FEATURES OF TRANSIENT PROCESSES SIMULATION IN THE AUTONOMOUS INDUCTION GENERATOR

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Autonomous induction generators are used in wind farms [1], although relatively rarely, compared to synchronous generators. Modeling autonomous induction generators in a physical experiment in an electrical laboratory requires an external motor, for example, a DC motor. The speed of this motor is conveniently controlled by a rheostat in the armature circuit and an autotransformer in the excitation winding circuit, thereby we can also regulate the speed of the induction generator. A capacitor with a variable capacitance is switched on in the stator windings of the generator. Graphs of transient processes are shown in Fig. 1 and Fig. 2 for cases of increasing voltage fluctuations across the stator winding or the excitation capacitor, which is the same, at a rotor speed of 800 rpm and 860 rpm.

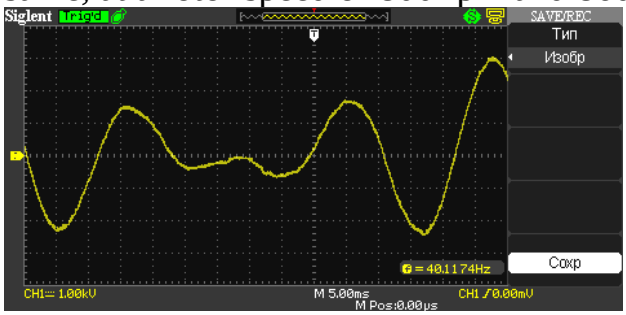

Fig.1 Transient process at f = 40 Hz

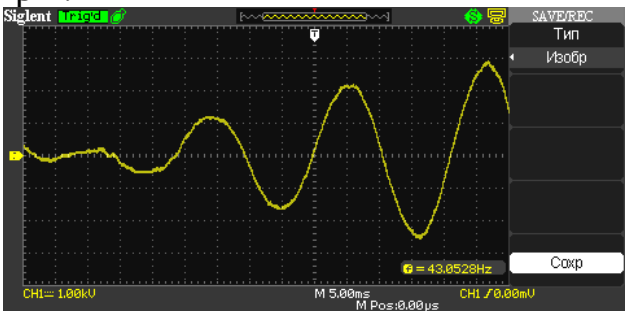

Fig.2 Transient process at f = 43 Hz

Graphs of steady processes are shown in Fig. 3 and Fig. 4 for the cases of rotor speed of 800 rpm and 1160 rpm. As can be seen from these figures, the voltage graphs contain frequencies that lie within the transmission frequency of the machine unit, determined by the speed of the rotor of the induction generator or the drive motor shaft. In the first case, the bandwidth is 40 Hz, and in the second, 58 Hz.

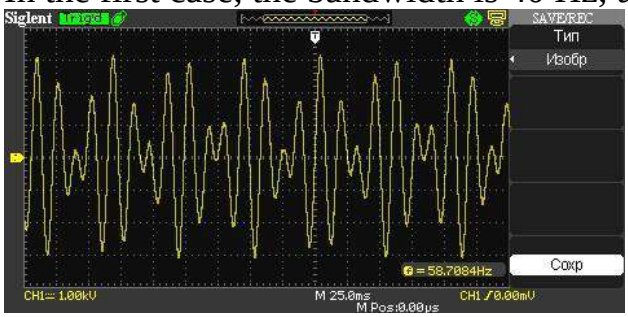

Fig.3. Steady process at f = 40 Hz

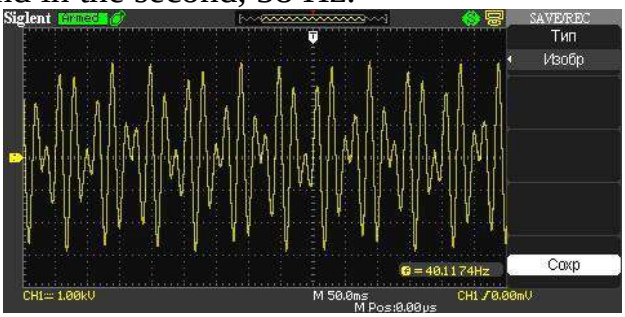

Fig.4 Steady process at f = 58 Hz

As can be seen from these figures, the voltage graph on consists of oscillatory processes, the frequencies of which lie within the transmission frequency of the machine unit, determined by the speed of the rotor of the induction generator or the drive motor shaft. In the first case, the bandwidth is 40 Hz, and in the second, 58 Hz. The oscillation frequencies depend on the time constants of the generator, as well as the two-mass electromechanical system as a whole.

Bibliography: 1. Problems Of Induction Generators Using At Wind Power Plants And Their Computer Simulation Vladyslav Markov, Evhen Honcharov, Natalia Kriukova, Igor Polyakov //2022 IEEE 8th International Conference on Energy Smart Systems (ESS) Igor Sikorsky Kyiv Polytechnic Institute. – 2022. p. 42-47.