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CYBERNETIC ACCESS TO MANUFACTURING SYSTEMS

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ABSTRACT
Every day we meet a variety of systems and technologies that seek to understand and successfully manage them. Special emphasis is imposed in the area of those systems and technologies that contribute to the production of new material goods which contributes to the creation of new additional value. Optimal management of such systems come from cybernetic access and cybernetic manage them of such complex systems. Observing manufacturing processes from the cybernetic perspective we see three levels: level of production, the level of management and decision – making level. Explaining that level in terms of cybernetic developed rudimentary operating system as the basic production constructor. Passing of such a basic element of today we have the opportunity to study the complex network of production systems, and all the aspects cybernetic.

Keywords: *autonomous operating system, elementary work system, elementary virtual systems, complex adaptive systems, complex manufacturing networks*

1. UVOD
In practical life we dually encounter with different operating systems and technologies. By the laws of nature we are trying to manage them alone or witch other work processes. Special role in this effort have production systems that contribute to the creation of new value. Structuring and management of such systems is very complex, because today's production systems are valid for complex systems without a formal mathematical description of their properties. Classical systems theory has no concrete answers to particular systems. Concrete results may be closer to the cybernetic individual manufacturing systems. Development of cybernetic man began to develop the means to manage and matter and energy, which is the use of information technology.

2. CYBERNETICA IN MANUFACTURING SYSTEMS
The scope of the cybernetic application area is very extensive and they have developed various branches cybernetic that are tailored to specific areas of research. Today the most important branches cybernetic:

- Information theory,
- Coding Theory,
- Theory of formal languages and grammars,
- Theory of random processes,
- Theory of statistical solutions,
- Game theory,
- Mathematical logic,
- Theory of algorithms and programming,
- Construction and use of computer equipment,
- Mathematical models and instruments,
- Statistical processes,

- Determined by large systems,
- Indeterminate large systems,
- Great and agreed systems,
- Automatic control and regulation,
- Robotics,
- Recognizing patterns and receptors,
- Machines capable of learning,
- Machines with the ability to only of self - organizing,
- Reliability theory,
- Slots with auto – tuning,
- Theory of mass serving,
- Theory of man – machine communication.

3. CYBERNETIC DISPLAY MORE MANUFACTURING SYSTEM

Production processes in the spirit cybernetics model Peklenik [1][2] and asserting his three levels, production level, management level and the level control. In level of ongoing production processes relating to products and production facilities, such as design, planning, control, processing, assembling, transport etc. Management level, the processes that support the production level, for example, management, and research and development sales, procurement and marketing. On the decision's level is making strategy and making strategic decisions [2].

To structural complexity ruled Peklenik introduces the basic building elementary of the elementary working system. For mastering the complexity of production networks are Butala and Sluga [3], introduced the concept of an autonomous system of production.

3.1. Elementary working system

Elementary work system (EWS) is the basic production constructor systems. Their cybernetic model displays 1. Elementary operating system consists a process, device for implementing the process and the subject. EWS is clear defining what are the basic elements of the production, without them you cannot do the job: process witch input and output partners, NIP, body and output. Concept EWS is also important from the stand point of managing the complexity of the structure of production system.

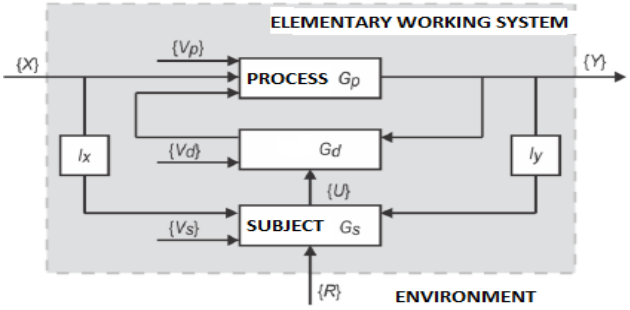

Figure 1. Elementary working system [2]

EWS is the least possible composition capable of performing jobs. If we exclude any part of the EWS, transforming input into output is not possible. Further division of the elements does not make sense because it increases volume [4].

3.2. Distribuiranie adaptive manufacturing system

Concept of adaptive distributed production systems (ADMS) is based on the concept of complexity adaptive production systems (CAMS), and the concept of dynamic production structures [2]. Concept of adaptive distributed production systems (CAMS) came up as response of problem hew the structure of production system adapts for specific goal(e.g. product, realization) and how the system can adapt the structure for extremer or internal disturbances. Butala and Valet argue that the key difference between ADMS and other approaches [5][6] is in phase of demolishment of system. In other approaches are the main building blocks for manufacturing of system of person that represents production functions and / or physical entities. That person represents production structure, which limits the reduction complex. ADMS controls the complexity effectively because they are the building blocks a systems – Elemental Work Systems – EWS [1]. To achieve acceptable efficiency of the system is structure. For its realization is of the concept of ADMS, it is necessary to define the basic building blocks of the self – learning, which have the ability and skills to perform certain

manufacturing processes. In this context, as the basic element was selected elementary operating system.

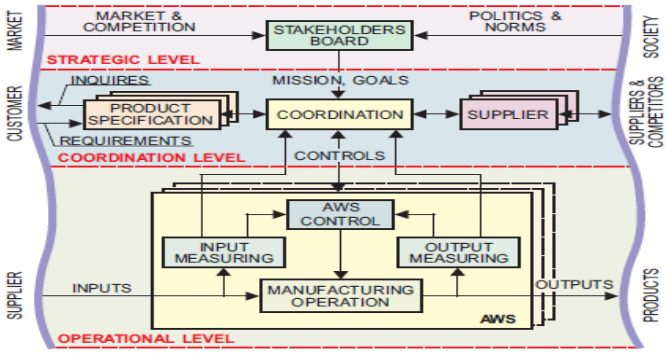

Figure 2. Adaptive distributed manufacturing system [5]

3.3. Autonomous working system

Autonomous working system is defined surrounded with technological functionality and corresponding management [7]. Technological functionality is basically building as an elementary operating system, which by definition [2], consist a process, device for implementing the process and subject. Elements are structured in two internal and one extremer control loop, Figure 3.

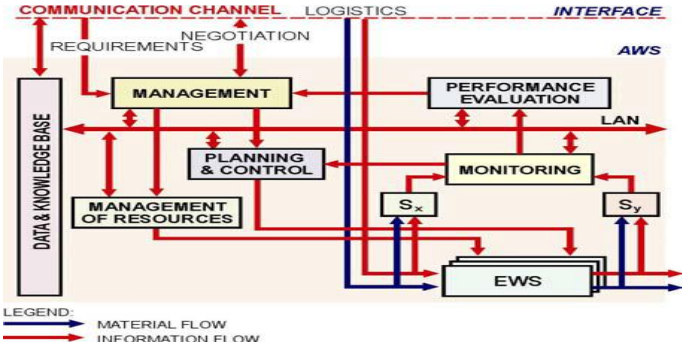

Figure 3. Autonomous working system [3]

The first inner control loop enables the control of real time. The second control loop enables management system based on parameters that measure critical dimensions, derived on the basis of information about events and situations in the elementary work system, and are used for quality making decision in the framework of resource management.

3.4. Self – learning adaptive working system

Concept of adaptive operation in autonomous working systems that learn by self in based on a mechanism of self-learning.

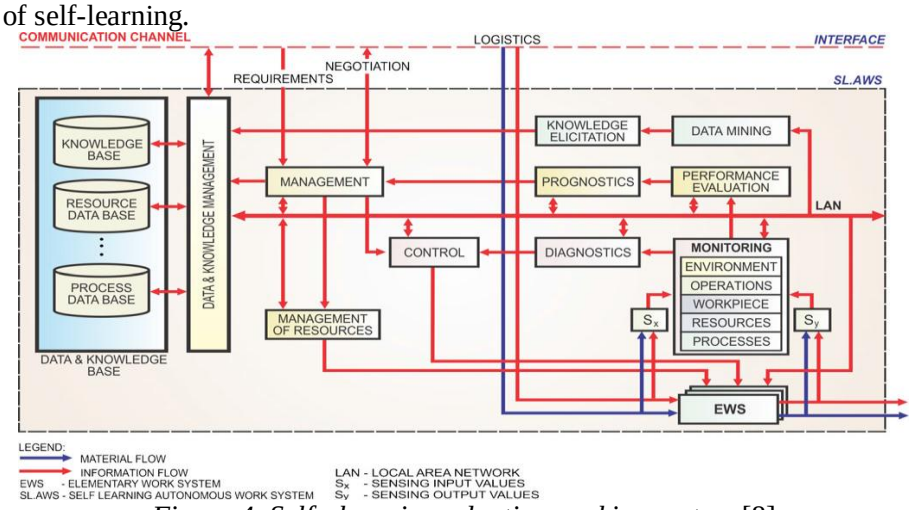

Figure 4. Self - learning adaptive working system [8]

Structure of adaptive control systems that learned were was discovering in Figure 4. SL. AWS based on autonomous working system AWS [8]. Looping learning is based on a database where the stored data are collected in loops in real time during production operation. Database contains information about the processes, resources, work piece, operations and his environment. Database represents input for digging data. The results digging data are used for removing knowledge. New discovered knowledge store in a model of knowledge base and managed to further use.

3.5. Manufacturing networks

Production networks and network connectivity are topics of research of many authors. Successful use of tree communication technologies is the main factor of success. A development introduction communications network in production represents development innovation in manufacturing in the last ten years [9]. They are known to approaches in structuring networks [1], production network, which node is dropped manufacturing companies and production network whose nodes are autonomous units. Lack of first approach is that a node, namely autonomous, but hierarchy complex structure as a result of series messenger communications channels and levels do not respond are indulgent to resist control. Given this, the complexity of the network by the number of partners involved increases. In effort to cope with the structures of complex production networks, Butala and Sluga proposed model concept of autonomous systems AWS, representing a node. Butala and Sluga of [3] proposed model B2MN (Business – to – Manufacturing Network). B2MN model systems link production environment with jobs.

4. CONCLUSION

Approaching production systems in the spirit cybernetic are developed approaches that presented in these work. The threshold of a new industrial and revolution – based cyber – physical system imposes a necessary development cybernetics approaches to connects the real and the virtual world in the production systems. Interaction production networks and basic – shapes of virtual working system future investigation will be directed towards the description between the real and the virtual world, where interaction with humans are unavoidable. So interaction creates a complexity that is required to rule, and thus develop new structural models for new production paralleled. Role of social aspect in the new production systems is an inevitable factor with which we must face and detailing describe.

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