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Verification of simplified modelling method for thermal lag analysis

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Safety equipment used in nuclear power plants is required to maintain its function for safety shutdown and containment integrity during severe accident. However, the high temperature environment resulted from hydrogen explosion during severe accident causes the malfunction of safety equipment. Especially, non-metallic parts of equipment installed inside the metal housing, such as cable and torque switch in actuator of motor operated valve, have been reported as vulnerable in high temperature environment. Therefore, it is important for the non-metallic part temperature during severe accident to be estimated for evaluating the survivability. The temperature estimation is generally through thermal lag analysis.

This study is aimed to estimate the temperatures of non-metallic parts inside safety equipment through thermal lag analysis and verify the results of analysis by comparing with the temperature measured by performing the related experiment to thermal lag. Temperatures on inner and outer surface of specimen composed of stainless steel and insulation materials layers were estimated with computational fluid dynamics analysis. Then, for verifying the results of analysis, an experiment using rapid thermal process equipment was performed with mock-up sample of metal housing.