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Work Of Asynchronous Generator In The Composition Of Mini-Ges In Autonomous Mode

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ABSTRACT

One of the ways to increase the efficiency of mini-hydroelectric power plants is the use of asynchronous generators in their composition, which have a number of advantages over synchronous ones. These advantages include low cost, simplicity of design and operation in normal modes, resistance to external accidents, and a significant resource. But asynchronous generators also have a number of disadvantages, in particular, the inability to regulate the voltage and the consumption of reactive power during the start-up of the unit, the negative effect of which on the distribution electrical networks significantly increases with an increase in the unit capacity of the unit. This article highlights work of asynchronous generator in the composition of mini-GES in autonomous mode.

KEYWORDS

Asynchronous generator, mini-GES, autonomous mode, electric generator, autonomous operation.

INTRODUCTION

In the 90s of the last century, sufficiently reliable and powerful technical means appeared that made it possible to stabilize the amplitude and frequency of an electric generator set using an asynchronousgenerator with a short-circuited rotor winding [2].

When using an asynchronous generator at power plants, two modes of their operation are possible - a parallel operation mode, when the asynchronous generator supplies power to the central power system, and an autonomous mode, when the generator operates directly on the load.

MATERIALS AND METHODS

When operating in parallel with a centralized power grid, an electric generating set must have means of maintaining the quality of the speed control of the asynchronous generator and must not adversely affect the frequency control process in the power system. Asynchronous generators provide sufficient reliable operation with high stability of the given voltage and overload capacity only under certain conditions. The saturation coefficient of the magnetic circuit of the generator, as the ratio of the total magnetizing force of the magnetic circuit to the magnetizing force of the air gap, should be in the range of 2.8-4 to improve the performance and increase the efficiency of the induction generator [3].

In general, the operation of asynchronous generating equipment in an autonomous mode of operation of a mini-hydroelectric power station can be divided into the following stages:

- Generator start-up due to self-excitation;
- Stabilization of the system voltage with increasing load and with a constant torque on the turbine shaft;
- Stabilization of the system voltage with a decrease in the torque on the turbine shaft and constant load.

Autonomous operation during the operation of a mini-hydroelectric power station requires a reliable initial excitation of the generator. The initial self-excitation is automatically provided when the critical rotor shaft speed is reached, which is 20-30% lower than the rated speed of the hydraulic turbine shaft. In real operating conditions, the excitation systems of asynchronous generators should ensure the operability of the mini-hydroelectric power units when the rotor shaft speed changes, which are caused by fluctuations in the load power, pressure or water flow.

The initial parameters of the asynchronous generator when the load changes can be stabilized by regulating the speed of the turbine or controlling the magnetic flux of the electric generator using capacitor banks. It is known technical solutions, in which it is proposed to convert the initial voltage of the generator into a constant one, and then again into an alternating voltage with the required frequency and amplitude. In this case, the inverter-stabilizer performs the functions of controlling the capacitive excitation and maintaining the specified initial parameters.

The operation of electrical machines as a whole is described by the Park-Gorev system of equations, which practically does not make it possible to analyze the oscillations that arise when individual parameters of the power system (autonomous or combined) change. To carry out such an analysis, it is necessary to use the equations of small oscillations, which are obtained from the original nonlinear equations after expanding them into a Taylor series (in the first, linear, approximation).

RESULTS AND DISCUSSIONS

The main direction in the creation of modern automated micro-hydroelectric power plants is the use of unregulated hydraulic motors and increased requirements for devices for generating electricity and stabilizing its parameters. In the article, it is proposed to use a three-phase asynchronous motor with a squirrel-cage rotor and capacitor self-excitation as an electric generator of a micro-hydroelectric power station, the hydraulic motor is a top-filling water wheel. The main indicators of the quality of power supplies include the parameters of the output voltage, characterized by the nominal value and frequency [2]. Therefore, the most important element of the power plant is the stabilization system, which provides a statically stable operating mode of the hydraulic unit and stabilization of its output voltage. All electromechanical systems for converting the energy of water flows into electricity of the required quality can be conditionally divided into five main classes [1, 4]:

- Systems with stabilization of the hydraulic motor speed by impact on the elements of hydraulic equipment;
- Systems that stabilize the frequency of the output voltage using special designs of electric machines-generators of a stable frequency at a variable frequency of rotation;
- Systems in which constant speed drives are installed between the hydraulic motor and the generator, which make it possible to stabilize the rotational speed of the electric machine;
- Systems based on the principle of regulating the generator braking torque by introducing an additional regulated load.
- Systems using static frequency converters that convert the generator voltage with a variable speed.

In addition to the indicated methods of voltage stabilization of micro-hydroelectric power stations, their combinations in various combinations can be used. The first and second classes of power plants involve the use of various electro- and hydromechanical regulators, others are built on the basis of valve electric machines. Hydro turbine power control systems or constant speed drives control the generator drive motor to regulate the mechanical energy of the electromechanical converter. Stations based on machine-valve systems regulate the electrical parameters of the installation.

CONCLUSION

The properties of micro-hydroelectric power plants built using various principles of stabilizing the output parameters differ significantly:

- The process of converting the mechanical energy of the flow of water into electricity can be carried out using a fairly wide range of devices, including those not specifically designed for use in micro-hydroelectric power plants. The problem is to optimize this transformation in order to obtain the best consumer and operational properties of power plants;
- In hydroelectric power plants of the "micro" class, there is a tendency towards some complication of the electrical part of

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the installations, which in most cases performs the functions of stabilizing the generated electricity due to the corresponding simplification of hydraulic equipment.

REFERENCES

1. Bezrukih, P.P. "The concept of development and use of opportunities for small and non-traditional energy in the energy balance of Russia" // World electric power industry. 1996, 3. - 22-27.
2. Strebkov D.S. Problems of the development of renewable energy // Mechanization and electrification of agriculture. 1997, No. 6. – p.4-8.
3. Dobrokhotov V.I., Shpilrain E.E. Unconventional renewable energy sources. Problems and Prospects // Teploenergetika. 1996, No. 5. – p.2-9.
4. Kadykov Yu.M., Selivakhin A.I. The concept of development of energy-saving technologies, small and non-traditional energy // Mechanization and electrification of agriculture. 1997, no. 6. - p. 2 - 3.
5. Perminov E.M. On the state and prospects of non-traditional electric power industry // Energetic. 1998, No. 10. - p. 13 - 14.
6. Zakrullaevna, Z. I., Akhadkhonovich, N. N., & Mamatkarimovich, N. M. (2020). Information About Transformer Oils. The American Journal of Engineering and Technology, 2(11), 43-45.