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Performance analysis of superconducting generator electromagnetic shielding

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The magnetic induction intensity of superconducting generator can reach a few Tesla, relative to the conventional generator, it has small volume and weight, compact structure, high power density and efficiency, big ultimate capacity, good stability, so superconducting generator is regarded as one of the attractive and novel generator with business competitiveness in the near future.
Electromagnetic shielding is one of the unique special structure of superconducting generator. When superconducting windings work in an alternating magnetic field, AC losses are produced in the windings. The losses increase the low temperature medium dosage and refrigeration power consumption and cause temperature rise, so that the efficiency of the generator is reduced. When serious, temperature rise will lead to the quench of superconducting tapes. The electromagnetic shielding is used to shield the superconducting windings from the alternating magnetic field and reduce the effect of alternating magnetic field on the superconducting windings, in order to ensure the normal work of the superconductor in the superconducting state, improve the efficiency of generator. For the superconducting generator, the electromagnetic shielding is a very important key part.
Using Maxwell equation of electromagnetic field and the mechanical motion equation, it is established the steady state and transient finite element analysis model, which is suitable for the problem of thin wall cylinder of high temperature superconducting generator electromagnetic shielding. In different operation state of a high temperature superconducting generator, the magnetic field and eddy current distribution in the monolayer and multilayer shielding cylinder are calculated, shielding coefficients of the electromagnetic shielding are obtained, and the calculation results are analyzed and compared.
The results provided in this paper are helpful to optimization design of superconducting generator electromagnetic shielding.

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