A. Kalyta, A. Horechko Master Students
M. Bogdanovskyi , Senior lecturer
V. Shadura, Senior lecturer, language advisor
Zhytomyr State Technological University

THE DEVELOPMENT OF WELDING COMPLEX FOR ELEMENT DESIGN

Nowadays the problem of increasing the efficiency of production is one of the most important tasks of industrial development. It is becoming of higher priority alongside with the problem of improving the technical level. It is due to the fact, that mechanical engineering and device production are the major industries in Ukraine and the most dynamically developing. The use of integrated automation and robotization is one of the directions to solve this problem according to the rapidly changing market demands, updating and expanding the range of products.

The worldwide use of industrial robots in manufacturing rapidly increased in 2014. The increase composed namely 11% (1.5 million units). At the same time, the level of use of industrial robots in Ukraine was much lower than in other countries. It causes the need for modernization and robotization of production in order to increase its efficiency and competitiveness. Moreover, it determines the urgency of development and introduction the high-performance robotic systems (RS) and robotic lines in manufacture.

Currently the industrial robots are increasingly used to perform not only support loading and unloading functions and transport actions. But they are applied to secondary operations such as preparation and sorting of parts, as well as cleaning surfacesbefore welding or gluing, packaging of finished parts and products, their measurement and etc. The industrial robots are being used at major industrial operations, for example for painting parts and components, connecting them with bolts, welding and others.

The automation of welding allows to increase productivity and product quality by increasing the accuracy of technological operations, reducing the number of support staff and reducing production costs. It will provide competitiveness rise, and rational use of equipment and factory space.

Besides, the use of robotics in welding production allows automating the execution of seams of any shape, as well as a large number of short seams, variously located in space. It can also help to execute the arc welding seams with the horizontal junction line at lower position. It makes possible to use the most productive modes of welding with the formation of seams with minimum geometrical deviation. A worker`s job in these conditions becomes more meaningful and creative, eliminating the operator`s "subjective factor".

The problem implies the robotization of welding production choice between universal and layout of specialized robotic. Therefore, technical and economic tasks related to improving the quality of products and the use of robotics for specific welding industry have to be solved.

Whereas the quality level of robotics increases the new possibilities robot application to manufacture appear for new tasks. The development of specialized software tools increases the efficiency and level of automation of preparation of control programs (CP) for robots. But usually, the operators of the robots rely on manual step-by-step training, which uses a special remote control. The methods of manual training of robots are time-consuming and inaccurate. Therefore, the current direction is to automate the development of RS for welding of structural elements, and generate a corresponding

control program using the appropriate software systems, i.e. the offline programming (OLP).

OLP offers a faster and more convenient way to specify trajectories of the manipulator. This programming can be carried out on the computer at the same time when the robot continues to perform operations in accordance with the previously created UE. Of course, OLP cannot be called a new method. but only now OLP-means functional has become available. This allows you to take an advantage of the much greater precision of modern robotics. Such means have become software packages that provide the ability to generate movements of the manipulator based on the data of CAD / CAM systems.

When designing a welding RS of structural elements, the industrial robot saves necessary to be equippedwith various technological devices - storage of parts and pieces, tore, positioners, transport devices (e.g., roller, belt conveyors), as well as devices, fencing, special gripping devices, etc.

For the development of complex robotic welding of structural elements, it is proposed to use an industrial robot KUKA KR16-2, which is designed for arc welding and brazing, all kinds of manipulation, packing, picking, palletizing, metal industry and processing of plastics, Assembly and disassembly of products, the formation, maintenance and testing of industrial equipment. The uniaxial modular drive unit (positioner) KP1-MD 250 kg payload for fixing and allowing rotation of the welding object is selected. Robot and a positioner are located on the base frame.

The use of SimPro software environment is a universal programming tool for KUKA robots. It helps to modulate the interaction of the industrial robot with RS. SimPro possesses the excellent modeling capabilities, which allow you to program industrial robots outside of the production environment. A characteristic feature of this software is the possibility of simulation. Besides, the interface itself is easy to understand, making the process of preparing the trajectories simpler and more visual. By setting the toolpath within SimPro environment, the robot movements interaction within the robot kinematics are transformed. Thus, it allows to avoid production downtime caused by programming in the workspace. The result of development and simulation of welding operations is shown in Fig. 1.

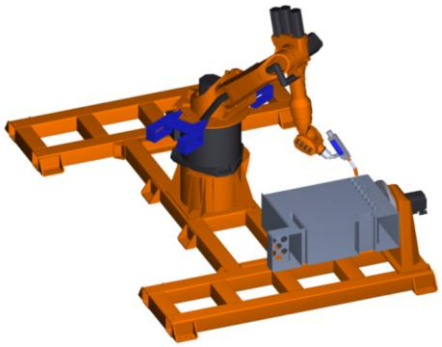

Fig. 1. The example of welding operations modulation using SimPro