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APPLICATION AND CLASSIFICATION OF INDUSTRIAL ROBOTS IN THE WOODWORKING PRODUCTION

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ABSTRACT
Industrial robots have one of the key roles in automatization of manufacturing processes. The theme of this thesis is the classification and application of industrial robots in the wood and furniture industry as well as the analysis of the presence of industrial robots in developed world economies. It is presented the total delivery of industrial robots for the period from the year 2000 to the year 2011. Conducted analysis demonstrates the specifity of the implementation of industrial robots in the wood and furniture industry, in comparison to other branches of industry, in fact, it is evident that the degree of implementation does not directly depend on countrie s technological development and that some countries have recognized their own potential chance for development in this branch of industry. It is noticeable that the trends of robotization are very different compared to the robotization in the wood and furniture industry. This work presents the comparative analysis by continents and regions for the mentioned period of time, both on an annual basis and on the total number of industrial robots delivered in the wood and furniture industry at that time.
Key words: robot, industrial robot, wood and furniture industry, automatization, wood and furniture manufacturing

1. INTRODUCTION
Production management plays the key role in the planning business, therefore it has the influence on the overall results of operations of any system in the manufacturing process. Development of technology and automation has opened up many possibilities in production processes. In that sense a man gets the opportunity to use and implement most of ideas. On the other hand, even though the conditions of production have improved, a man is encountering with jobs that are harmful to his health and also with jobs that are very monotonous or that are repeated in short cycles. It goes without saying that the accuracy and the quality of products is expected – especially in the final processing. Usage of robots in the woodworking industry includes simple operations as well as those more complicated – from automated assembly of products, storage of products, up to surface finishing and processing, sanding, grinding, polishing and sorting of products. We can say that there is almost no area in the woodworking industry where robots cannot be used or find its role.

2. APPLICATION AND CLASSIFICATION OF INDUSTRIAL ROBOTS IN THE WOODWORKING PRODUCTION

2.1. Handling

Transporting the workpiece and handling the structural elements takes one of the central places in the production processes. Increasing number of robots is used for various kinds of tasks where robot is performing the required functions rapidly, continuously and reliably. Robots have a high degree of flexibility, therefore, they are able to redirect the production cycle to other tasks at any time, with minimal interruptions. Robotic system for automatic serving of machines is fully automated and can operate independently. Robotic system is designed in accordance to customer requirements in order to adapt to a new or to already existing tool. In cooperation with the client the most appropriate type of serving is chosen, after that, the type of robot is being selected (the one that fits its configuration), then, the size and load capacity is chosen (up to several hundred kilograms).

Regardless to the type of the product that is being manipulated – small and compact or large and cumbersome, lightweight or heavy, soft or rough, gentle or robust – so called the pallet robots are used. Robotic palletizing systems are fully automatized, therefore they are capable of working independently.

Palletizers are adjusting to the specific needs of the lines for palletizing the manufacturing plants enabling the palletizing of different forms and materials.

Directly on the pallet the scheme of palletizing is quickly and easily formed according to scheme provided by the employee.

2.2. Editing

It is very common that in the furniture manufacturing the operations of assembling are often repeated. Many of these operations are inexpensive but take up some specified period of time, so that the automation of these tasks over the long run is almost unavoidable. For the example, in some production systems montage takes over 50 percent of costs. Simple machines are often programmed only to a single task and are constructed to create only certain items, so it is quite clear why robots are increasingly represented in the woodworking industry. The possibility of the individual configuration of the robot and the possibility to change the desired tool satisfies the all the aspects and needs when it comes to mounting in the woodworking and furniture industry. Also, it is possible to achieve a high precision and the same value of the external forces – which is crucial when it comes to sensitive materials and components. In short, we can say that by introducing the robots in the woodworking industry we attain to:

- Optimize the production process
- Reduce the manufacturing costs
- Increase the productivity
- Increase the quality of the final (finished) product

Mounting the robotic system is fully automatic and autonomic which means that these systems are able to work independently. Some of the particular characteristics of the robotic systems for mounting are efficiency, reliability, flexibility and the simplicity of use. When it comes to mounting the drawers we have a complete solution for mounting the sides – including the frontal parts. The drilling of the frontal parts and the mounting of the drawers are taking place simultaneously, and then the holders for drawers are mounted. It is important to note that some companies provide drawers for various furniture manufacturers because they are specialized in this sort of work.

By using simple, uncomplicated and intuitive program for surveillance, which is installed directly on the moveable monitor, allowing the user to maintain a complete control over the robotic systems, engineering solutions for robotic assembly of products particularly come to the fore. Especially comes to the fore the possibility of rapid changes in the type of production and learning the new forms of production, enabling the system for mounting to be also used for the small series of production.

2.3. Processing

Economically speaking, the automation is much more interesting if we can accomplish complicated and valuable functions. Robots with their kinematics can meet the processing of workpieces. They are specific because of its complexity. In the woodworking industry there are areas in which the robot, as the final factor, finds its place. Robot`s flexibility and its range emphases robot`s versatility. Great advantage is observed in functions of handling and processing, regardless of whether a workpiece, a tool or both are driven by a robot. With the additional capabilities of changing the tools independently these functions can continue to be expanded.

2.4. Coating

There are many reasons why coating should be done by a robot. It is a very "dirty" work. The atmosphere in the sections for painting, pasting, etc., is saturated with evaporations from the substances being used. They could be very toxic and carcinogenic. Given that these substances are often combustible – there is a high risk of fire. For all these reasons it is very important to liberate people from these dangerous jobs. Except the humanization of the work, robots bring a number of advantages in these jobs, such as:

- Improved quality – given that robot is able to provide a very proper control when coating, bonding, etc.
- Material savings can be achieved by application of the color/glue/fugue evenly
- Robotic cell does not require complicated ventilation system – this achieves energy savings
- Increased productivity can be achieved by reducing the participation of human labor and by improving quality

From the standpoint of control system the flexibility and the easy modification of the program is required, which allows adjustment of the robot to various objects that must be processed. Mechanical configuration of the robot which does coating is characterized by slenderness and its reach. This kind of configuration allows the robot to access all the surfaces which need to be processed, even when pulling through vents is required.

3. THE DELIVERY OF THE INDUSTRIAL ROBOT IN THE WOODWORKING INDUSTRY FOR THE PERIOD FROM THE YEAR 2000 TILL THE YEAR 2011

The following diagrams show the delivery of the industrial robots in the world and also the delivery of the industrial robots in the woodworking industry. We are able to conclude that the most dominant country is Germany, when it comes to the delivery of industrial robots for the period from the year 2000 till the year 2011 and that 30 percent of total delivery of the industrial robots in the world refers to Germany. It is also very clear that Italy plays an important role too, and that this branch of industry, despite recession, is very important for country`s overall economy. Scandinavian countries are per capita the strongest by delivery of the industrial robots in the woodworking industry. There is no need to emphasize that Scandinavian countries are strongly connected to this branch of industry due to their tradition, continuity and quality.

It is not hard to conclude that we cannot compare this branch of industry to other branches and that the domination of Europe stands out, compared to other world economies. It is to expect, because the tradition of the final wood processing and furniture manufacturing is closely connected to European countries.

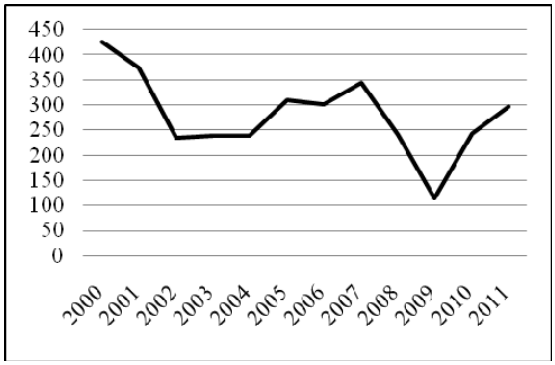

Figure 1. World, the delivery of the ind. robots in the woodworking industry, 2000 – 2011

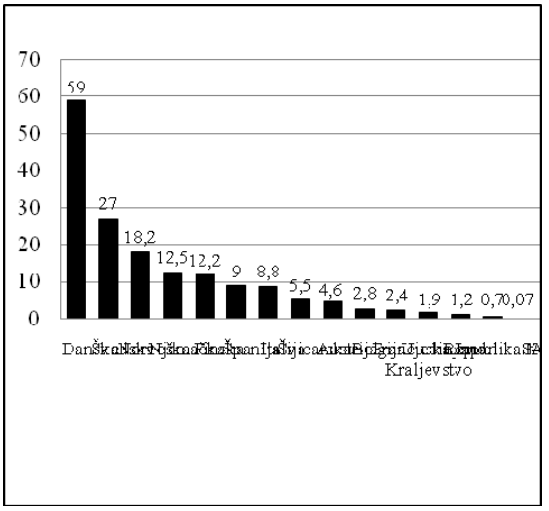

Figure 2. Top 15 countries by delivery of ind robots per 1 mil. of citizens 2000-2011, wwi

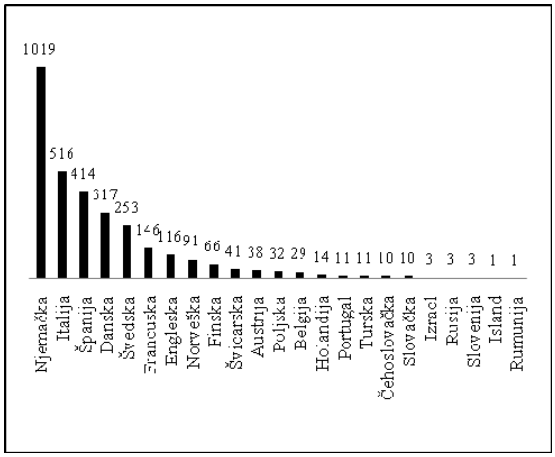

Figure 3. Europe, the total number of delivered ind. robots by contries, 2000 – 2011, wwi

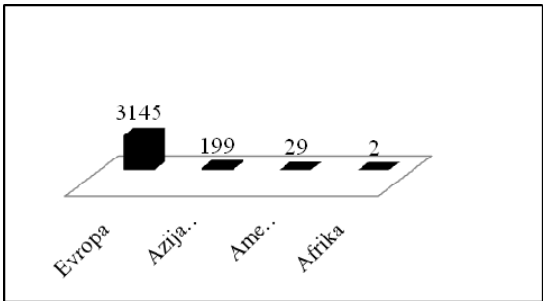

Figure 4. The number of delivery of the ind. robots in the woodw. ind., 2000 - 2011

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4. CONCLUSION

Exploring the market, having clear goals and visions, gives an enterprise the opportunity to introduce industrial robots in the production process. The leading systems are ready to continuously sophisticate the technology of production. The woodworking industry stands out due to its requirements for high flexibility in production process, therefore, there is a need of constant cooperation with the manufacturers of robots.

5. REFERENCES

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