

State Analysis of BOP Using Statistical And Heuristic Methods

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Abstract

Under the deregulation environment, the performance enhancement of BOP in nuclear power plants is being highlighted. To analyze performance level of BOP, we use the performance test procedures provided from an authorized institution such as ASME. However, through plant investigation, it was proved that the requirements of the performance test procedures about the reliability and quantity of sensors was difficult to be satisfied. As a solution of this, state analysis method that are the expanded concept of signal validation, was proposed on the basis of the statistical and heuristic approaches. Authors recommended the statistical linear regression model by analyzing correlation among BOP parameters as a reference state analysis method. Its advantage is that its derivation is not heuristic, it is possible to calculate model uncertainty, and it is easy to apply to an actual plant. The error of the statistical linear regression model is below 3% under normal as well as abnormal system states. Additionally a neural network model was recommended since the statistical model is impossible to apply to the validation of all of the sensors and is sensitive to the outlier that is the signal located out of a statistical distribution. Because there are a lot of sensors need to be validated in BOP, wavelet analysis (WA) were applied as a pre-processor for the reduction of input dimension and for the enhancement of training accuracy. The outlier localization capability of WA enhanced the robustness of the neural network. The trained neural network restored the degraded signals to the values within 3% of the true signals.