DYNAMIC ANALYSIS OF MECHATRONIC DRIVE SYSTEM WITH ANSYNCHRONOUS MOTOR

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The paper presents results of investigations on modeling and optimizaing dynamic features of drive systems in order to minimize amplitudes of forces occurring in kinematic pairs of an electromechanical system with an ansynchronous motor and a vector control unit. The genetic algorithm was applied for optimization of design features of the system. The obtained results of numerical calculations confirmed the accuracy of the applied models and research methods for estimation of dynamic features of drive systems. The set of design variables selected in the optimization process contained parameters describing design features of gear shafts and settings of control units

Key words: *dynamic model, electromechanical system, vector control, optimization*

1. Introduction

The investigation of dynamic phenomena in complex electromechanical systems requires adopting a physical model of the real object. The success of the investigation and the reliability of computer simulation results depend on making adequate simplifying assumptions in the modeling process. When developing a model, both the most important dynamic features of the system as well as the most important external forces acting on the system must be taken into account. The authors have undertaken to study the effectiveness of applying vector control in an induction motor to reduce dynamic loads in kinematic pairs of an electromechanical drive system. Possibilities were analyzed of tuning the mechanical subsystem, the electrical subsystem and the control unit to obtain the lowest possible amplitudes of dynamic interactions in kinematic pairs of the system.

2. Mathematical model

Drive systems of machines are complex dynamic systems with many degrees of freedom. One of the methods for determining the dynamic state of a machine consists in modelling its form as a complex dynamic system composed of a number of simple subsystems, which interact one on another. Modelling of an electromechanical drive system as a system with feedback between its electric part and mechanical one is an example of such an approach.

Vector drives that are currently being developed enable accurate speed control and full control of torque of a squirrel-cage motor. The solutions that are applied differ in the way the speed and the torque are regulated and in the way the internal status of the motor is assessed. However, the most common method is the Field Oriented Control. Gear trains are complex dynamic systems with many degrees of freedom. A detailed analysis of dynamic phenomena

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