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Abstract Abstract

Because of the complex working theory and numerous component elements, people still cannot fully understand the cause and effect of many vibrations of the turbine-generator. As the rotating shafts and long blades under normal operation, any additional stress could result in fatigue or even damage when the unit encounters power disturbance and results in resonance.

The mechanical engineers analyze the vibration of structure by finite element method. The prediction of stress distribution and mode frequency is more accurate than dynamic analysis by collecting a few lumped parameters of the whole plant. However, traditional finite element is not capable of analyzing the disturbances coming from the generator, and therefore the damage prediction cannot be assessed. The conventional turbine-generator model representing the blade in a one-degree-of —freedom is used to analyze its dynamic response, it is difficult to discribe dynamic response of the blades. In the study, a dynamic program is used to simulate the turbine blade vibrations resulting from power system disturbances. Than the resulting system parameters provide the necessary information of boundary and load conditions needed by FEM.

In this thesis?in addition to the information provided in documentation for research and reference, the study will include the simulation as well as the results and analysis made by the biggest nuclear units factual condition we investigate the stress of long blade of low pressure turbine under high temperature. When the same Load BCs and power disturbances and different temperatures were applied? study the stress of the long blade. A modified dynamic program is used to simulate the turbine-generator blade vibrations resulting from power system faults. And the Power Spectrum Density (PSD) method is adopted to assist in the analysis of blade vibrations occurring at various frequencies. Finally, using Finite Element Method (FEM) software MSC/NASTRAN to analyze the transient response and frequency response of the long blade, then we can obtain the effect of the long blade when power system faults more clearly.

Key words: Turbine-generator , Power Spectrum Density , Finite Element Method
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