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CLOSED BY FEEDBACK SYSTEMS THEORY'S PRINCIPLES

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In the material and physical nature the so called "feed back" phenomenon does not exist at all.. It is created artificially in automatic control systems (ACS) of technological processes. For the first time the method is given, that proves the society's and enterprises' economies possess own natural, negatively influencing, positive feedback.

The machine production started in 1765 [1] when a steam machine and the automatic water level controller in the boiler of that steam machine was invented by I.I. Polzunov for the first time. The industry, technological processes and, accordingly, the industry of automatic controolers, as it is impossible to conduct technological processes without them, were developing. Thus, at the end of the 19th century the theory of automatic control systems (ACS) [2] consisting of technological process and a controller developed. After the article of G.V.Shchipanov had been published, [3] contrary to the serious criticism, the theory of invariability in automatics appeared and, since 1958 up to 1982 (VI) All-Union Conferences on the theory of invariability of ACS were held every 4 years. Proportional (P) controllers described by the equation $\Delta c = -Crx$, with Δc as the controller's outlet change, Cr - the controller's gain coefficient and Δx - the controlled variable change, were large-scale manufactured; proportional-integral (PI) controllers $\Delta c = -Cr(\Delta x + \int \Delta x dt)$; and proportional-integral-differential (PID) controllers $\Delta c = -Cr(\Delta x + \int \Delta x dt + dx/dt)$. The processes were described by linear differential equations. That is why both the controllers and the ACS theory were kept in frames of linear systems capable to work at load variation in the process by 6-8%. Left parts of the processes equations were composed on the experimental data, and the right ones were written in the form of the product f(t) [1]. In them, f(t) is so called "disturbance", being not to the point of the process equation on its functional structure, and [1] – is a unit function of the unknown origin as well. So, both the ACS theory and the controllers remained independent from the symbolic models of technological processes. As the technological processes were developing, the controllers capable to work at load variation up to 100% and a theory making possible to build an ACS on symbolic models of technological processes became required. For this it should have been defined what is what.

Logically, a technological process is a manufacturing process when one or more product streams influence some other one or ones. Thus, a technological process is an interaction of two or more product streams, where the first ones are the material and the second ones – influences on the material, the streams' characteristics being changed. From the controlling point of view the last become regulating parameters, and from mathematical point of view the material, thermal et al. balance equations are symbolic models. As the process outlet is connected with the controller's inlet, the controller's outlet is connected with the inlet of the process (control object), a closed system comes into being. When laid on paper, a previously unknown geometric configuration, called a "***nomogram***"* (pic.1), comes into being, with x – as the value of the circuit/process output parameter, a – the measuring instrument's gain coefficient, m – output values of the measuring system, b_i – the task's structure coefficients, n – the controller's input, u_1 – the controller's output values, f_1 –

loading values. As it is seen from the picture, the nomogram is the basis of invariant systems' construction. The necessary for achieving the invariance condition of values of the controlling parameter at various loading values and the given values of the controlling factor are patently seen in it. This made possible the creation of invariant electronic controllers for galvanic processes for loading change conditions up to 100% [4], [5], [6] and allows one to create invariant ACS for the statics of the process with any forms of non-linearity. The ACS operating mechanism rests on the fact that by the changes in loading on the circuit/process in Δf, an output parameter change (the controlled variable) described by the differential equation occurs. After the transition process, the output variable will be transformed into Δx under the influence of the loading change in Δf. It means that the ***differential equation*** turns into the ***potential equation*****solved relative to Δx after the transition process. For example, on the nomogram (pic.1) the transition from the loading value f_1 to f_2 corresponds to the loading change. To achieve the static invariance in an ACS, the transition of controlling parameter value from $u_1$to u_2 is required. In most cases it is enough. To achieve the absolute ACS invariance, the second (dynamic) condition of invariance, by changing the rate of the controlling parameter's change, must be carried out. These data are given in the report in the 5th Conference [7]. The problem having been left unsolved for 100 years eventually proved to be very simple.

Many centuries ago, philosophers and, at the end of the 19th century, economists noticed that the economies of separate countries and that of the world develop unevenly. Inflations and recessions, which have been called the cyclical results, happened and are still happening. The main point retained is their unknown nature. Building in of the processes/circuits in an enterprise' economy with due regard for special features of economic processes into the nomogram for ACS lead to an overwhelming conclusion, that enterprises' economy possesses own natural positive feedback and it is subject to the theory of not existing in the nature, but artificially created systems, closed by feedback, i. e. the theory of Automatically Controlled Systems.

***Nomogram* ***– (from Greek = law + gramma) graphic illustration of theoretical or empiric dependencies simplifying practical calculations.

Potential equation** – the equation after the parameters' and variables' change.

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