

Optimum Selection of Design Features of Electromechanical Drive Systems Incorporating a Control Unit

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Problems relating to modelling, sensitivity analysis and optimization of a high-power electromechanical drive system composed of an induction motor and toothed gear, in which a vector control unit is used, have been dealt with in the paper. The spatial model in which couplings between particular subsystems have been taken into consideration was employed here. Direct differentiation method was used to investigate the sensitivity of dynamic forces in kinematic pairs of the drive system with regard to electromagnetic parameters of the motor. Numerical simulations were carried out for a model of transverse torsional vibrations coupled with a polyharmonic model of the induction motor with a vector control unit. The optimization-oriented objective was to reduce maximal values of the electromagnetic moment of a driving motor. The set of design variables contained design features of gear shafts and settings of control units. Numerical simulations have proved that when all subsystems are tuned one to another the best results can be obtained in respect of lowering of the vibration level, reducing of energy consumption and enhancing of durability.

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