-temperature systems, such as service water systems in nuclear power plants, replacement of carbon steel pipe with high-density polyethylene (HDPE) pipe is a cost-effective solution. The results documented in this report are intended to support development of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Case N-755. This case supports use of HDPE pipe in buried Section III, Division 1, safety-related piping applications. This document updates EPRI report 1015062 to provide fatigue capacities, ASME stress intensification factors (SIFs), and flexibility factors of selective fittings for use in piping design.

Tensile Testing of Cell Classification 445474C High Density Polyethylene Pipe Material

Product ID: 1018351
Date Published: 12/12/2008
Public Domain: Yes
Sector Name: Nuclear
Document Type: Technical Report

Abstract

Results in this report support development of American Society of Mechanical Engineers (ASME) Code Case N-755 for use of high-density polyethylene (HDPE) in buried and above-ground ASME Boiler and Pressure Vessel Code, Section III, Division 1 safety-related piping applications by determining material and engineering properties needed for pipe design. These include full-range stress-strain data, fatigue data, stress intensification factors, and flexibility factors for selected components to be used by lead plants. This report presents results of standard tensile testing on cell composition 445474C HDPE material. Testing methodology is similar to the methodology used in previous testing of cell classification 345464C HDPE material, covered in EPRI Report 1013479. This report is freestanding and, therefore, the methodology and supporting theory detailed in Report 1013479 is restated.

Plant Support Engineering: Buried Pipe End-of-Expected-Life Considerations and the Need for Planning

Product ID: 1016687
Date Published: 12/21/2008
Public Domain: No
Sector Name: Nuclear
Document Type: Technical Report
Cost: $25,000 (US dollars)

Abstract

The purpose of this report is to alert plant managers and component/system engineers of the point in life of buried piping systems when long-term planning or contingency planning is desirable to preclude end-of-life failure or to make its impact manageable.

This report defines the expected life of buried steel pipe, and specifies actions that can be taken to identify the approach of end-of-life.

A comprehensive technical treatment of the integrity of buried pipe in nuclear power plants is provided in Recommendations for an Effective Program to Control degradation of Buried Pipe. EPRI, Palo Alto, CA: 2008. 1016456 [1].

BPWORKS Application Version 1.0 A

Product ID: 1019178
Date Published: 4/23/2009
No Price Available

Sector Name: Nuclear
Document Type: Software

Abstract

The EPRI BPWORKS™ Version 1.0a software application performs risk ranking to help plant owners prioritize the inspections of buried piping systems.

An Assessment of Industry Needs for Control of Degradation in Buried Pipe

Product ID: 1016276
Date Published: 3/11/2008
Public Domain: No

Sector Name: Nuclear
Document Type: Technical Update
Cost: $15,000 (US dollars)

Abstract

This report makes recommendations for improving the safety and reliability of buried pipe. Since most buried pipe is constructed of carbon steel, it is the report's main focus. Other less commonly used materials, including reinforced concrete, cast iron, copper nickel, aluminum, and fiber-reinforced plastics, are discussed to a lesser extent. The report's recommendations will be presented to appropriate organizations for funding consideration in 2008 and beyond. Some recommendations apply to utilities; in addition to this report, these recommendations will be provided to members through presentations at related meetings and user groups.