УДК 621.3.067

RESEARCH MODELS IN MatLab CHARACTERISTICS OF ELECTRIC DC Lenze 530 SERIES

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DC drive model with thyristor voltage regulator Lenze 534 and results of investigations of electromechanical properties are presented.

Transition process, semiconductor voltage converters, feedback, PI-controls, electromechanical characteristics, model.

Now the industry is widely used modern electric adjustable based on power electronics. Specifications that appear in the passport data on the drive elements do not always give answers about his work in transient conditions. For information on the transitional regimes should conduct research on laboratory or test bench, which is associated with considerable expenditure of time and additional costs for their creation. Greatly simplify the study of transients can be using a computer model of the electric system MatLab, which consists of a DC motor with separate excitation and voltage thyristor converter Lenze 530 series. Aim of paper - to provide reliable performance of DC drive with semiconductor voltage converter Lenze 530 Series at transient processes in MatLab system computer models with a significant reduction of time and reduce material costs.

Materials and research methods. Analysis of driving performance was based on the theory of electric drive using a computer model of the system MatLab.

Research results. Thyristor Voltage (ESRD) German company Lenze 530 series produced in four versions with output power from 0.36 to 2.04 kW and are designed for use with DC motors with separate excitation in the I quadrant. Converters operate with negative feedback armature voltage (IR- compensation) or speed voltage Tacho.

On the front side of the unit controllers are: Imax – setting the maximum load current; IxR – tuning regulator feedback armature voltage (IxR-compensation); n_{max}, n_{min} – limiting the maximum and minimum engine speed; Ti – setting time of the transition process.

According to the reduced electrical circuit drive with ESRD after the power supply to ESRD while current enters the excitation winding and for power supply to the motor armature must enable additional switch. With this procedure enabling the drive nominal magnetic flux is set to the beginning of the engine. The speed setpoint is regulated, which may be a potentiometer R = 10 Ohms or external source control voltage U_K = 0 ... 10 V.

Based on the electrical circuit ESRD was created in MatLab model with negative feedback for speed.

For used electric DC motor with separate excitation МИ32 314-02.

The input parameters of the model are given in relative units. To convert them with relative units referred to simply multiplying the results to the corresponding baseline values U_H, I_H, R_H and ω_0.

The table model unit Transfer Fcn1 link anchor engine models (T_A= 0,02 c and the gain $1/R^*_{A\Sigma}$), and a block Transfer Fcn – link voltage thyristor converter ($T_П$= 0,01 c). Power Integrator and Gain1 amplifier with gain $K_1=1/k_I T_M$ implement the equations of motion of the electric drive. The load current is formed as an integral of a continuous signal blocks Step1, Gain2 with a gain of K_2 = 0.07 and Integrator1. Two-circuit model. The basis of the first circuit is a PI controller with gain $k_{П.C}$= 3 and $k_{I.S}$ = 167, TPH and link anchor engine, reached a negative feedback for the current anchor. The second circuit with negative feedback on speed is also proportional-integral PI controller with gain = 36 $k_{P.S}$ and $k_{I.S}$ = 0.09. Type of regulators and their ratios determined in accordance with [2, 3]. In selected regulator circuit current is set to optimum technical and circuit speed - at symmetrical. With the regulator Those who mounted on front panel TPH, you can change the gain integral component of PI speed controller that allows you to change the transition process. Management model provides block Step, which sets the output voltage TPH. The model has two blocks restrictive Saturation. Saturation1 intended to limit nmax maximum and minimum speed nmin, Saturation2 - to limit the maximum current Imax. To visualize the electromechanical (mechanical) properties used unit XYGraph, and oscilloscope Scope allows to observe instantaneous speed and armature current.

The simulation results of electric drive shown in Fig.

Process modeling is so. Run the engine is unloaded, and after 3 s load begins to increase. According to the task set speed limits to $0{,}8\omega_0$, and maximum current - at $1{,}3I_H$. The limit value model accurately tracks that can be seen from the resulting electromechanical characteristics.

Analysis graphs confirms the adequacy of the results obtained in the model and the actual installation.

Conclusions

The computer model in MatLab electric series with ESRD Lenze 530, which provides for limiting the maximum and minimum speeds and maximum current stabilization specified speed, change the time of the transition process that meets the technical requirements specified device. Analysis of the studies confirmed the adequacy of the simulated transients in electric real.

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