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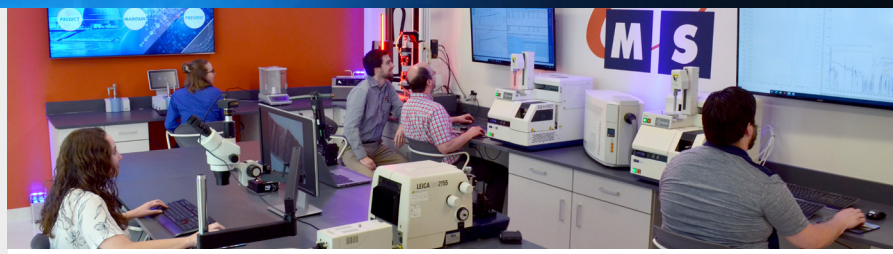
MATERIALS TESTING LABORATORY

Evaluating Polymers, Composites, and Other Materials for Nuclear Power Plants and Other Industries



AMS has a state-of-the-art Materials Testing Laboratory providing services to nuclear power plants and other industrial facilities. Using a suite of visual, thermal, chemical, and mechanical characterization tests and analysis tools, our engineers conduct in-depth evaluation of the chemical composition, molecular structure, mechanical characteristics, and physical properties of a variety of materials. This laboratory is staffed by a group of engineers with B.S. to Ph.D. degrees in materials science, chemical engineering, nuclear engineering, and related disciplines offering the following services:

- Aging assessments of industrial polymers to determine age-related degradation of cables
- Remaining useful life estimation of polymeric components based on their in-service environmental conditions.
- Root cause analysis of failed materials to determine degradation mechanisms (e.g. thermo-oxidative degradation, photolytic degradation, chemical contamination, hydrolysis, corrosion, and fatigue).
- Material identification based on chemical composition, structure, thermal properties, mechanical properties, and measurement of other characteristics.
- Evaluation of thermal stability, oxidative stability, molecular structure, polymer chain structure, chemical composition, and mechanical characteristics of materials to determine if they are suitable for specific industrial applications.
- Determination of effects of UV light and other radiation sources on materials.

AMS's suite of laboratory materials testing technologies listed in the table here are used to inform maintenance activities, develop mitigation strategies, and solve complex problems related to material degradation and failure. Many of these technologies have been used in support of the nuclear industry for cable aging management and evaluating the effect of environmental degradation including thermo-oxidative degradation, nuclear radiation induced degradation, and UV light induced photodegradation on properties of material.

Test Technologies	Test Outcomes
Visual and Optical Microscope Inspections	Identify mechanical defects in materials as well as signs of age-related degradation (e.g. discoloration, cracking, etc.).
Tensile Testing	Assess mechanical properties of materials including tensile strength, yield strength, elasticity, plasticity, toughness, and elongation at break (EAB).
Oxidation Induction Time and Temperature	Determine the thermo-oxidative stability of materials under isothermal and dynamic conditions.
Thermo-Gravimetric Analysis	Evaluate the chemical composition and determine the thermal stability of materials and their additives (e.g. antioxidants, thermal stabilizers, UV screeners, etc.).
Mass Spectroscopy	Perform evolved gas analysis of materials during thermal decomposition to provide an in-depth assessment of their chemical make-up, structure, and additives.
Fourier-Transform Infrared Spectroscopy	Analyze the molecular structure of materials and their additives.
Differential Scanning Calorimetry	Assess the structure of materials (e.g. crystallinity) based on their thermal transition temperatures.
Scanning Electron Microscopy / Electron Dispersive X-ray Spectroscopy	Analyze the microstructure of materials and their elemental composition.
Indenter Modulus	Measure the mechanical hardness of materials.
Density	Analyze the structure of materials based on their physical properties.

10CFR50 Appendix B Program

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