

ROBOTIZATION OF WELDING PRODUCTION — ARGUMENTS «FOR»

In the recent past, in the engineering industry of Ukraine a persistent stereotype has emerged that industrial robots are expensive machines, which require a highly professional personnel and should be rationally applied in the conditions of mass or large-scale production. This myth is based on the following facts.



Robotic complex for welding of rear tail boards of dump trucks

Firstly, when calculating the effectiveness of implementing a robotic and technical complex (RTC), incomplete methods are often used. They take into account a direct piece-rate salary of welder, but at the same time the following items are missing:

- direct and indirect taxes on basic salary;
- additional salary;
- expenses for maintenance of back rooms (changing rooms, showers, toilets, canteens, etc.);
- coefficient, accounting for the probability of continuous operation of the RTC due to the absence of working shifts, vacations, sick leave, unproductive losses;

- reduction in costs for welding consumables (wire, shielding gas) and electricity;
- reduction in labor intensity for cleaning of welds;
- elimination of costs for training and recertification of qualified welders.

Secondly:

• unwillingness and inability of personnel at the enterprise to master the new technological processes. Hence, the forced administrative measures emerge, like additional inviting of new specialists to the existing staff, which threatens the recoupment of investments and creates antagonism in the team. Here it should be mentioned about the problematic nature of inviting the programmer-operator of the RTC of an appropriate level of training to the project.

Thirdly:

• it is believed that robotic welding is intended for large volumes of products — for example, mass production of cars. At the same time, the model range should not change during several years;



Robotic complex for welding of transverse carriage beams



Robotic complex for welding of container walls

- lack of flexibility of RTC. Most managers believe that their enterprises produce rather small batches of goods in order to invest in a robotic system.

Fourthly:

- robotic and technical complexes often break down, their repair is expensive and takes a lot of time. It is difficult to find specialists in repair and maintenance.

These are the main myths which make us think that industrial robots are expensive technologies which require a highly professional personnel and should be rationally used only in mass or large-scale production.

Now let us look how things on the outlined problems are going in reality.

On the first problem. By applying the real basic data on the cost-effectiveness of using RTC of the own enterprise, you will have the expected payback period of investments, which will help you to make a well-grounded decision. A recommendation is that basic data should reflect real values and not be «far-fetched».

As a result, you will receive a payback period on investments and can make a well-grounded decision.

On the second problem. Since the appearance of welding robots, manufacturers have constantly improved the process of writing working programs, striving to simplify it as much as possible and at the same time to make life for the future operator-programmer easier.



Robotic complex for welding of heating boilers

Today, this problem has been solved with the help of the program Kinetiq, developed by the Robotiq Company (Canada), a fundamentally new program for training robots. The similar programs also exist at other developers. This technology allows the operator to manually move the welding torch of the robot along the entire weld line, and then, using the remote control, to entry the movement trajectory into memory and determine the welding parameters.



Robotic complex for welding of side boards of dump trucks

On the third problem. Modern RTCs are capable to quickly replace tools in automatic mode. Therefore, it is advisable to surround the robotic welding device with various removable tools. The robot can be programmed for all day operation only in position A with a specific set of tools, or alternately in positions A, B and C, producing small batches of each part. The sockets for tools are designed for quick replacement. The operator only needs a couple of movements to completely change one set to another. The robot stores many different programs in memory and it remains only to switch-over the program to make the robot start welding of a completely different part.

Here are just a few examples of RTC configuration.

You do not need to choose configuration and completing parts of the RTC on yourself. You need to correctly make a technical assignment for the required complex and contact the specialists.

The Scientific and Production Tekhvagonmash Company has been an integrator of the robots Fanuc in Ukraine for 10 years. As a rule, the proposal includes several options for solving the problem.

You will have only to make a choice in favor of one of them. Our company, in addition to the delivery of equipment, performs assembly and mounting, develops technology and trains the customer's personnel.

On the fourth problem. Modern complexes, as a rule, are equipped with USB output, which allows transferring programs, created remotely using offline programming, to the robot memory. In addition, they are provided with a function of Internet connection for online communication with the supplier carrying out warranty or post-warranty support. As the practice shows, 99 % of failures of a complex occur because of the error of the operator or programmer of the RTC (a part is incorrectly installed in the RTC, a poor-quality assembly for welding, an error in creating a program, etc.). These errors are easily diagnosed and eliminated on site. The remaining 1 % is the failure of the program. Diagnostics and elimination are performed remotely without the time losses. In extremely rare cases, it is necessary that a specialist-integrator arrive to the site. Here the decisive factor is the geographical distance and the obligation of the supplier. The terms of warranty or post-warranty service should necessarily be taken into account in the contract for delivery.

A few more reasons in favor of the RTC effectiveness

Increase in efficiency

One of the main ways to justify the costs on a robot is to compare the efficiency of the RTC with the efficiency that you currently have, using manual or semi-automatic welding. In many cases, robot welding is performed 2–5 times quicker than using any other method. This means that for each hour you will produce 2–5 times more parts than you produce now. For example, the system of tandem MIG welding which simultaneously uses two arcs, combined by a robot, can increase efficiency by several times.

High reliability

Let us admit that hired workers are sometimes unreliable, they may not appear at work or they may have a bad day. Robots are reliable, they can work around the clock without a rest or a lunch break. In addition, having robots, you will forget about the staff turnover. They are loyal to your company and will not leave after their training by you.

Ability to increase volumes

When you sign a new contract, or wish to expand the range of performed works, robots will easily cope with the additional volume. And since they occupy less working space than people, during expansion of production, you will not have to worry about buildings, renting or purchasing additional areas. In most cases, robots are paid back within six months.

Guaranteed quality

Each time, robot will perform the same welding at the same point. Thus, it helps manufacturer to improve quality and efficiency. Having robots, the company invests in goods in advance without the need to correct defects after their occurrence as often happens in the case with manual or semi-automatic welding.

To check the welds, made by the robot, a visual inspection is usually sufficient. In semi-automatic or manual welding, additional tests may be needed, such as selective destructive testing, radiography or color flaw detection.

Savings on welding consumables

Buying a robot will reduce overlapping of a rather large weld, which often occurs during manual performing. During the work of electric welder the strength margin is already preset into each weld, which is made by him. As a result, he usually uses more filler metal than it is necessary and also makes an excessive weld reinforcement. The accuracy of the robot is much higher, it uses as much filler material as necessary. Moreover, in robotic welding, spattering is lower and, as a result, the consumption of welding wire is 10–15 % lower.

Reduced costs for training

As we have already mentioned, today it is very difficult to find a skilled worker. In changing economic conditions, it turns out that the labor market lacks qualified welders. Ever more young people are seeking for higher education. This means a shortage of young specialists who would replace the specialists of retirement age. The companies spend huge sums of money on search and training of welders, which are much higher than they realize themselves. Moreover, during the work requiring keeping in compliance with the rules of technical operation, welders should constantly pass retraining and prove their skills. Some enterprises even provided workers with their own training centers. As compared to the salary of a qualified welder, it is much cheaper to hire someone who will simply load and unload RTC.

Quality control during welding

The modern software of robots allows companies to improve the process of production control. For example, the software for arc tracking which monitors, records, and makes reports with welding data in real time mode. The data can be transferred to the central storage database via the Internet (local network). Other software automatically corrects errors and provides a quick solution to the problem in the case of an unexpected error of the robot, if it occurs. And finally, protection with the password and making the log of events will provide a current report of any changes in the process of robotic welding over a certain period of time. All these software packages are developed to help companies in maintaining a high standard of quality even in case of personnel replacement.

Conclusion

We hope that these arguments will help you to make a well-grounded decision in favor of robotization of your production. For most manufacturers, robotization and automation should only be a matter of time. If you are going to install a robot for the first time, choose a reliable integrator who in close cooperation with you will develop a system, corresponding to your individual desires. For any project on welding automation the technical support and training are also important. Remember that the tasks of automation and robotization are to reduce the production costs and improve the quality of welding.

Be sure, robots will help you to achieve these goals!

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