13. Grygorskyi, S. Ya. Rezultaty eksperymentalnykh doslidzhen zakonomirnostei hidrodynamichnykh protsesiv u naftoprovodi za zminy kilkosti pratsiuiuchykh nasosnykh ahrehativ [Text] / S. Ya. Grygorskyi, M. D. Serediuk // Rozvidka i rozrobka naftovykh i hazovykh rodovyshch. – 2014. – Vol. 1. – P. 161–172.

14. Serediuk, M. D. Zakonomernosti izmeneniia davleniia v nefteprovodakh pri ostanovkakh nasosnykh ahrehatov [Text] / M. D. Serediuk, S. Ya. Grygorskyi // Neftianoe khoziaistvo. – 2015. – Vol. 2. – P. 100–104.

Предметом дослідження є об'єкти, які визначаються поняттям «система», а саме той клас систем, об'єкти якого забезпечують виконання певної функції. Такий клас систем визначено поняттям «кібернетичні системи» (КС). Об'єктом дослідження є процеси взаємодії КС. В результаті дослідження було встановлено властивості КС, особливості їх архітектурного взаємодії і дано визначення КС. Отримані результати можуть використовуватися при проектуванні автоматичних ліній у вигляді адаптивних, оптимальних об'єктів інтерактивної взаємодії

Ключові слова: статична система, кібернетична система, динамічна система, система перетворення, система буферізації

Предметом исследования являются объекты, которые определяются понятием «система», а именно тот класс систем, объекты которого обеспечивают выполнение определенной функции. Такой класс систем определен понятием «кибернетические системы» (КС). Объектом исследования являются процессы взаимодействия КС. В результате исследования были установлены свойства КС, особенности их архитектурного взаимодействия и дано определение КС. Полученные результаты могут использоваться при проектировании автоматических линий в виде адаптивных, оптимальных объектов интерактивного взаимодействия

Ключевые слова: статическая система, кибернетическая система, динамическая система, система преобразования, система буферизации

PRINCIPLES OF CYBERNETIC SYSTEMS INTERACTION, THEIR DEFINITION AND CLASSIFICATION

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1. Introduction

One of the main issues of modern business is connected with a problem of efficiency increase. And it's really a problem, because the practitioners' efforts are aimed at efficiency improving of such enterprise structural divisions as: the departments, sites, shops, etc. However, the enterprise consists of systems and the functions of each one are performed in many different structural divisions. There is a question: "If the system is an integrity, what are the consequences of an attempt to optimize a separate process in different structural entity divisions?".

The automation of technological processes to some extent solves the problem of increasing the efficiency. However, the automation of technological processes doesn`t solve the issue of increasing efficiency completely. It is connected with the fact that a search of an optimum is defined in control process. But also control won't execute the assigned to it optimization functions if technological operations are rigidly connected among themselves. That is, the optimization efforts, in general, are vain if the automatic transfer line isn't designed as dynamic systems interaction process. Therefore, the existing practice of creating automatic and automated production processes excludes a possibility of full optimization.

The "system" category is one of the fundamental concepts associated with the world around models in the course of thinking. And the models determined by the concept "system" are understood and defined as a certain integrity.

The complexity of the situation is that the concept "system" is used for some integrity identification in defining of interconnected objects complete set and of holistic objects that perform a certain function. Also, the objects are defined by the "system" concept if they are able to perform or perform a certain function in the interaction process with other similar objects by the products variety exchange.

For example, the concept "system of movement" can be used for definition of numerous mechanisms and the relations between them. The functional orientation of an object is the sign by which the structural elements of the movement object are defined as movement system.

We are talking about object's cybernetic representation when the system of movement is defined as the object, performing movement function.

Thus, the movement system can be used for definition of objects (models) of two classes. On the one hand, it is a set of

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the objects united by their belonging to some integrity that is intended for movement function performance (the static system). On the other hand, it is integrity that can perform moving functions (the dynamic system).

But the one correspondence is not always observed.

So, the concept "control system" (as the static system) has no pair cybernetic category because the control is the cybernetic system (CS) built-in function. As the cybernetic category, the controlled object can be determined only by the concept "control subsystem" or "complex of control" if the subsystem concept is already used for definition of internal objects of the complex of control.

The conceptual uncertainty connected with system objects research has led to such situation when the mathematical orientation works are defined as the works connected with control.

This problem is well known and more than once has been mentioned in discussions or statements of experts opinions related to the solution of problems in the classical theory of automatic control (TAC). However, in the TAC development, not all is well from the practical point of view. The automatic control theory (TAC) was generally created by engineers for engineers and only partially by mathematicians for engineers. TAC is generally created by mathematicians for engineers and, increasingly, by mathematicians for mathematicians. The latter one causes some concern from the practical point of view [1].

The creation of not very good systems classification and also being of cybernetic systems class conceptual uncertainty don`t let to develop the works about general issues decision in control.

Thus, the conceptual determination of cybernetic systems, finding of their main properties and classification of the CS are an important scientific task. The solution of this task will allow to design and create fundamentally new automation processes and control processes technologies.

2. Literature review and problem statement

General interpretation of the concept "system" gives meaning to this object as "a set of the interconnected elements acting as a single entity with all internal and external relations and properties inherent in it" [2]. The system element is defined as its indivisible part that "has independence in relation to this system" [3]. In fact, this interpretation of the concept "systems" is the classification instrument because many enterprise cybernetic systems can be considered as an objects system united by the concept "enterprise" [4].

There is the conception in which such concept as "enterprise management system" is formed as a result of classification approach use [5]. Because of uniting by each enterprise a lot of CS, the quantity of which, in fact, is specific, the idea that every enterprise creates or has its own unique control model is formed [6].

Development of this approach is the idea that the property of adaptability is inherent only in complex controlled systems [7]. Such sign of difficulty in the work [8] is the volume of data being processed.

In the work [9], the development of the "enterprise" system with the change of its structure is solved by introduction of special systems creative agents to the model. At the same time, according to the definition, the system is a holistic object. Therefore, it is possible to speak about the enterprise development by introduction and interaction of additional system units.

In the work [10], the supersystem concept has been introduced. There is the excess quantity of reserve objects for the object with the broken function needed replacement are created within this supersystem. Why introduction of reservation leads to the change of a system's type, isn't proved in the work.

It is obvious that a "banking system" [11] or a "transport system" [12] as sets of static systems, in turn, consist of many cybernetic systems. Therefore, in relation to such objects it is better to speak about an opportunity of influence on the functioning of such structures, but not about the principles of control.

Thus, semantic loading that is born by the concept "system" belongs to the different classes of objects. And this fact needs to be considered when it comes to systems.

It is also possible to note that:

– at the present moment there is no rather complete and evidence-based definition for the "cybernetic system" category;

– the types and the basic properties of the CS are not defined;

– cybernetic systems are not classified.

3. Purpose and objectives of research

The purpose of the work is to define the class of cybernetic (dynamic) systems, their specific features and opportunities.

To achieve the goal, the following tasks have been set:

– to define the class of dynamic systems;

– to define the simple CS types and principles of their architectural interaction;

– to define the internal structure of autonomous CS;

– to define the concept "cybernetic system" and basic classification of CS.

4. Determination of functional features and properties of cybernetic systems

Because the class of cybernetic systems hasn`t been defined conceptually now, the only reliable method of its definition is creation and research of results of online interacting objects interaction. Each object of such structure has to perform a certain technological function for converting the input products to output consumer products.

This technological function performance has to be supported by the control processes that are built in the interactive object.

Also, among the functions of such cybernetic objects, there has to be a possibility of their response to external changes (adaptation) and optimization of technological processes, if necessary. Processes of adaptation and optimization have to be initialized after start-up and in case of registration of significant changes of certain parameters (level of demand, expert (cost) estimates of input and output products) and, if necessary, the external environment parameters (temperature, humidity, shock loadings, etc.).

Such representation of the CS is intuitively clear. So, such patterns as movement system, crushing system, heating system, sorting system, buffering system, storage system, etc. are natural.

The process of objectives achievement that is always limited by available resources, is followed by existence of the competition and limited supersystem life time. Here, the supersystem is the object providing goal statement and use of the added value as a result of the functioning of CS.

Therefore, the adaptive expediency (the built-in opportunities of adaptation and optimization) is the natural requirement to the created or used CS.

Hence, research of CS has to be conducted within the structure consisting of many online interacting objects, each of which performs a certain technological function.

4. 1. Principle of performance of one basic function by CS

Special software designer has been created for the CS synthesis and their studies [13, 14]. It is connected with the fact that the CS many properties become obvious only if the synthesized systems function in the automatic mode.

The conclusion that an object that is able to provide a possibility of interaction not necessarily is CS was one of the first results which has been received in an attempt of synthesis of CS having a possibility of control processes optimization.

As an example, we will consider a structure which consists of interactive objects. The central object of this structure is the object of liquid heating (HO). It provides heating of cold liquid to the set temperature and transfer of the output product to the consumption object (Fig. 1).
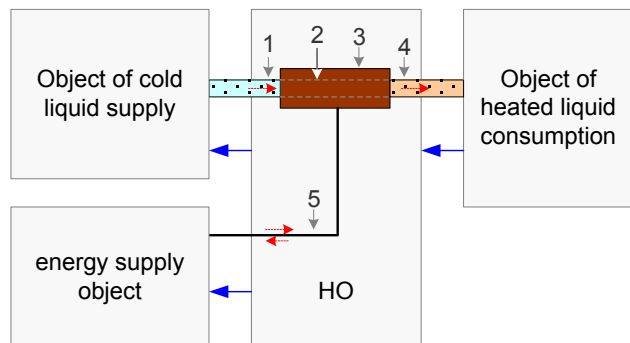

Fig. 1. Structure of the objects providing realization of the interaction principle: 1 — mechanism of cold liquid supply; 2 — liquid storages mechanism; 3 — liquid heating mechanism; 4 — mechanism of heated liquid delivery; 5 — energy product feeder

There are no basic technical problems for practical creation of such HO.

The heating object provides interaction with the consumption object of heated liquid and with objects of technological products supply (cold liquid and energy product) and also provides the function of required liquid volume heating to the set temperature.

There is an only question: "Could we consider the HO a system?"

As it has been noted above, one of the principles that, if necessary, the CS has to provide is realization of adaptive expediency function. This function can automatically be performed, and can be realized with the use of a human factor.

Strictly speaking, lack of automatically performed functions of optimization and adaptation don't demonstrate that an object isn't CS. The object can be ergatic CS.

That is, if an object is CS, then in the course of realization of the mission it has to provide such functioning mode at which the efficiency of resources use will be maximum.

In the reviewed example of heating of liquid to a higher temperature, there are two quality indicators: the temperature of heating and the rate of heated liquid supply. Each responsible control operation of the rate of heated liquid supply corresponds to the one responsible control operation of its temperature compliance. Therefore, heated liquid supply rate control operation is rigidly connected with control operation that provides the set heating temperature.

Attempts of decomposition have shown the HO as two systems. Rigid interaction of such systems is defined at the design period. Structural optimization by cost criterion allows to lower the costs for HO production by a combination of liquid heating and buffering functions. At the same time, such technical solution excludes a possibility of parametrical optimization of system processes.

We will determine the property of a system to have freedom degrees for a separate control path by the concept "control independence".

Definition 1. CS freedom degrees are a number of independent controls, the change of parameters of which, within restrictions for control, provides achievement of the set quality of the main technological system product.

HO has no such freedom and, therefore, it isn't at least a simple CS.

Such situation, as it has been already noted, is connected with the fact that HO provides performance of not one, but two basic technological functions at once: 1 – the function of the required liquid volume supply; 2 – the function of the required liquid volume heating to the set temperature.

If to design a technological part of this object in the form of two objects (Fig. 2), the situation will change.

The converting object provides portion liquid heating to the set temperature. At the same time, in the range of allowed controls, the heating process can be carried out with different rates of power product supply, and, therefore, with different speeds.

Besides, it is possible to change independently the volume of cold liquid supply in the heating mechanism.

On the other hand, the heated liquid delivery object, at the expense of stocks, can provide the consumption object of the heated liquid in necessary volume and with the required rate of supply. At the same time, it is possible to control independently the lower and top stocks level in the buffering mechanism.

Thus, it is possible to define the basic principle of simple CS creation – it is performance only of one basic technological function by the interactive object.

The following principle which has been revealed in the course of the research is that the simple CS providing performance of the converting function always has to interact only with buffering CS and vice versa.

Independence of CS controls is provided only when such conditions are performed. It is connected with the fact that the CS of converting type has to have fast access to input products, long enough and continuously function for start-up costs decrease and effective equipment use.

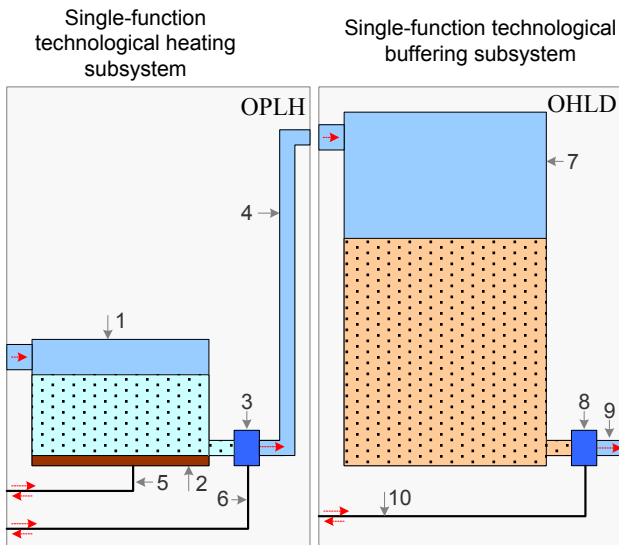All these opportunities are provided by the buffering CS.

Single-function
technological heating
subsystem

Single-function technological
buffering subsystem

Fig. 2. Technological object of portion liquid heating
(OPLH) and technological object of hot liquid delivery
(OHLD): 1 — heated liquid storages; 2 — liquid heating
mechanism; 3 — already heated liquid feeder;
4 — mechanism of already heated liquid delivery;
5, 6, 10 — mechanisms of energy product movement;
6 — already heated liquid feeder; 7 — already heated liquid
buffering mechanism; 8 — feeder of buffered liquid;
9 — mechanism of buffered liquid delivery

4. 2. Complex for CS functioning properties and principles research

For the investigation, two classes of CS models have been created.

The first class is heating liquid system model (sTechX). The second class is buffering liquid system model (sSepX).

The principle of symbol formation for objects models names is given as

$$-x+Object+X+n+/+L.$$

Here are: x – object type (s – a system, sb – a subsystem, m – a mechanism); Object – an object class/subclass; X – a kind of an object (A, B, C...); n – object copy (1, 2, 3...); L – functional restriction (not obligatory parameter); "+" – designates operation of symbolical designations pasting; "/" – the direct slash separates an optional element in the symbol in the right part.

For converting type system model creation, the results of the converting type CS structure synthesis received in the work [15] were used.

Each CS has many interface objects intended for interaction with adjacent CS. All objects of CS provide reception of input and deliveries of output products function. The entire set of such objects is united by a concept "port".

The separate port object is its section. As the functions of CS port sections of one class are the same, it is expedient to introduce symbols for the sections performing a certain function.

In Fig. 3, the CS interface model of converting class sTechA is represented. In this CS, one control function is automated. This function provides the opportunity of interaction with adjacent CS.
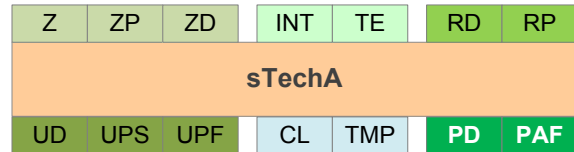

Fig. 3. Heating CS interface model

In Fig. 3 CL – the current stock rate; INT –rate of ready-made product delivery; Z – task for system function execution; ZD – the required liquid supply volume; ZP –rate of an energy product supply; UD – control of the required liquid volume supply; UPS – control of the starting of required rate energy product supply; UPF – control on completion of energy product supply; RD – liquid supply; RP – energy product supply; PD – already heated liquid delivery; PAF signal of completion of ready-made product delivery operation; TMP – the current value of liquid temperature.

For creation of buffering systems, the results of the researches received in the work [16] were used. In the model of CS buffering sSepA, the function providing a possibility of interactive interaction is also automated (Fig. 4).

By change of the energy product supply rate (section of ZP port) and of the volume of liquid supply (section ZD), the optimization possibility of the heating process is provided.
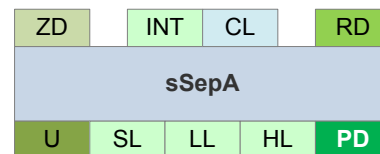

Fig. 4. Interface model of the buffering system: SL — initial stock rate; LL — the lower stock rate; HL — the top stocks level

As it has been noted in [16], the buffering systems have two independent control complexes (CC) (Fig. 5).
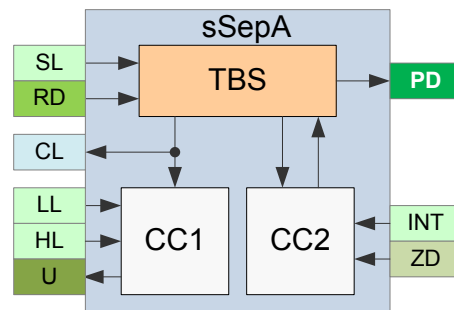

Fig. 5. Internal structure of the buffering CS concerning control complexes

The first control complex provides stocks replenishment of the buffering mechanism. By means of, for example, selecting the lower and top stock rates, optimization of this type of CS is provided.

The second control complex provides delivery of a ready-made product to the consumption system.

By selecting the design parameters of the buffering mechanism and the technologies that are put in control CC1, the conditions are created in order that the consumer of CS didn't "feel" stocks limitation.

Thus, the buffering system can conditionally be presented consisting of two systems: the receiver system and the buffering product source system.

Optimizing structures opportunities of sTechX exist because the structure of sSepX, as the consumer of products, doesn't determine quantitative parameters of the product that is transferred by its system of sTechX type in control parameters. The task of the buffering system signals only about the need of replenishment of its stocks. What output product volume should be transferred to the buffering system and when it should be transferred, is defined by the system of converting type in the course of own optimization.

On the other hand, the buffering system independently changes own parameters of the lower and top stock rates. It provides independence of its own optimizing processes.

Existence of two control complexes of buffering systems allows creating sources and receivers of the technological products that have limited functionality on their basis (Fig. 6, 7).
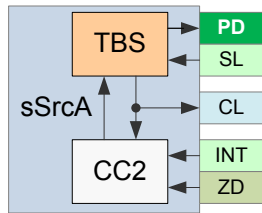

Fig. 6. Buffering system that doesn't use a possibility of stocks replenishment
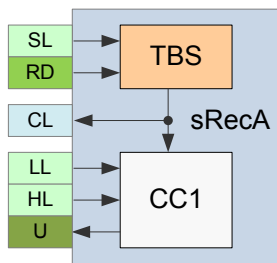

Fig. 7. Buffering system that doesn't use a possibility of stocks delivery

So, the sSrcA object, in this case, provides delivery of the buffered liquid. Functioning of the sSrcA object demands setting the initial stock rate. Such opportunity is provided with the installation of the corresponding value in the section of SL port.

Functioning of an object of sRecA1 is shown in receiving the already heated liquid from the heating system TechA2.

Thus, sSrcA – is the object equivalent to an object of sSepA in which the functions of the control kit CC1 are not used. If to designate sSepA with such limited functionality of L symbol (sSepA/L), it is possible to claim that the objects of sSepA/L and sSrcA are equivalent (sSepA/L<−>sSrcA).

Similarly, if in the sSepA object the functions of control kit CC2 aren't demanded, then, having designated the sSepA object, with limited functionality on the output, by the symbol R (sSepA/R), it is possible to claim that sSepA/R and sRecA objects are equivalent (sSepA-R <−>sRecA).

Limited functionality of the objects of sSrcA and sSrcP can be found in the existing systems. So, the pit together with mechanisms of delivery of a raw product is a system with naturally limited functionality of giving of input prod-

ucts. Even if such giving is carried out, it is not a result of control, but a consequence of natural influences.

Dumps together with the mechanisms of reception and laying of dead rock are systems with limited functionality on the output.

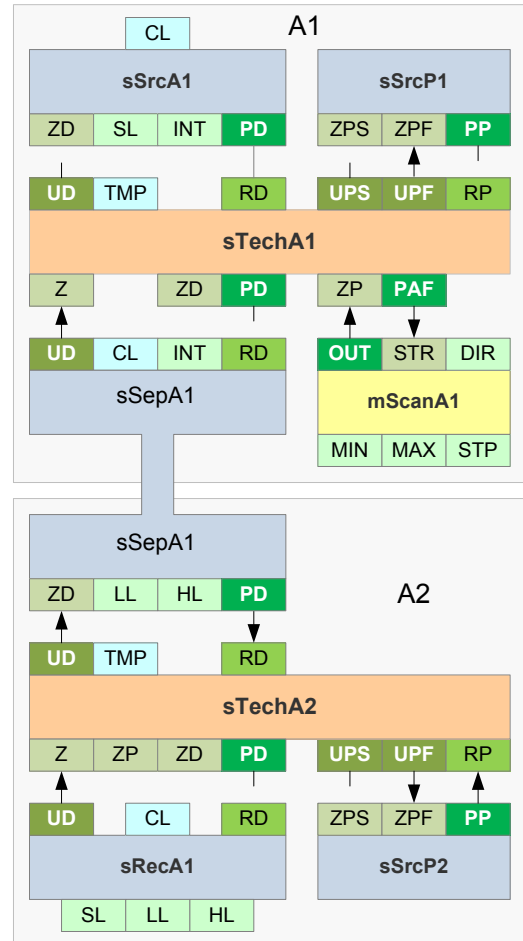Building and running the structure makes it possible to observe the interaction of systems (Fig. 8).

Fig. 8. The structure consisting of CS and the range of admissible controls CS sTechA1 scanning mechanism: MIN — initial control value; MAX — final control value; STP — control change step; OUT — output control; DIR —control change direction; STR — a sign of a stop of functioning of the studied object upon completion of scanning of the control range; PP — energy product

The working model of the structure (Fig. 8) is available in the reference [17]. The program designer is realized in the VisualBasicforApplication, therefore, before the start of the process, it is necessary to choose the average mode of safety allowing to run macros.

After completion of the process, the results of CS functioning are available on reports shifts sSrcA_R, sTechA_R, sSepA_R and sRecA_R.

Objects of sTechA1 and sTechA2 model the processes connected with the portion liquid heating. The object of sSrcA1 imitates the process of cold liquid supply, the sSrcP1 and sSrcP2 objects model the process of energy products supply, and the sSepA1 object models the buffering process of previously heated liquid. The sRecA1 object imitates the process

of accumulation of finally heated liquid and the mScanA1 object provides scanning of the field of available controls of the sTechA1 object.

Properties of the CS interactivity and independence of the controls change illustrate the results of the structure functioning (Fig. 9).

After the CS starts, until t1 the structure of A2 actively functions (Fig. 8). The stock rate of the sSrcA1 system doesn't change. It is connected with the fact that the stock rate of sSepA1 is higher than the lower level LL.

As the CS sTechA2 functions in the set mode, there is a linear-step change of stock rate of sSepA1 and sRecA1.

At the time of t1, the stock rate of sSepA1 decreases to level lower than LL, therefore, sSepA1 forms a high level control signal for sTechA1.
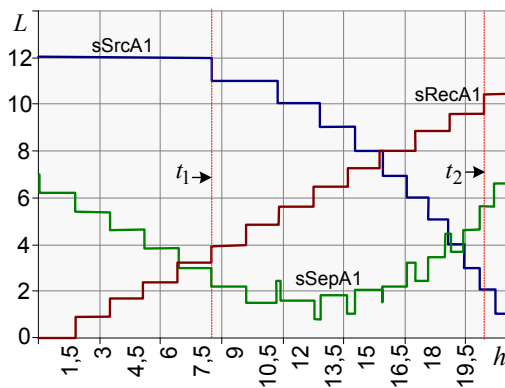

Fig. 9. Stocks change in buffering systems

As in the course of sTechA1 functioning the rate of energy product supply increases with each control step, the heating operation time is reduced (Fig. 10), and the stocks change of buffering systems of the structure A1 (Fig. 8) is nonlinear.

At the same time, this nonlinearity doesn't affect the processes of the structure A2.
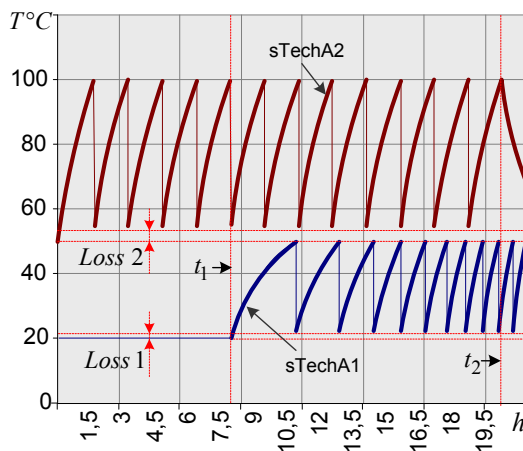

Fig. 10. Values of temperature change of the heated liquid in converting systems

At the time of t2, the A2 structure objects are passing into the passive mode functioning, and objects of A1 structure are actively functioning.

It happens just because the buffering system, in fact, provides a possibility of independent functioning of the objects connected with the ready-made product delivery in relation

to the processes connected with stocks replenishment. That is the buffering system performs the processes division function (separation), as it is displayed in its reference designation.

Thus, the research of the structure functioning results (Fig. 9, 10) allows to make the following conclusions:

– Each sTechX or sSepX object carries out one simple technological operation. The sTechX system provides the formation of the conversion product quality parameter, and the sSepX system is responsible for its quantitative indices (volume and rate of delivery).

– sTechX and sSepX objects are the objects of interaction.

– The object of converting type always interacts with the object providing buffering of the technological product and vice versa.

– The processes of the structure (sSepX-L, sTechX, sSepX-R) are functionally independent of the processes proceeding in similar adjacent structures.

Why sTechX and sSepX objects can be defined as the cybernetic systems?

1) Each of these objects is capable of providing performance of a certain simple technological function by interaction with similar objects.

2) Each of these objects is capable of responding to external changes [15] and, respectively, to optimize own control processes.

3) Properties of the object elements don`t come down to properties of the whole object.

In the structure (Fig. 8), it is possible to allocate two objects that are rather independent and can function independently for some time. These are A1 and A2 structures.

So, for example, if the sSrcA1 system has a reserve of cold liquid, the sSrsP1 system has stocks of an energy product, and the stock rate of the sSepA1 system is lower than the top level, then the sSrcA1, s SrcP1, sTechA1 and sSepA1/R systems will independently function until the top level of stocks of the sSepA1/R system is reached or sSrcA1 stock will be exhausted.

The research of the nature of the processes in the structures A1 and A2 leads to the conclusion that the concept "cybernetic system" can be used for objects with an essentially different architecture.

So, it is possible to assume that sSepX are really two independent objects, in which the technological products transfer path at the same time performs the information exchange channel functions. In the structure (Fig. 11), information about the ready-made product delivery by the sSrcX system, through the communicating vessels, becomes available in the sRecX system at once.
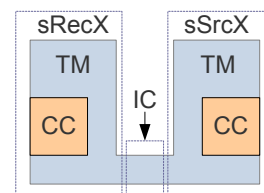

Fig. 11. Representation of the cybernetic buffering system as two simple buffering CS: TM — the technological mechanism; CC — a complex of control; IC — the interaction channel

The sSepX system can be defined by introduction of the concept "dual buffering system".

Indeed, if to investigate the processes of the sSepX system, it is possible to notice that it performs two technological functions. The sRecX system provides performance of the function of stocks replenishment, and the sSrcX system – the function of delivery of the buffering product to the consumer. And if in the systems of converting type such function is a service technological function, in the buffering sSrcX system, it can be defined as a basic technological function.

Based on a sign of internal coherence of the objects providing the buffering function (sSrcX, sSrcP, sRecX) and the products converting function (sTechX), and also on a sign of relative autonomy of structures of type A, it is possible to define the concept "autonomous CS" (Fig. 12).
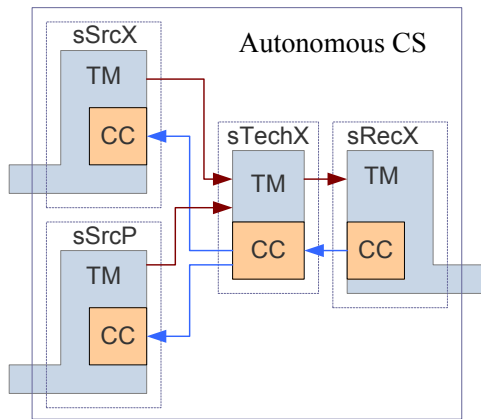

Fig. 12. Autonomous CS internal structure on the example of the liquid heating autonomous CS

In relation to the object (Fig. 12), it is also possible to speak about its integrity and emergency. It is connected with the fact that any internal object of an autonomous system, despite its interactivity, can't function independently.

Representation of the sSepX system in the form of two sRecX and sSrcX systems leads to a new idea about simple system properties. So, the systems of sSrcX type aren't optimum.

Definition 2. The simple cybernetic system is the complete object providing performance of one basic technological function in the course of physical interaction with the environment, interaction with the system environment in the form of the CS of another type and control adaptation by parametrical search engine optimization for the simple CS that have the optimization function.

Definition 3. Dual buffering CS is the object providing independent realization of the stocks replenishment and delivery functions, and information exchange between the interacting objects elements is provided by means of independent tracking the buffering mechanism stock rate by these objects elements.

Definition 4. The autonomous cybernetic system is the complete object providing autonomous adaptive and optimum performance of basic technological functions. Such basic functions are ensuring qualitative and quantitative parameters of the ready-made product of the autonomous system. The autonomous cybernetic system consists of simple cybernetic systems. Performance of the functions of the autonomous system is provided in the course of its physical interaction with the environment and implicit interaction with adjacent autonomous CS.

On the basis of the conducted researches, it is possible to offer the cybernetic systems basic classification (Fig. 13).
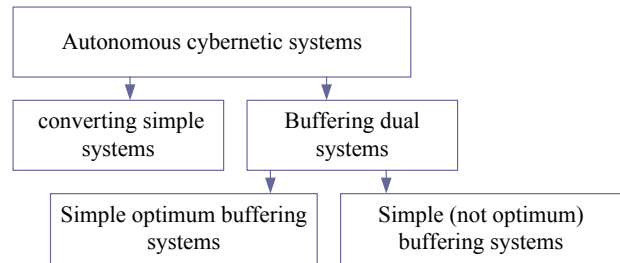

Fig. 13. Cybernetic systems basic classification

As at this investigation phase it wasn't succeeded to synthesize a larger cybernetic unit possessing some general system sign, the autonomous system can be considered as the uniting class.

5. Discussion of the results connected with the research of the cybernetic systems interaction process

For carrying out researches, the models of the objects, which are determined by the concept "cybernetic system", were created. It is connected with the fact that each object, except sSrcX type objects, provides the function of interactivity and possibility of adaptive expediency function realization. Each CS performs only one simple function of converting or buffering.

Such approach has allowed creating the structure within which the independent change of the CS control parameters is possible.

In turn, the research of processes of different types CS interaction has allowed defining the new type CS structure – the "autonomous CS".

The lack of the research can be considered the fact that model, but not real objects are investigated as noisy signals of sensors of physical objects introduce amendments in a real picture of the interacting systems. This, in particular, results in the need of using quite difficult methods of search engine optimization.

The division of many systems into two classes, the definition of CS, and also representation of the CS class in the form of two subclasses: the converting CS and the buffering CS open opportunities for correct definition of systems within the class, their properties, parameters and structure.

As for the whole class of CS, the understanding of their functions, structure and properties opens the opportunity for evidence-based definition of such concepts as "complex system", "big system", "controlled system", "open system", "supersystem", etc.

For example, a complex CS can be defined as the CS within which a certain function is also performed by the CS, or many functions of which are performed by many CS.

The conducted researches show that the property of hierarchy isn't inherent in the CS. So, it is impossible, having divided the CS of one class, to receive two structures consisting of systems of the same class.

In most cases, the existing systems are projected without the use of their interaction opportunities. Respectively, the possibility of a full parametrical optimization of system technological processes is excluded.

The conducted researches illustrate potential opportunities of design and creation of the automated productions of new generation constructed on the system objects interaction principles.

Results of researches are a continuation of earlier conducted researches in [13-16]. Further researches will be directed to researches of interference of adjacent systems and properties of their internal optimization.

6. Conclusions

1. Researchers have shown that the concept system unites a class of static and dynamic systems. The dynamic systems are defined as the concept "cybernetic systems" in the work.

2. It is established that in the course of functioning each cybernetic system provides performance of one basic technological function. It is also established that processes of optimizing adaptation, for systems of converting type, can be realized only if each such system interacts with the buffering systems presented in an explicit form. It is established that the information exchange channel of buffering simple systems, within the dual dividing system, is the buffering mechanism. Information exchange between simple systems is provided by control with each stock rate buffering simple system.

3. It is established that in a tree of the interacting systems it is possible to allocate the object formations presented by simple systems of two types that are defined in the work as autonomous systems. The feature of processes of such autonomous systems is their independence of processes which happen in other autonomous systems. Such feature provides a possibility of implementation of parallel processes of optimizing adaptation.

4. The definition of the categories "degree of freedom of management", "simple CS", "dual CS" and "autonomous CS" is given and basic CS classification is offered.

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