

FUNCTION OF DISPROPORTION

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It is impossible to provide reliable work of different mechanisms at all stages of their life cycle without wide use of diagnostic tools. Emergency situations at nuclear and thermal power plants, oil and gas pipelines can be considerably diminished or completely eliminated by effective use of automated diagnostic techniques.

There are classes of objects, the parameters of which can change in process of exploitation. This can lead to changes in static characteristics of these objects. The DC (direct-current) or AC (alternating-current) amplifiers, sensors or converters can refer to such objects, in particular. For example:

- In DC amplifier: the so-called «zero drift» is often observed, and amplification coefficient is changed after the input voltage elevates above the defined boundary value. The same is true for various converters.
- In AC amplifiers: the breach of proportionality between input and output processes usually leads to the creation of high-frequency harmonics of the main signal and, as a result, to worsening of the signal presentation quality.

As a rule, breach of proportionality between the input and output processes for the controlled objects leads to deterioration of the quality of their work or to lowering efficiency. That's why it is necessary to elicit the fact of this breach and to spot the reason of such trouble.

This problem can be solved by function of disproportion:

$$z(t) = \frac{y(t)}{x(t)} - \frac{dy/dt}{dx/dt}$$

where: t – time;

$z(t)$ – value of «disproportionality»;

$x(t)$, $y(t)$ – input and output processes;

dx/dt , dy/dt – values of derivatives.

The fact of proportionality breach between $x(t)$ and $y(t)$ is elicited by value of «disproportionality» $z(t)$, that becomes nonzero.

This method is verified by the check tests and confirmed by the obtained results. Such diagnostic system can be used for controlling the objects functioning during their continuous exploitation.