Application of robotic systems in production: new opportunities for development and risks

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Abstract. It is impossible to imagine the modern world and the near future without robots. They have already penetrated into absolutely all spheres of our life, including work, are used to perform various functions, which previously only a person could cope with. Automation and robotics of work processes in production, reduces the impact of human factors and leads to improved product quality, while reducing costs.

Today, according to Russian experts, 71% of working time is related to human labor, and the remaining 29% is performed by machines. In 5 years, this indicator is expected to change to 48% and 52%, respectively. The rapid aging of the population of the developed world, the development of new technologies and the cheapening of electronics contribute to the introduction of robots in production, so as not to reduce economic activity and labor productivity.

In recent years, the mass introduction of industrial robots in different countries has given up to 10% of GDP growth. Therefore, the transition to the use of robotic production systems is defined as one of the priority directions of development of the domestic industry. Before the crisis of 2014, the robotization of the industry was taking rapid steps, but the weakening of the ruble slowed this process.

The development of robotics in Russia meets the goals of the national project "Digital economy" and it is expected that by 2024 28.8 billion rubles will be allocated from the budget and 73.8 billion from other sources.

At the moment, the Russian Federation lags behind the world leaders in the number of robots used in industry, and the overall ratio of the number of industrial robots to the number of workers is very low. According to 2017 data, the structure of the Russian market for industrial robots is as follows: 80% of implementations were for robotic complexes (RC) for welding and cutting metals, in second place is the movement and stowage of cargo. Milling, painting, measuring and other types of RC are less in demand [1].

As noted by Eduard Prodikov, a specialist in robotics, due to the strong backlog in robotics, it is almost difficult in Russia to safely switch to a four-day working week, announced recently by the Prime Minister of the Russian Federation.

We have a shortage of qualified workers and specialists in our country. Also, labor productivity is low compared to developed countries in Western Europe, Asia, and the United States. Despite overall competence, effective leadership, and a positive climate in the team, the results are ultimately poor. A
2017 HeadHunter study found that the reasons for poor performance among employees of St. Petersburg companies are the following factors: inconsistency of work between departments (57%), low salaries (46%), incomplete use of personal potential (42%), time and stress (41%), lack of praise and rewards for good work (38%), noisy colleagues and their chatter (33%) [2].

Industrial robots have very high positioning accuracy, and repeatability makes it possible to achieve the desired level of product processing while reducing production defects.

By eliminating the human factor in technological processes, the percentage of operating errors is significantly reduced. This approach has a positive effect on the growth of the company's performance and the overall performance of the industry [3].

We can use modern industrial robots in many processing operations where it was previously impossible to imagine: milling, grinding, polishing, trimming, deburring and cutting. They can be applied to all industries, and they are also available for small and medium-sized businesses, allowing them to develop even with small investments.

Industrial robots are becoming more accurate and robust every year - today it is possible to position the robot with an accuracy of several hundredths of a millimeter. And more advanced controllers make it possible to control several robots at once. This made it possible to use robots in industries where only specialized CNC machines could be used.

To date, the most common area where it is applied to industrial robots is performing repetitive operations on the production lines: welding, moving parts, Assembly, painting, etc. On these lines the robots operate in cycles, and carry out the same operation, replacing routine human work. This allows you to: increase productivity, reduce the factor of human error and injuries, and automate the process as much as possible.

In the process of creating parts, industrial robotic systems (ORS) allow you to save a large amount of materials and raw materials (with a rational organization of the workflow) [4].

But this is not the limit of possibilities: since more expensive robotic systems can make multi-axis movements along the required trajectory, due to the robot's six-power freedom. Thus performing any processing that was previously possible only on specialized machines.

When properly organized, all these operations are managed by a single operator. PRS makes it possible to carry out work where it is difficult and dangerous for a person. They act accurately, accurately, and quickly. They can work 24 hours a day, with the lowest light and temperature of the shop, thus saving on utility costs [5].

Despite all the advantages of using robots, they cannot fully replace humans. Many functions are not yet possible for them, they do not know how to think, analyze, and draw conclusions, and more complex operations require very expensive systems that are not cost-effective to use.

Also, we must remember the axiom: the reliability of any system is equal to the reliability of the weakest link. Using inefficient links and low-cost solutions with unknown quality and manufacturer in the system can lead to huge expenses and downtime if they break down.

The vast majority of working Russians have a negative attitude to robotics, and they can be understood: after all, the introduction of robots into production will lead to the fact that someone will be left without a job.

Robots will leave millions of people without work, blockchain will be able to perform some functions of the state, cryptocurrencies are able to displace banks, artificial intelligence in General threatens to put a fat point on the history of mankind. It is necessary to understand that progress cannot be stopped, it is necessary to find ways to solve the upcoming problem in a rapidly changing world [6].
Robotization will deprive a large number of people of jobs, but only in specific activities. This is not the first time that humanity has faced this problem, and it is necessary to decide where to send people: mechanization in agriculture - the people went to the industry, automation in the industry – the people went to the service.

But the risks are not related to potential layoffs, but to the inability to retrain and create new jobs in a short time. However, there are also some thoughts that the robotization of the industry will take place very slowly, due to the low wages of the labor force in Russia.

But in this case, in the conditions of increasing labor productivity and the introduction of robotics in the developed countries of the world, our domestic goods and services will lose their competitiveness. Progress will eventually lead to the displacement of traditional industries by automatic factories. Therefore, it is necessary not to resist automation processes, but to "swim" in parallel and look for opportunities [7].

Only by keeping up with the times can we become successful. Stabilizing the technical process, improving the accuracy of processed parts and the speed of achieving goals - all these are just a small part of the reasons why companies around the world are implementing robots in production.

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