Arrhenius Heat Aging and Service Life Prediction for Nuclear Cables

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Abstract

Nuclear reactors require up to sixty year life expectancy for components. Cables aged to sixty years have to demonstrate their ability to deliver reliable service by passing the stringent Loss of Coolant Accident (LOCA) and Steam Line Break (SLB) tests as well as postulated Design Basis Event (DBE) testing. Arrhenius aging concepts are discussed to predict life. It is important that the Arrhenius aging relationships must be generated for specific cable insulations and jacketing compounds rather than just relying on activation energies only. Examples of various activation energies will be compared resulting in unexpected results if only activation energies were to be considered to predict life. Activation energy values cannot be solely used to compare the performance of different materials even within the same family of polymeric compounds. Experimental test data will be reviewed for 60-year life applications.