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ANALYSIS OF OPERATING MODES OF SYNCHRONOUS MOTORS AND COMPRESSORS

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Abstract: This article is devoted to the use of a DC wind generator as an exciter for synchronous machines. As is known, according to the operating principle of a synchronous machine, the excitation winding is powered by direct current. Compressor, pump, and diesel generator installations in the mining industry are driven mainly by synchronous motors, which are located in open space, where a wind generator can be used as a source to power the excitation winding of synchronous machines.

Keywords: Wind generator, direct current, battery, voltage, power, wind energy, rotation frequency, synchronous motor, electromagnetic excitation.

INTRODUCTION: According to the classical definition, a wind generator or wind power plant (WPP) ensures the conversion of wind energy into electrical energy [3]. Structurally, these installations convert the kinetic energy of the wind, due to the installed rotor, into mechanical energy with subsequent conversion into electrical energy. Typical wind generator power ranges from 5 kW to 4500 kW, but it is also possible to generate minimum wind energy from 4 m/s. The scope of application of wind-electric installations makes it possible to solve the problem of autonomous provision of electrical energy supply to state and social facilities, under the terms of the “feed-in tariff”. This is mainly relevant for island and local objects [1].

MATERIALS AND METHODS: The process of converting wind energy in a wind generator is solved at the structural level, where wind flows touching and passing through the blades that are part of the turbine cause it to rotate. In this case, the energy generated on the wind turbine shaft is proportional to the resulting wind flow, which is transferred from the rotor shaft to the multiplier to generate it. However, installations that do not include a multiplier are more efficient, because There is no waste of energy expended in accelerating the rotation of the axis. The resulting wind speed is sufficient for optimal operation of the wind generator, because its power, measured by the “swept” area of the turbine, is proportional to the geometric parameters of the blades [1].

RESULTS AND DISCUSSION:

Today there are two main types of wind generators, namely:

A wind generator with a horizontal axis of rotation is the most common wind turbine, which contains two or three rotating blades (“non-monolithic” installations) with a horizontal axis of rotation of the rotor drive shaft (windward rotor) or behind the support - a leeward rotor, which is in working condition may be located in front of the support post. The rotation speed of the blades of these installations is very high to ensure maximum “coverage” of wind flows passing through the rotor area.

Monolithic wind turbines (models with a large number of blades) are used, as a rule, as water pumps, usually operating at low rotation speeds. However, the number of blades on the rotor does not determine the efficiency of the installation, due to the interference the blades have on each other.

Wind turbines with a vertical axis of rotation (H-shaped) have a very wide range, because thanks to the design features they can

"capture" the wind blowing in any direction. This feature lies in the possibility of changing the position of the rotor, which can be changed when the direction of wind flows changes. The design

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feature of H-shaped wind turbines is determined by the location of the rotor drive shaft; it is located vertically, and the turbine blades are long and arched, and are attached to the upper and lower parts of the tower.

The performance characteristics and properties of a DC generator are determined by the way the field winding is powered, and the following types of generators exist:

1) with independent excitation - the excitation winding receives power from an external DC source;

2) with parallel excitation - the excitation winding is connected to the armature winding parallel to the load;

3) with series excitation - the excitation winding is connected in series with the armature winding and the load;

4) with mixed excitation - there are two excitation windings: one connected in parallel to the load, and the other in series with it [4, 5].

Studying the issue and analyzing the literature on excitation of a synchronous compressor motor due to electromagnetic influence, allowed us to make recommendations on electromagnetic influence, which is powered by a wind-driven DC generator. This can be done by installing it near the compressor unit of the Kauldi mine, where the compressor station building is located in the mine yard, and the wind generator itself must be installed on the roofs of the compressor station buildings.

It should be noted that for autonomous synchronous motors of low and medium power, it is also possible to use a DC wind generator with a permanent magnet as an exciter [3]. In this case, the system for exciting a synchronous motor with a wind-driven DC generator is shown in Fig. 1.

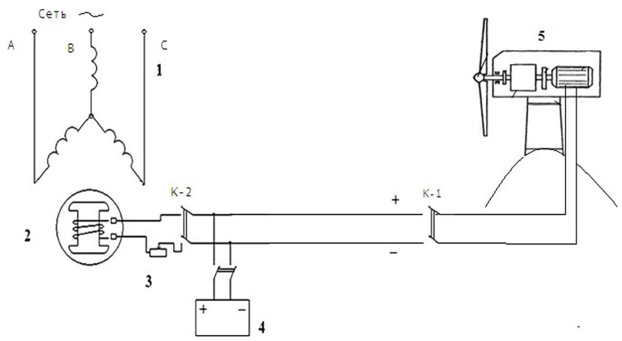

Figure 1. Diagram of the excitation system for a synchronous motor with a wind-driven DC generator: 1- winding of a stator-synchronous motor; 2 - rotor winding (excitation) of a synchronous motor; 3- adjusting rheostat; 4- battery; 5- DC wind generator

CONCLUSION: Based on the above and relying on the results of our own scientific research, we can conclude that it is possible to use a DC wind generator with a permanent magnet as an exciter for autonomous synchronous motors of low and medium power.

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