Algebraic Model for Root-Cause Diagnosis in Nuclear Turbine Cycles

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Abstract

From considering practical needs, authors proposed a diagnosis model to identify the performance degradation of steam turbine cycles in nuclear power plants(NPPs). In this study, the diagnosis is limited to the component-level root cause analysis. That is, this diagnosis model answers which component is the main reason of degradation of electric output or heat rate. Authors knew there were few diagnosis applications in NPPs currently because of various technological, financial, political characteristics. So a great part of the diagnosis has been dependent on efficiency staff's experience and knowledge. However as economic competition becomes severe, the efficiency staff in plants is asking for practical diagnosis-supporting tools. The essential concept of the proposed diagnosis model is the superposition rule of degradation phenomena. Though the superposition rule is not so significant statistically, almost of the performance indices are fairly compatible with this model. Using the superficial degradation which is observable in performance tests, and the correlation matrix among the performance indices, the proposed model can find the intrinsic degradation that is the root cause of overall performance degradation. Authors developed a proto-type model of quantitative root-cause diagnosis and validated the background theory using the simulated data. The turbine cycle diagnosis-supporting tool using this model was applied to Gori NPP unit 3&4.