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Research Article

Model of Transient Process Where Three-Phase Transducer Feeds Induction Motor Equivalent as a Variable Active-Inductive Load

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The paper presents a new approach in the analysis of a transient state in a system where the feeding source is a transducer-IGBT inverter and load is introduced through the induction motor with its *R-L* parameters. Induction motors with different parameters of powers and power factors are tested. MATLAB simulation of the three-phase inverter that feeds the induction machine has replaced the missing lab equipment with which mathematical model of this system was verified. According to the selected parameters of the inverter and induction machine and through the simulation in the MATLAB program, the results are obtained in the form of diagrams that verify the model of a transient state of the induction machine operation when it operates as a motor which is presented as a variable *R-L* load. The transient process of the system three-phase bridge inverter whose active-inductive load is the induction machine in the conditions of the change of the load parameters is analyzed. The model of the transient process in the system formed by the inverter in PWM (Pulse Width Modulation) converter and induction machine is developed in the time domain and phase coordinates.

1. Introduction

When there was a need for the analysis of a wave current in a system in which the three-phase induction motor was fed from a three-phase bridge inverter it appeared that there were no adequate mathematical models of such a system in available literature. The models of three-phase induction motors, mostly derived by Park's coordinate system, are quite common in the literature. However, the mathematical model which unites the processes in the system of polyphase motor-polyphase inverter in the time domain could not be found. Therefore, during the formation of the transient state model an idea emerged to present an induction machine in such system as an active-inductive (*RL*) load which significantly simplifies the whole process.

The analysis of stationary processes in the inverter during the operation with active-inductive (*RL*) load can be performed using the different methods. However, for the analysis of the transient states it is necessary to compose differential equations and to implement boundary conditions for each time interval of operation. If the form of phase voltage in the electrical circuit is known, then the inverse Laplace transform applies. By applying the different methods it is possible to determine instantaneous values of currents for each part of the voltage, respectively, independent of some other part during the given time interval, while the substitution of initial conditions in obtained relations is not necessary. The use of thyristors that block the passage in electric circuit of the voltage inverter can simplify its typology since there is no