

Cable Aging Management and Monitoring Technologies

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Abstract

This presentation would provide an overview of various activities associated with Aging Management of Cables of low-voltage (mainly instrumentation and control) cables in nuclear power plants. AMS has several grants from the U.S. DOE to conduct research and development of in-situ cable testing technologies as part of an overall program that can determine the health and condition of cables to support plant life extension efforts. One completed research project focused on investigating the degradation modes of cables and connectors. Various types of thermally aged and mechanically induced cable faults were evaluated with existing and emerging cable testing technologies to develop the best combination of tests for a comprehensive cable aging management program. These technologies included non-destructive electrical tests such as time and frequency domain reflectometry, impedance measurements, and insulation resistance measurements. An additional project integrated these electrical tests into a cable condition monitoring system (CHAR) that is currently being used in many nuclear power plants to test low voltage cables and end devices. Further development with the FDR method will establish correlations to material degradation of the cable.

These results from electrical tests such as FDR and well established polymer degradation testing with the cable indenter are being compared with the traditional Elongation at Break (EAB) measurements to determine the condition of the cable and to assist in remaining-useful-life estimations. These measurements along with other activities such as plant walkdowns and cable deposits can be used in the overall program for low-voltage (I&C) cable aging management programs. This presentation will present the results to-date for the R&D projects.

Another R&D effort that will be discussed pertains to a Coordinated Research Project (CRP) for the International Atomic Energy Agency (IAEA). This CRP, which began in 2012, brings together a group of experts from around the world to provide the current fleet of reactors and the next generation of nuclear facilities with information and guidelines on how to qualify new cables, monitor the performance of existing cables, and establish a program of cable aging. The second general meeting of the CRP was hosted by AMS on July 8th-12th, 2013 and was attended by over 60 experts from around the world to discuss the initial results from a benchmarking program and all aspects of cable aging management, cable degradation, failure mechanisms, and condition monitoring. The progress to date of the CRP will be covered.