CONTROL OBJECTS IDENTIFICATION AND REGULATORS SETTINGS OPTIMIZATION

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Modern technological processes are complex objects characterized by the tonnage, the processes high speed, the explosion and flammability risk, the possibility of harmful and poisonous substances emission in the environment, and so on. One of the major tasks of automation systems design is the control object identification. Object mathematical modeling is a very difficult and time-consuming work including the following steps: determining the process parameters affecting the object; determining relations between the parameters; object balances forming; these balances linearization; differential equation derivation.

The result is a complex high-order differential equation used later on for the calculation of the automatic regulation system ARS.

The problem is solved much easier if the acceleration curve of the equivalent control object exists.

The purpose of this work is the development and software implementation of the technological control object identification algorithm on the acceleration curve of the second order segment and the choice of the regulator optimum settings with the quadratic optimization function use.

The object of this investigation is the single-circuit ARS of the temperature in the catalytic reactor and the turbine speed GTT (gas turbine technological) of the nitric acid production.

The subject of this investigation is the transients and ARS quality indicators.

The method of this investigation research can be defined as the theoretical one with a computer using. The transfer function calculation algorithm according to the acceleration curve has been implemented with the «Maple» software package.

To identify the equivalent control object by the second-order segment at the ARS parametric synthesis has been proposed in this work. The algorithm of the equivalent object transfer function search according to the

acceleration curve has been devised and this algorithm software implementation in «Maple» mathematical package has been developed.

The identification of the catalytic reactor and the GTT turbine of nitric acid production have been made. It is specially noted that replacement in the calculation of the catalytic reactor acceleration curve and GTT turbine with the second-order segment can cause an error that will not exceed 3.5% and it is quite acceptable for the calculations of this type.

According to the obtained equivalent objects transfer functions the settings of P -, PI - and PID - regulators for ARS of catalytic reactor temperature and ARS of GTT turbine speed by the method of triangles, method of undamped vibrations (The Ziegler–Nichols method) and with the quadratic optimization function have been found. Comparative analysis of the transition processes quality indicators investigated by the ARS at the settings obtained by different methods has been made.

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