

A Study on the Combustion Characteristics of Non Class 1E Cables with Accelerated Deterioration

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A nuclear power plant(NPP) demands in-depth defense systems as they can cause serious accidents related to radioactivity leakage. However, a NPP is complex and large in scale and has a lot of combustible materials, such as complex devices and facilities and large amounts of cables. Therefore, in the event of a fire, fire spread by combustible materials can cause damage to the cables and cause malfunction of the safety system. In addition, the smoke with hazardous combustion products can have negative effects on the evacuation of occupants and manual actions of operators for safe shutdown. A NPP uses class 1E cables for the system connected inside the containment unit, and non-class 1E cables used for the other areas. The sheath and insulation of cables account for the largest number of combustible materials in NPP. In this study, Non-class 1E cables, which is mostly used in NPP, were selected as test specimen.

In this study, combustion characteristics and composition of combustion product gas are investigated with respect to the the lifetime of these cables according to the standard code of KS F ISO 5660-1 and ISO 19702. Accelerated deterioration methods are used to get the test specimen of 10, 20, 30, 40 years old cables. The cone calorimeter experiment according to standard code KS F ISO 5660-1 can analyze combustion characteristics for time series heat release rate(HRR), total heat release(THR), mass lost rate(MLR) and the FTIR experiment according to standard code ISO 19702 can analyze the combustion products for time series using infrared spectroscopy. In this study, nine types of combustion products, including CO, CO₂, NO, NO₂, SO₂, HF, HBr, HCl, HCN, were identified and analyzed.

Test results will be used as a baseline data to secure operators' reliability of manual actions for the safe shutdown and evacuation.

Key Words : Non Class 1E Cable, Cone calorimeter, Combustion Characteristic