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THE RESULTS OF THE STUDY ROBUST DURABILITY THE CLOSED ACS THE DRYER FLUIDIZED BED

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The stability of automatic control systems is one of the most important criteria for the operability and controllability of the object. So it turns out that in the long operation, parameters, this object may change. Therefore, it is necessary to foresee and calculate in advance how will behave the system in this case. The object of this work is the dryer fluidized bed, the experimental analysis of shot characteristics of which showed that it belongs to the class of multidimensional dynamic systems with distributed parameters and time-delay. This dryer is described by a matrix of transfer functions, parameters of which were specially modified (enlarged 10 times) for what would previously synthesized to investigate the system on the fact of sustainability. For this we used the Kharitonov polynomials and a theorem on bounding the ratio that was the basis for writing methods of research of robust stability in the case of a multidimensional object.

The main stages of the research robust durability of the multidimensional object are:

1. Forming for each of the elements of the FPM closed-loop ACS system Kharitonov in the form

$$Gij = \frac{K_A^i(s)}{K_B^j(s)}. \qquad (1)$$

This formed the eponymous polynomials for the numerator and denominator of expression (1), and loop over all possible non-repeating options, using the following expression (4 Kharitonov polynomials)

$$K_A^1(s) = \overline{a}_{12}s^0 + \underline{a}_{11}s^1 + \underline{a}_{10}s^2 + \overline{a}_9 s^3 + ... + \underline{a}_3 s^9 + \underline{a}_2 s^{10} + \overline{a}_1 s^{11} + \overline{a}_0 s^{12}$$
$$K_A^2(s) = \overline{a}_{12}s^0 + \overline{a}_{11}s^1 + \underline{a}_{10}s^2 + \underline{a}_9 s^3 + ... + \overline{a}_3 s^9 + \underline{a}_2 s^{10} + \underline{a}_1 s^{11} + \overline{a}_0 s^{12}$$
$$K_A^3(s) = \underline{a}_{12}s^0 + \overline{a}_{11}s^1 + \overline{a}_{10}s^2 + \underline{a}_9 s^3 + ... + \overline{a}_3 s^9 + \overline{a}_2 s^{10} + \underline{a}_1 s^{11} + \underline{a}_0 s^{12}$$
$$K_A^4(s) = \underline{a}_{12}s^0 + \underline{a}_{11}s^1 + \overline{a}_{10}s^2 + \overline{a}_9 s^3 + ... + \underline{a}_3 s^9 + \overline{a}_2 s^{10} + \overline{a}_1 s^{11} + \underline{a}_0 s^{12}$$

Resulting in get a m rational expressions ($m \le 16$) for only one matrix element (1).

This stage is carried out for all elements of the matrix transfer function of the closed-loop system (1).

2. The calculation of H∞-norms for each of the Kharitonov systems are obtained. You can use the Matlab program, the treatment of the following format:

$$|Gij(s)| = \text{norm}(Gij, \text{inf}), \tag{2}$$

Gij – rational fractional expression having the structure (1),

$|Gij(s)|$ -computed H∞-norm.

3. Analysis of the obtained H∞-norms and determining the maximum one.

4. The calculation of the edge coefficient according to the formula

$$\alpha = \frac{1}{|Gij(s)|_{\infty \max}}. \tag{3}$$

5. The definition of norms for nominal $\|H_{ном}\|_{\infty}$ and parametrically-excited closed-loop system $\|H_{возм}\|_{\infty}$.

6. To check the fulfillment of the condition, according to the theorem on boundary coefficient $|H_{возм}|_{\infty} - |H_{ном}|_{\infty} \leq \alpha$, that is a measure of the robustness of the closed-loop ACS.

The use of this method theoretically proved the fact of stability of the closed-loop system even under the condition that the object parameters can be changed in pretty wide range.