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Abstract
The expansion in power system capacities and power demand leads to the development of large-scale steam turbine-generator units. As a result, a fault on the power system may induce large fault current and give rise to serious torque vibrations on turbine shafts and blades, which ought to be improved for the reliable operation of a turbine-generator system. In this thesis, the flywheel damping device is installed in the turbine-generator shaft coupling to ensure that the vibration torque of component of the steam turbine can be lightened in the trouble of the network.
Because of the complicated working theory and numerous component elements, the cause and effect of vibrations of the turbine-generator still can not be thoroughly understood. Due to the huge body and expensive cost of the turbine-generator unit, it is unrealistic to conduct research through experiments. This thesis, by using the data obtained from our simulation program and previous documentation, aimed to study and establish electrical, mechanical and control model with more accuracy.

The analytical method put forward in this thesis, can adequately explain the results obtained from dynamic simulative programs. Eigenvalue method can analyze the vibration models to know how stable the system is. The method of power spectral density can analyze the frequency domain of vibration when the unit is disturbed. The thesis puts forward the theory based on electro-mechanical analog analysis to analyze the unit vibrations and component responses in detail by transferring the mechanical system model to the electronic system model. Then, simulating the circuit with software Pspice allows us to analyze component responses of the unit.
750MW, 951MW, 985MW turbine-generator units are mainly simulated and analyzed with the circuit-simulation software, Pspice. The results obtained from each simulating analysis are listed and compared with the data from the real experiments. In this thesis, the theory of applying electro-mechanical analog on simulation turbine-generator system is proved to be a realistic and accurate method.
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