Internal Corrosion Control Of Water Supply Systems Code Of Practice

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BLEVINS CIERRA

Handbook of Environmental Degradation of Materials IWA Publishing
New environmental water quality directives and increasing demands on pipe performance have focused attention on design criteria and selection of pipe materials for drinking water distribution systems. Water quality changes during distribution and the different pipe materials (and their degree of corrosion) are linked. Other factors in the selection of materials such as physical strength, pipe construction, laying technology, joint methodology and the external environment of the pipe must also be considered. These proceedings comprise 14 papers selected from the 3rd international seminar that aimed to bring a holistic perspective to the issue: amongst the topics covered are internal corrosion, microbiological activity, water treatment and corrosion control, pipe material selection case studies, and external corrosion and structural design. The seminar provided a very successful forum for water supply professionals, corrosion scientists, pipe designers and manufacturers and engineers. The state of the art contributions selected for these proceedings set out current experience and strategies for pipe material selection from a holistic viewpoint.
Internal Corrosion Control in Water Distribution Systems American Water Works Association
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Corrosion and Materials in Hydrocarbon Production American Water Works Association
Protecting and maintaining water distributions systems is crucial to ensuring high quality drinking water. Distribution systems -- consisting of pipes, pumps, valves, storage tanks, reservoirs, meters, fittings, and other hydraulic appurtenances -- carry drinking water from a centralized treatment plant or well supplies to consumersâ€™ taps. Spanning almost 1 million miles in the United States, distribution systems represent the vast majority of physical infrastructure for water supplies, and thus constitute the primary management challenge from both an operational and public health standpoint. Recent data on waterborne disease outbreaks suggest that distribution systems remain a source of contamination that has yet to be fully addressed. This report evaluates approaches for risk characterization and recent data, and it identifies a variety of strategies that could be considered to reduce the risks posed by water-quality deteriorating events in distribution systems. Particular attention is given to backflow events via cross connections, the potential for contamination of the distribution system during construction and repair activities, maintenance of storage facilities, and the role of premise plumbing in public health risk. The report also identifies advances in detection, monitoring and modeling, analytical methods, and research and development opportunities that will enable the water supply industry to further reduce risks associated with drinking water distribution systems.
Pipelines, Subsea Equipment, and Structures American Water Works Association
The Handbook of Environmental Degradation of Materials, Third Edition, explains how to measure, analyze and control environmental degradation for a wide range of industrial materials, including metals, polymers, ceramics, concrete, wood and textiles exposed to environmental factors, such as weather, seawater, and fire. This updated edition divides the material into four new sections, Analysis and Testing, Types of Degradation, Protective Measures and Surface Engineering, then concluding with Case Studies. New chapters include topics on Hydrogen Permeation and Hydrogen Induced Cracking, Weathering of Plastics, the Environmental Degradation of Ceramics and Advanced Materials, Antimicrobial Layers, Coatings, and the Corrosion of Pipes in Drinking Water Systems. Expert contributors to this book provide a wealth of insider knowledge and engineering expertise that complements their explanations and advice. Case Studies from areas such as pipelines, tankers, packaging and chemical processing equipment ensure that the reader understands the practical measures that can be put in place to save money, lives and the environment. Introduces the reader to the effects of environmental degradation on a wide range of materials, including metals, plastics, concrete, wood and textiles Describes the kind of degradation that effects each

material and how best to protect it Includes case studies that show how organizations, from small consulting firms, to corporate giants design and manufacture products that are more resistant to environmental effects

Microbial Quality of Water Supply in Distribution Systems National Academies Press

gives distribution operators and engineers all the information needed in the field for protecting water mains from both exterior and interior corrosion. This handy pocket guide describes the soil types, environmental conditions, and electrochemical processes that cause external corrosion of metal pipes, as well as how to protect pipe with coatings, polyethylene wraps, electric current (cathodic protection), and good installation practices. The guide also describes the causes of internal pipe corrosion and protective measures, such as linings, water treatment chemistry, and good installation practices.

M58 Internal Corrosion Control in Water Distribution SystemsM58

A variable game changer for those companies operating in hostile, corrosive marine environments, Corrosion Control for Offshore Structures provides critical corrosion control tips and techniques that will prolong structural life while saving millions in cost. In this book, Ramesh Singh explains the ABCs of prolonging structural life of platforms and pipelines while reducing cost and decreasing the risk of failure. Corrosion Control for Offshore Structures places major emphasis on the popular use of cathodic protection (CP) combined with high efficiency coating to prevent subsea corrosion. This reference begins with the fundamental science of corrosion and structures and then moves on to cover more advanced topics such as cathodic protection, coating as corrosion prevention using mill applied coatings, field applications, and the advantages and limitations of some common coating systems. In addition, the author provides expert insight on a number of NACE and DNV standards and recommended practices as well as ISO and Standard and Test Methods. Packed with tables, charts and case studies, Corrosion Control for Offshore Structures is a valuable guide to offshore corrosion control both in terms of its theory and application. Prolong the structural life of your offshore platforms and pipelines Understand critical topics such as cathodic protection and coating as corrosion prevention with mill applied coatings Gain expert insight on a number of NACE and DNV standards and recommended practices as well as ISO and Standard Test Methods.

Trends in Oil and Gas Corrosion Research and Technologies John Wiley & Sons

This comprehensive handbook covers all aspects of cathodic protection in terms of both practice and theory.

Pocket Field Guide National Academies Press

The effect of corrosion in the oil industry leads to the failure of parts. This failure results in shutting down the plant to clean the facility. The annual cost of corrosion to the oil and gas industry in the United States alone is estimated at $27 billion (According to NACE International)—leading some to estimate the global annual cost to the oil and gas industry as exceeding $60 billion. In addition, corrosion commonly causes serious environmental problems, such as spills and releases. An essential resource for all those who are involved in the corrosion management of oil and gas infrastructure, Corrosion Control in the Oil and Gas Industry provides engineers and designers with the tools and methods to design and implement comprehensive corrosion-management programs for oil and gas infrastructures. The book addresses all segments of the industry, including production, transmission, storage, refining and distribution. Selects cost-effective methods to control corrosion Quantitatively measures and estimates corrosion rates Treats oil and gas infrastructures as systems in order to avoid the impacts that changes to one segment if a corrosion management program may have on others Provides a gateway to more than 1,000 industry best practices and international standards

Corrosion Protection for the Oil and Gas Industry CRC Press

Comprehensively covers the engineering aspects of corrosion and materials in hydrocarbon production This book captures the current understanding of corrosion processes in upstream operations and provides a brief overview of parameters and measures needed for optimum design of facilities. It focuses on internal corrosion occurring in hydrocarbon production environments and the key issues affecting its occurrence, including: the types and morphology of corrosion damage; principal metallic materials deployed; and mitigating measures to optimise its occurrence. The book also highlights important areas of progress and challenges, and looks toward the future of research and development to enable improved and economical design of facilities for oil and a gas production. Written for both those familiar and unfamiliar with the subject—and by two authors with more than 60 years combined industry experience—this book covers everything from Corrosion Resistant Alloys (CRAs) to internal metal loss corrosion threats, corrosion in injection systems to microbiologically influenced corrosion, corrosion risk analysis to corrosion and integrity management, and more, notably: Comprehensively covers the engineering aspects of corrosion and materials in hydrocarbon production Written by two, renowned experts in the field Offers practical guide to those unfamiliar with the subject whilst providing a focused roadmap to addressing the topics in a precise and methodical manner Covers all aspects of corrosion threat and remedial and mitigation measures in upstream hydrocarbon production applicable to sub-surface, surface, and transportation facilities Outlines technology challenges that need further research as a pre-cursor to moving the industry forward. Operational and Engineering Aspects of Corrosion and Materials in Hydrocarbon Production is an excellent guide for both practicing materials and corrosion engineers working in hydrocarbons production as well as those entering the area who may not be fully familiar with the subject.

Internal Corrosion Control of Water Supply Systems Gulf Professional Publishing

Underground pipelines transporting liquid petroleum products and natural gas are critical components of civil infrastructure, making corrosion prevention an essential part of asset-protection strategy. Underground Pipeline Corrosion provides a basic understanding of the problems associated with corrosion detection and mitigation, and of the state of the art in corrosion prevention. The topics covered in part one include: basic principles for corrosion in underground pipelines, AC-induced corrosion of underground pipelines, significance of corrosion in onshore oil and gas pipelines, numerical simulations for cathodic protection of pipelines, and use of corrosion inhibitors in managing corrosion in underground pipelines. The methods described in part two for detecting corrosion in underground pipelines include: magnetic flux leakage, close interval potential surveys (CIS/CIPS), Pearson surveys, in-line inspection, and use of both electrochemical and optical probes. While the emphasis is on pipelines transporting fossil fuels, the concepts apply as well to metallic pipes for delivery of water and other liquids. Underground Pipeline Corrosion is a comprehensive resource for corrosion, materials, chemical, petroleum, and civil engineers constructing or managing both onshore and offshore pipeline assets; professionals in steel and coating companies; and academic researchers and professors with an interest in corrosion and pipeline engineering. Reviews the causes and considers the

detection and prevention of corrosion to underground pipes Addresses a lack of current, readily available information on the subject Case studies demonstrate how corrosion is managed in the underground pipeline industry

Internal Corrosion Control of Water Supply Systems CRC Press

The research reported herein describes the study activities performed by University of Central Florida (UCF) on behalf of the Town of Jupiter Water Utilities (Town). The Town recently changed its water treatment operations from a combination of reverse osmosis (RO), lime softening (LS) and anion-exchange (IX) to a combination of RO, IX and nanofiltration (NF). Although this treatment change provided enhanced water to the surrounding community in terms of better contaminant removal and reduced DBP formation potential, integration of the NF process altered finished water quality parameters including pH, alkalinity and hardness. There was concern that these changes could result in secondary impacts related to accelerated corrosion of distribution system components and subsequent regulatory compliance. In addition, replacement of the LS process altered the in-plant blending operations by creating an unstable intermediate blend composed of RO and IX waters. There were concerns that this intermediate blend was affecting the integrity of in-plant hydraulic conveyance components. UCF developed a corrosion monitoring study to assess the potential impacts related to internal corrosion, water quality and regulatory compliance after integrating NF into the existing water supply. The intended purpose was to further highlight the complexities of corrosion, describe a unique approach to corrosion monitoring as well as offer various recommendations for corrosion control in a system that relies on a blended water supply. Research was conducted in three phases to address the in-plant and distribution system corrosion issues separately and identify appropriate corrosion control treatment alternatives. The three test phases included: a baseline conditions assessment to compare corrosion of the intermediate RO-IX blend with the finished water blend (RO-IX-NF); an in-plant corrosion control evaluation; and a distribution system corrosion control evaluation. A test apparatus was constructed and operated at the Town's facilities to monitor corrosion activity of mild steel, copper and lead solder metal components. The test apparatus consisted of looped PVC pipe segments housed with electrochemical probes and metal coupons to monitor corrosion rates of the metallic components. Electrochemical probes containing metal electrodes were used to obtain instantaneous corrosion rates by means of the Linear Polarization Resistance (LPR) technique while the metal coupons were gravimetrically evaluated for weight loss. The electrochemical probes permitted daily monitoring of each metal's corrosion rates while metal coupons were analyzed at the conclusion of testing and used for comparison. Different test waters flowed through the corrosion rack according to each test phase and relative corrosion rates were compared to evaluate corrosion control techniques. Study findings indicated that the intermediate blend was more corrosive, in general, then the final blend; however, research also indicated that the final blend of water was increasing lead and copper concentrations within the distribution system. An orthophosphate corrosion inhibitor was evaluated for in-plant corrosion control. The inhibitor's performance was assessed by comparing mild steel corrosion rates with and without the chemical. In addition, secondary impacts related to introduction of the chemical were evaluated by pre-corroding the metallic components prior to the introduction of the inhibitor. Results indicated that the inhibitor marginally decreased corrosion rates and increased the turbidity of the water supply. Based on these observations, it was concluded that the inhibitor was not a viable solution for in-plant corrosion control. To resolve in-plant corrosion issues, recommendations were made for modification of in-plant blending operations to eliminate the corrosive intermediate blend from the process allowing the RO, IX and NF treated waters to be blended in a common location. The effectiveness of a poly/ortho blended phosphate chemical inhibitor was evaluated for reducing lead and copper corrosion to resolve distribution corrosion issues. A 50/50 poly/ortho blend was selected because of its analogous use in similar municipal water facilities. Metallic corrosion rates, particularly lead and copper, were compared with and without the inhibitor to assess the performance of the chemical. Like the previous test phase, the metallic components were pre-corroded prior to the chemical's introduction to determine if secondary impacts could result from its presence. Results indicated that lead and copper corrosion rates were lower in the presence of the inhibitor, and secondary impacts related to increased turbidity were not observed for this chemical. Based on these results, it was recommended that a poly/ortho blended phosphate be used to decrease lead and copper corrosion within the Town's distribution system.

Review of the Bureau of Reclamation's Corrosion Prevention Standards for Ductile Iron Pipe Wiley-ASME Press Series

Ductile iron pipe (DIP) was introduced about 50 years ago as a more economical and better-performing product for water transmission and distribution. As with iron or steel pipes, DIP is subject to corrosion, the rate of which depends on the environment in which the pipe is placed. Corrosion mitigation protocols are employed to slow the corrosion process to an acceptable rate for the application. When to use corrosion mitigation systems, and which system, depends on the corrosivity of the soils in which the pipeline is buried. The Bureau of Reclamation's specification for DIP in highly corrosive soil has been contested by some as an overly stringent requirement, necessitating the pipe to be modified from its as-manufactured state and thereby adding unnecessary cost to a pipeline system. This book evaluates the specifications in question and presents findings and recommendations. Specifically, the authoring committee answers the following questions: Does polyethylene encasement with cathodic protection work on ductile iron pipe installed in highly corrosive soils? Will polyethylene encasement and cathodic protection reliably provide a minimum service life of 50 years? What possible alternative corrosion mitigation methods for DIP would provide a service life of 50 years?

Drinking Water Distribution Systems Elsevier

In the Army's 12,000 miles of water lines, internal corrosion slowly destroys a large investment and creates significant problems for Army water treatment plant operators, who try to maintain the water quality at acceptable levels. Corrosion can be slowed using corrosion-inhibiting chemicals, but it is difficult to measure the extent of corrosion and the effectiveness of inhibitors without excavating actual pipes. This study surveyed corrosion-inhibiting water quality control chemicals and methods for monitoring corrosion. With this knowledge, a pine loop system was developed and installed at Fort Bragg, NC and Fort Monroe, VA. It was shown to be effective in gathering data on corrosion rates. After a standard procedure has been established, this loop will allow a water treatment plant operator to monitor with ease the effectiveness of corrosion-inhibiting treatments. Keywords: Corrosion inhibition; Water pipes; Pipe loop system. (KT).

Optimizing Corrosion Control in Water Distribution Systems John Wiley & Sons

This comprehensive reference for engineers, consultants, and public administration officials is recognized as the most complete, practical guide to water pipe corrosion, its health effects, and

how to control it.
Development of the Pipe Loop System for Determining Effectiveness of Corrosion Control Chemicals in Potable Water Systems IWA Publishing
Internal Corrosion Control in Water Distribution SystemsM58American Water Works Association
Internal Corrosion of Water Distribution Systems, 2 Edition American Water Works Association
This AWWA manual of practice provides information on the factors that influence pipe corrosion, assessing corrosion-related impacts, water quality and implementation, and maintenance of an effective corrosion control program.
Metals and Related Substances in Drinking Water Set IWA Publishing
According to NACE (National Association of Corrosion Engineers), the total annual cost of corrosion in petroleum refining takes up $3.7 billion in the US alone. Corrosion control is always a challenge for the downstream industry, but as the quality of feedstock is declining due to refineries accepting more of the heavy and shale gas and oil resources that are more readily available today, refinery managers, petroleum and natural gas engineers are unprepared for the new set of corrosion problems that are showing up in their equipment and processing units. Oil and Gas Corrosion Prevention: From Surface Facilities to Refineries quickly gets the engineer and manager up to speed on the latest types of corrosion common for these lower grade crude oils and gases as well as the best prevention methods for all of the major sections of the refinery, especially desalting and sulfur recovery units, which are the most common problem areas for unconventional feedstocks. Also covering the unique midstream sections, or point of entry to the refinery, as well as the major critical refinery equipment, Oil and Gas Corrosion Prevention: From Surface Facilities to Refineries offers the perfect quick cross-reference for the oil and gas community. Gets engineers and managers up to speed on the latest types of corrosion common for lower grade crude oils and gases Provides the best prevention methods for all of the major sections of the refinery, especially desalting and sulfur recovery units Covers additional topics such as unique midstream sections, or point of entry to the refinery, as well as major critical refinery equipment
Corrosion Control for Buried Water Mains Elsevier
Comprehensively covers the engineering aspects of corrosion and materials in hydrocarbon production This book captures the current understanding of corrosion processes in upstream operations and provides a brief overview of parameters and measures needed for optimum design of facilities. It focuses on internal corrosion occurring in hydrocarbon production environments and the key issues affecting its occurrence, including: the types and morphology of corrosion damage; principal metallic materials deployed; and mitigating measures to optimise its occurrence. The book also highlights important areas of progress and challenges, and looks toward the future of research and development to enable improved and economical design of facilities for oil and a gas production. Written for both those familiar and unfamiliar with the subject—and by two authors with more than 60 years combined industry experience—this book covers everything from Corrosion Resistant Alloys (CRAs) to internal metal loss corrosion threats, corrosion in injection systems to microbiologically influenced corrosion, corrosion risk analysis to corrosion and integrity management, and more, notably: Comprehensively covers the engineering aspects of corrosion and materials in hydrocarbon production Written by two, renowned experts in the field Offers practical guide to those unfamiliar with the subject whilst providing a focused roadmap to addressing the topics in a precise and methodical manner Covers all aspects of corrosion threat and remedial and mitigation measures in upstream hydrocarbon production applicable to sub-surface, surface, and transportation facilities Outlines technology challenges that need further research as a pre-cursor to moving the industry forward. Operational and Engineering Aspects of Corrosion and Materials in Hydrocarbon Production is an excellent guide for both practicing materials and corrosion engineers working in hydrocarbons production as well as those entering the area who may not be fully familiar with the subject.
Corrosion Inhibitors in the Oil and Gas Industry National Academies Press
A guide to preventing and monitoring corrosion within municipal water systems. Includes case histories and reviews of monitoring, detection, prevention, and control techniques.
M58--internal Corrosion Control in Water Distribution Systems Gulf Professional Publishing
Trends in Oil and Gas Corrosion Research and Technologies: Production and Transmission delivers the most up-to-date and highly multidisciplinary reference available to identify emerging developments, fundamental mechanisms and the technologies necessary in one unified source. Starting with a brief explanation on corrosion management that also addresses today’s most challenging issues for oil and gas production and transmission operations, the book dives into the latest advances in microbiology-influenced corrosion and other corrosion threats, such as stress corrosion cracking and hydrogen damage just to name a few. In addition, it covers testing and monitoring techniques, such as molecular microbiology and online monitoring for surface and subsurface facilities, mitigation tools, including coatings, nano-packaged biocides, modeling and prediction, cathodic protection and new steels and non-metallics. Rounding out with an extensive glossary and list of abbreviations, the book equips upstream and midstream corrosion professionals in the oil and gas industry with the most advanced collection of topics and solutions to responsibly help solve today’s oil and gas corrosion challenges. Covers the latest in corrosion mitigation techniques, such as corrosion inhibitors, biocides, non-metallics, coatings, and modeling and prediction Solves knowledge gaps with the most current technology and discoveries on specific corrosion mechanisms, highlighting where future research and industry efforts should be concentrated Achieves practical and balanced understanding with a full spectrum of subjects presented from multiple academic and world-renowned contributors in the industry