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Aging Equipment: Is My Closure Still Safe?

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Abstract

Pipeline and Oilfield equipment are expected to perform safely, continuously and reliability for the life of the assets. The equipment is designed to be robust when used in harsh environments and have the ability to be maintained to extend the safe operation of the equipment. Maintenance schedules, seal and gasket materials, and operational and maintenance procedures can be updated as needed to be in compliance with changing operational needs or regulatory requirements. More difficult or not possible to change is the design and the material of the in-service equipment. Regulations and design codes are continuously evolving, driven by the experiences of the industry. These design code revisions represent bo th proactive measures and reactive changes to improve the experiences within the industry. This paper brings into focus the opportunity to evaluate operational equipment, as example a pipeline closure, that was designed in accordance with former codes and standards and may or may not be incompliance with the safe operations and designs as measured against today's current codes and standards. We will also evaluate the impact of using non-OEM components to maintain oilfield equipment. ASME Codes and Standards, industry regulations, and corporate management plans continue to evolve and are applied to new purchase equipment. Bringing awareness to existing, older equipment, identifying safety risks that may be present, and next steps for mitigation are within the natural life cycle of our oil and gas equipment.

The aging: of nuclear power plants is one of the most important issues facing the nuclear industry worldwide. Aging encompasses all forms of degradation to nuclear power plant components, systems, and structures that result from exposure to environmental conditions or from operational stresses. Both the degradation from aging and actions taken to address the aging, such as increased maintenance and testing, can significantly impact human: performance in the plant. Research: into the causes and effects of aging as obtained through the assessment of operating experience and testing have raised questions regarding the adequacy of existing industry standards for addressing the concerns raised by this research. This paper discusses these issues, with particular emphasis in the area of equipment qualification and human performance.

The U.S. NRCs hardware oriented engineering research program for plant aging and degradation monitoring has evaluated the susceptibility to aging of systems^ structures, and components (SSCs) important to the safe operation of nuclear power plants (NPPs). The principal goals of the program, known as the Nuclear Plant Aging Research Program (NPAR),. are to understand the effects of age-related degradation in NPPs and to manage them effectively. Results have been achieved in the area, of electrical, control, and instrumentation (ECI) components encompassed by EEEE standards. Through the NRCs NPAR Program, degradation mechanisms and aging management techniques have been or are being evaluated for bistabies, switches, transmitters, inverters, I&C modules, cable penetrations, and isolation devices. In addition, the ECI components associated with systems such as the Emergency Diesel Generators, Control Rod Drive Systems, and Emergency Core Cooling Systems have been addressed for their aging significance. An evaluation of the operating experience of these components and systems, coupled with a determination of the materials of construction, operating and environmental stresses, and failure modes, causes, and effects have provided the NRC with the technical basis required to assure the continued safe operation of present reactors through the license renewal period. An understanding of the aging process has been achieved in the NPAR Program. Aging is the cumulative degradation to aa SSC from operational and environmental mechanisms such as cycling, transients, vibration, testing, temperature, and humidity^ These types of stresses have resulted in the degradation of certain subcomponents such as electrolytic capacitors, fuses, or power semiconductors which, can effect the operation, of various ECI equipment. Similarly, aging degradation associated with the mechanical properties of

elastomers, connectors, and fuse holders have also resulted in ECI failures. To a large degree, mitigation of this degradation is accomplished through a comprehensive maintenance program which incorporates predictive and condition monitoring techniques. Some questions remain, however, particularly related ta the industry's need to factor agingrelated data into equipment qualification programs and staffing practices. The latter are associated with the additional maintenance and testing often required to manage aging.

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