



# CABLE AGING MANAGEMENT

In-Situ Field Testing and Polymer Aging Laboratory

## **IN-SITU FIELD TESTING**

AMS's nondestructive evaluation techniques are used to identify localized cable insulation degradation, assess the severity of the degradation, and evaluate the overall health of the cable.

**AMS' suite of field testing techniques include:**

*Frequency Domain Reflectometry (FDR)*

- Measures insulation aging and hot spot detection

*Indenter Polymer Aging Monitor (IPAM)*

- Monitors and trends cable polymer hardness

*Cable Characterization Testing (CHAR)*

- Troubleshooting, condition monitoring, and trending

## **LABORATORY MATERIALS ANALYSIS**

AMS's laboratory testing techniques allow for an in depth assessment of degraded and failed cables. Evaluation methods are used to determine a root cause analysis and formulate an effective mitigation strategy. A suite of chemical and mechanical tests along with accelerated aging is used to predict cable remaining useful life.

**AMS's suite of forensics analysis techniques includes:**

*Elongation at Break (EAB)*

- Tensile test (Industry standard)

*Thermo-Gravimetric Analysis (TGA)*

- Quantifies thermal degradation, reactive atmosphere effects, decomposition characteristics, and polymer composition

*Differential Scanning Calorimetry (DSC)*

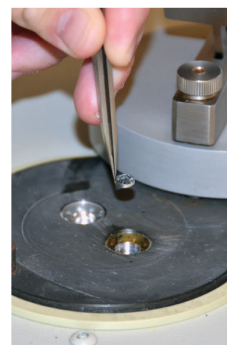
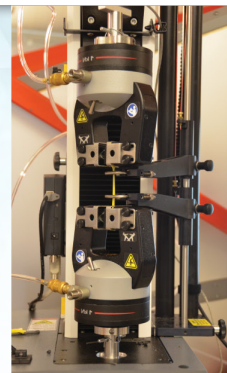
- Quantifies thermal stability, degree of polymer degradation, and presence of contaminants

*Density*

- Used to evaluate bulk changes in the polymer structure caused by degradation

*Fourier Transform Infrared Spectroscopy (FTIR)*

- Used to identify unknown cable types and evaluate changes to the polymer's structure caused by degradation



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10CFR50 Appendix B Program

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## Advantages

- 20 years of expertise testing cables in nuclear power plants including:
  - System Health Monitoring
  - Root Cause Analysis
  - Remaining Useful Life
  - Aging Management
  - Materials Analysis
- Supplement cable troubleshooting, fault finding, and condition monitoring

## Benefits

- Identify degradation in cable circuits that could impact operability
- Identify location of thermal hot spots and trend for premature aging
- Trend cable aging/degradation to supplement maintenance planning
- Test techniques recommended in NRC Reg Guide 1.218 on cable condition monitoring
- In addition to cables, this technology is applicable to other polymers such as gaskets, O-rings, seals, etc.



Cable Condition Monitoring System



AMS Materials Analysis Laboratory



IPAM Cable Indenter

## 10CFR50 Appendix B Program

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