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DIAGNOSING THE ROTOR OF THE OPERATING HYDROGENERATOR

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Abstract

An approach allowing to register the short time energy flux influence on heat aging of rotor coil insulation of hydro generator is suggested in the paper.. It enables improving the accuracy of determining the residual operation life of coils insulation.

Keywords: hydro generator rotor, diagnosing, heat aging, temperature, thermal image.

Hydrogen generators are known to be specific electrical machines and have various protection and control systems in place for their reliable operation. Isolation of the windings of the hydrogenerator, like any electrical equipment, under the influence of temperature loses its properties and in the case of unqualified operation can lead to an emergency. The intensity of insulation wear is determined by the operating and short-term extreme modes of operation of the hydrogenerator. The long (steady) mode of operation is characterized, as a rule, by a stable operating temperature, which causes a uniform working life of the insulation work. Short-term changes to the mode of operation of the hydrogenerator, caused by short overloads or short-circuit currents, also affect the final insulation life, but it is much more difficult to detect them.

In general, thermocouples are used in hydrogenerators to control the temperature state of the winding insulation. A separate task is to control the thermal condition of the rotor, which rotates during operation. It should be noted that these approaches do not allow to obtain a complete picture of the thermal state of the insulation, and therefore, the determination of the residual working life of the insulation is carried out with great error.

In [1], thermal imaging methods and diagnostic tools for rotating objects can be applied, which can also be applied to control the thermal aging of the rotor winding of the generator. The problem is complicated by the fact that the hydrogenerator is a closed-loop machine and the proposed means can not be directly applied.

In [2, 3], tools were developed to control the thermal portrait of the rotor of the generator with the output of the surface temperature of the windings to the computer, but these tools do not allow to evaluate the impact on the aging process of short-term energy pulses.

In this paper it is proposed to evaluate the temperature influence on the rotor winding of the hydrogenerator by the measured values of current and voltage at the moments of short-term overloads. Subsequently, the obtained information about the values of values and their duration is processed by a mathematical model, which takes into account the direction of propagation of the heat flux and its direct influence on each layer of windings. It is evident that the inner layers of the windings are subjected to an additional temperature effect from the adjacent layers compared to the outer layer of the windings. Computer simulation confirms the effectiveness of this approach.

Conclusions

1. The approaches to thermal diagnostics of the windings of the rotor of the hydrogenerator are analyzed in order to control the aging process of the insulation taking into account the peculiarities of its operation.

2. An approach is suggested to determine the effects of short-term energy flows on the process of thermal aging of the rotor insulation of a hydroelectric generator.

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