**УДК 621.311.24**

# MAGNUS WIND TURBINE CYLINDRICAL BLADE CONTROL SYSTEM

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The Magnus wind turbine is an invention that uses rotating cylinders as blades to extract energy from the wind. This invention overcomes the limitation of operating a wind turbine at low wind speed conditions. In this paper, the control system for the cylindric blades based on a brushless direct current motor was performed.

**Введение.** Nowadays a lot of research focuses on distributed energy systems especially on their composition and control systems for each part of it. The first version of the Magnus wind turbine has a dc motor, but due to several negative qualities, such as significant heating and low speed, it has been replaced by a brushless DC motor. The control system of cylindrical blade based on FOC control was synthesized.

**Основная часть.** From the control system point of view, the cylindric blade consists of a BLDC motor with additional inertia depending on the cylinder implementation. A BLDC motor can be modeled in the same way as a three-phase synchronous motor. Some dynamic characteristics differ due to the presence of a permanent magnet on the rotor. By using specific transformations known as Clarke and Park forward and inverse transformations, the three-phase model can be simplified for simulation, analysis, and control design. This transformation turns the (A-B-C) phase system model representation to the (α-β) and (d-q) systems. To simulate the BLDC motor and control method, MATLAB/Simulink software was used. Field oriented control (FOC) method was chosen to control the motor. The aim of vector control is to convert the nonlinear equations into linear equations and decouple the three-phase stator currents into flux and torque components. The machine under test is an outrunner BLDC motor (T-motor MN4014 KV400). The simulation was done for a step input. The analysis of the transient response of this signal, overshoot is 6%, rising time 0.005 sec, settling time 0.24 sec. Also, the simulation was done using the signal produced by the MPPT controller with a fixed initial strep size. The analysis of the transient response of this signal, overshoot is 9%, rising time 0.005 sec, settling time 0.24 sec

**Выводы.** This research focused on developing the control system of the cylindric blades for the further synthesizing power control system. The topology of such a technical system is not regulated by the industry and this augurs several iterations of such wind turbines. The control system of the cylindric blades was synthesized by using field-oriented control. The implemented cylinder speed control system has shown the possibility of operating blades control system collectively to the inner power control loop.

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