



Presenting Author:

Bill Needham

Ser: 1

Organization: NSWCCD

Paper Title: [Corrosion Based Maintenance: Using CBM to Reduce the Cost of Corrosion](#)

Abstract:

The United States Navy operates and maintains over 300 ships in a highly aggressive marine environment. The corrosion of ship structural steel and shipboard components in this environment results in one of the Navy's highest maintenance costs. In 2007, a DoD study of corrosion costs found that the Navy's overall cost of corrosion was over \$6B, about 25 percent of the overall maintenance budgets for ships, aircraft, and (USMC) ground vehicles. Past measures of dealing with the corrosion problem have largely been borne by the operating forces, painting whenever the opportunity arose and replacing rusted components on a routine basis. At the depot level, corrosion related maintenance consists primarily of repairing or replacing corroded structure and system components such as ventilation ducts, and of coating the ship's hull, freeboard and tanks. Most corrosion maintenance is based on visual inspection, which in many cases requires that a component be opened for inspection. The use of sensors to indicate the extent and severity of corrosion would significantly reduce the overall maintenance cost by allowing for a reduction in open and inspect maintenance requirements

This presentation will provide a historical overview of the efforts that have been made in the area of using sensors to promote "corrosion based maintenance" on Navy ships that began in the 1990's with NAVSEA's Engineering for Reduced Maintenance (ERM) Program and extended through the "Paint Teams" of the Capital Investment for Labor (CI Labor) Program. This discussion will include the use of tank corrosion monitors, corrosion detection algorithms and topside corrosion assessment methods. The prognosis for the development of new advanced sensors to deal with some of the most difficult corrosion related maintenance problems including shafting and submarine structures will serve as a concluding challenge for advancements in machinery health monitoring.



Presenting Author: Neville Rieger

Ser: 2

Organization: SimuTech Group

Paper Title: [The Origins of Structural Failure by Fatigue](#)

Abstract:

Structural Failure by fatigue is commonly a twofold process, involving both crack initiation and crack propagation. Initiation typically takes longer to occur than propagation, perhaps ten to one hundred times longer. Initiation may begin from a flaw or an inclusion, or from a scratch or corrosion pit on the surface of the component.

Crack propagation is a well-understood process, involving growth to rupture of cracks greater than threshold size. By comparison, initiation is not as well understood. It is a topic of present research, some of which will be reviewed.

This paper discusses the initiation of cracks from flaws, and the growth of such cracks to threshold size. The effect of the environment on both phases is considered. The state of present methods for quantifying the processes involved as predictive methods for the complete process is discussed. A recently-built facility for corrosion-fatigue research will be mentioned.



Presenting Author: Leonard Bond

Ser: 3

Organization: Pacific Northwest National Laboratory

Paper Title: Opportunities for Monitoring and Prognostics in Nuclear Power Plants

Abstract:

Robust growth in the global nuclear power industry is anticipated as demand for electricity surges and converges with the desire to minimize carbon emissions. There are currently 439 nuclear power plants (NPP) in the commercial global fleet and by some estimates another 222 projects are in various stages of development. For both existing and new plant designs there are increasing needs for the application of advanced online surveillance, diagnostic and prognostic techniques to continuously monitor and assess the health of NPP systems and components. The added effectiveness of such programs has the potential to enable holistic plant management, maintain and enhance safety and minimize exposure to future and unknown risks.

The talk will discuss on-line monitoring in both existing and new plants, including the increased functionality and system condition awareness achievable with digital instrumentation. The current state of the art will be reviewed, including the deployment of systems that monitor reactor noise, acoustic signals and vibration in various forms, leak monitoring, and now increasingly include data needed to enable condition-based maintenance (CBM) for parts such as pumps, motors and valves.

Current developments are causing the community to look beyond locally monitored CBM. Current trends include centralized fleet-based CBM and new small modular reactor designs that are expected to operate with fewer scheduled outages and more limited access to key equipment located inside containment, increase in remote operation and with limited on-site staff. Attention is also moving to systems that use online monitoring to permit longer term operation (LTO) for legacy and new plants, including a prognostic or predictive element that estimates a remaining useful life (RUL). Many, if not all, active components (pumps, valves, motors etc.) can potentially be well managed, routinely diagnosed, analyzed and upgraded as needed using a combination of periodic and online condition based monitoring/condition based maintenance(CBM2). The ability to successfully manage passive systems and structures is seen as the key to LTO, including looking beyond 60 years for operation in the USA.

New approaches will be reviewed, including prognostics for passive structures, which is critical to maintaining safety and availability and to reducing operations and maintenance costs for NPP's. To provide proactive on-line monitoring that includes estimates for RUL there are new opportunities for research, including advanced sensors, better understanding and quantification of stressors and challenges faced in quantification of uncertainty associated with RUL. This paper discusses insights from past experience, the state of the art, and current activities in the move towards providing a on-line monitoring to support new concepts of operation, including LTO for NPP.