

Integration of the industrial robotics in the food industry

Victor Yegorov, P. Golubkov

The food industry plays a significant role in development of economy of the state as occupies one of important places in production. Technological features of this branch allow to carry out fast change of the range of products at a minimum of expenses.

On similar productions packing of finished goods is difficult process from the organizational, technical and economic parties. The world practice shows: for mass productions the optimum solution of the problem of transport packing consists in its maximum automation. The robotized equipment for this industry represents as the automated production lines, and various manipulators. Among the last, manipulators packers are considered the most widespread. They serve for recognition of moving at the same time different types of production and their distribution in the streams. The robot sorter operates thus: receives a subject, reads out its stroke a code, defines mission of object and puts on the corresponding tape of the conveyor. Such industrial robots, guarantee the high speed, accuracy and overall performance. Also, in food and processing industry, the important place is taken by robots formers. Such cars establish model for molding, fill in it with the necessary mix, and watch consolidation of a form. Thus the role of the person in control and service remains to the extremely important.

Thus, the important role which play the automated mechanisms in the industry in general, and in the food industry in particular, is defined first of all by simplicity and efficiency of their operating mode. The continuity of action is the factor providing more high efficiency of cars so - working processes. At the modern enterprises robots became extremely important as they are capable to replace the person when performing of actions, dangerous to its health, increasing the accuracy and speed of process of production [1]. Today prospects of use of industrial robots in production technologies are indisputable. On volumes of introduction of robots in the food industry it is possible to allocate leaders: Kawasaki Robotics [2], Yasakawa Electric [3], ABB [4], Fanuc [5], Kuka [6].

Arguments in favor of use of industrial robots in the food industry:

1. **Cut in expenditure.** ABB, KUKA and FANUC companies are leaders in production of the modular automated systems and industrial robots. More than 20 000 industrial robots of these companies are installed worldwide. Use of industrial robots allows to cut direct and overhead costs that promotes significant increase in competitiveness of the made production. Industrial robots help to exclude the expenses connected with workers not only from the point of view of a salary, but also the additional expenses connected with training, health and safety of employees and administrations;

2. **Improvement of quality of production.** Integration into production of an industrial robotics allows to maintain high quality of production, in a type of minimization in the course of production of "a human factor". The highest accuracy of processing of products provides with industrial robots to production steadily high quality;

3. **Improvement of working conditions of employees.** Use of industrial robots allows to improve working conditions of the personnel considerably. Work of the personnel of the enterprise in the dangerous conditions connected, for example, with high temperatures and a dust content can be minimized.

4. **Increase in outputs.** Industrial robots can work in output and night shifts with the minimum control that will provide significant growth in production and will allow to perform work in the most short time. Modern robots can be programmed on processing of new products in the autonomous mode, providing thereby process production;

5. **Flexibility of the organization of production.** Use of robotic complexes considerably increases flexibility of the organization of production. After the robot is programmed on performance of the demanded processes, it can still be switched easily from one task to another, thereby having increased profitability of investments due to use of a robotics by production of various products;

6. **Reduction of quantity of production wastes.** By means of robots, quality of production released by the enterprise considerably increases;

7. **Increase of safety of work.** Integration of an industrial robotics reduces probability of the accidents caused by contact with machines or with other potentially dangerous production equipment;

8. **Optimization of production space.** Industrial robots can be placed on rack systems, on walls and on a ceiling. They can be also programmed for work in limited space that significantly reduces actively operated industrial space.

Industrial robots are designed for the solution of a wide range of technological tasks, including tasks at which decision equipment dimensions are prime. The robot is ideally suited for technologies of assembly/laying/movement. Opportunity to be established at any angle, expands the list of possible use (so-called integration) of the robot.

Industrial robots became not only one of driving forces of automation, but also one of the major means for profound social and economic changes in the sphere of work. Development and deployment of industrial robots solutions of tasks of complex automation at the industrial enterprises already allowed to move to new, higher scientific and technical level, to redistribute functions between the person and car and considerably to increase labor productivity [7].

The technique of determination of robot's integration level proceeding from an indicator of "density" of robots on 10 000 people working at manufacturing enterprises is standard. The average world indicator makes 60 robots on 10 000 people, thus in South Korea it reaches 400 robots, in Japan 340 robots, in Germany 280 robots. In Ukraine and Russia the robot's integration level makes less than 10 robots on 10 000 people [8]. During 2015-2017, sale of industrial robots, by estimates of a number of experts, will increase approximately by 6% in North and South America, and also in Europe, and approximately for 16% in Asia / Australia on average in a year. Besides, at the end of 2017, about 2 million industrial robots will be involved at plants worldwide. In the next years there was a considerable impulse of sales of industrial robots in China. In 2014, sales increased to 50 000 units. During the period from 2015 to 2017, height not less than 25% on average in a year, about 100 000 units in 2017 is expected. By 2017, more than 400 000 industrial robots will be installed at plants of China.

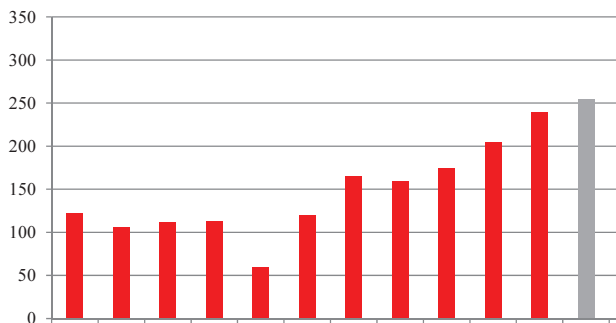


Fig.1 The schedule of deliveries of industrial robots for 2005-2015 and the forecast of deliveries with 2014 to 2017 years, thousands of pieces [9].

CONCLUSIONS

Surprising achievements and innovative technological development in industrial production caused essential increase in demand on robots within the last four years, especially in automotive industry. Many of the appeared technological capabilities, still aren't used fully. A huge number of energy, costs of service, space and investments into the equipment it is possible to save if, for example, the controller of the robot was simply service of cloud computing with which all other robots on production have communication.

REFERENCES

- [1] <http://robotics.ua>;
- [2] <http://robotics.kawasaki.com>;
- [3] <http://www.motoman.com>;
- [4] <http://www.abb.com>;
- [5] <http://www.fanuc.co.jp>;
- [6] <http://www.kuka.com>;
- [7] <http://www.robo-hunter.com>;
- [8] <http://robotforum.ru>;
- [9] <http://www.worldrobotics.org>.

Contact information:

1. PhD Yegorov Victor, ORCID: [0000-0003-4699-834X](https://orcid.org/0000-0003-4699-834X), ResearcherID: [I-6963-2015](https://orcid.org/I-6963-2015), Odessa National Academy of Food Technologies
2. Golubkov P.S. ORCID: [0000-0002-7663-6772](https://orcid.org/0000-0002-7663-6772), ResearcherID: [J-2332-2015](https://orcid.org/J-2332-2015), Odessa National Academy of Food Technologies

Докладът е рецензиран.