



## AUTOMATED INSTALLATION FOR WELDING PIPES WITH ADDITIONAL ELEMENTS

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### ABSTRACT

*The creation of a universal installation is proposed, which allows the production of functional and high-quality hydraulic cylinders at an affordable price for Ukrainian enterprises engaged in the manufacture of special equipment.*

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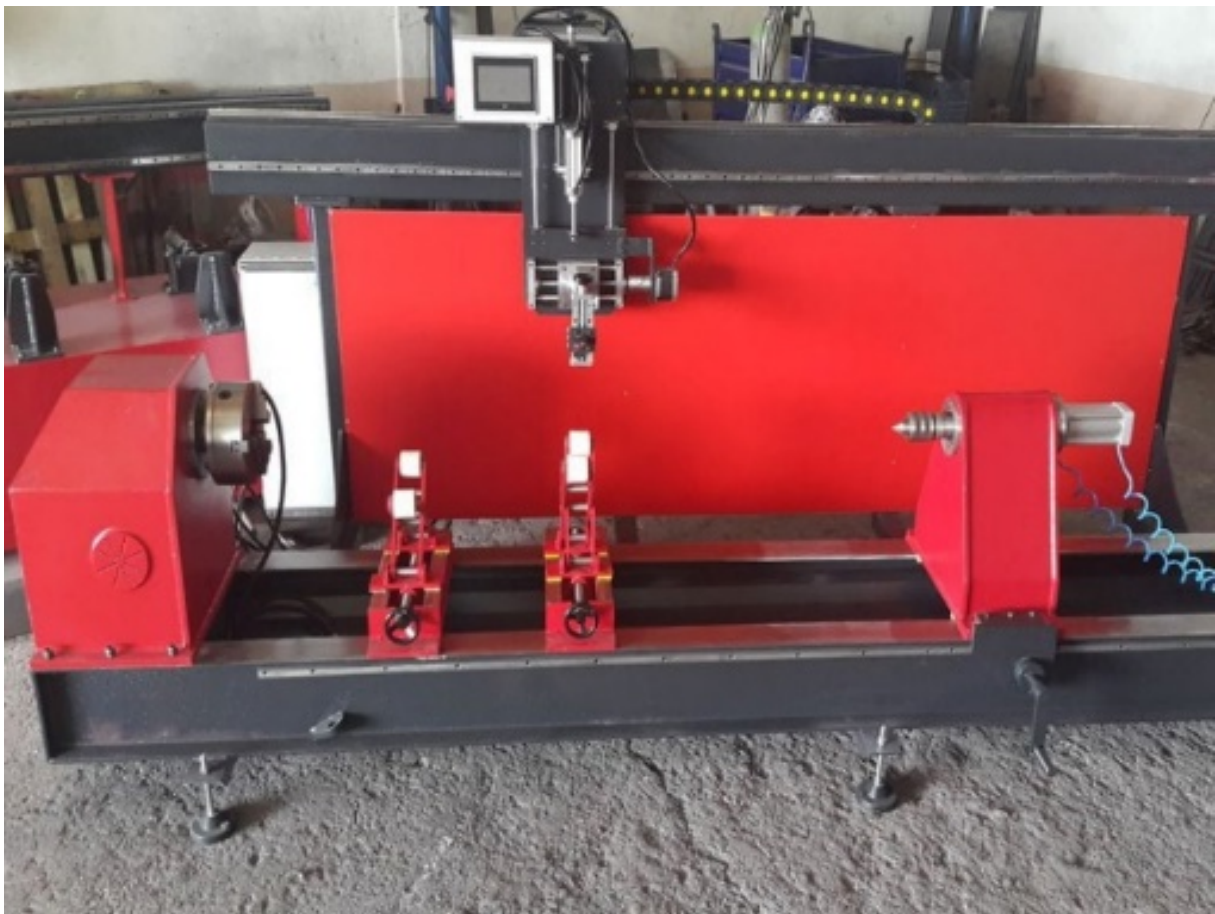
Relevance of the study Today, engineers and manufacturers are faced with the challenges of the 4th industrial revolution Industry 4.0. All leading manufacturers and companies are trying to simplify production chains as much as possible to achieve maximum productivity, flexibility and environmental friendliness. Therefore, the establishment of a new productive production (welding) requires new approaches to it, which is inherent in Industry 4.0., namely: new devices that will be more technological with reduced human participation, energy-efficient, economical (reduced metal consumption) and environmentally friendly. It is necessary to take into account new factors and challenges when selecting, developing and manufacturing equipment. It is these requirements that are not inherent in the production of the 20th century that require the search for new solutions. Welding is a technological process for obtaining inseparable connections of two or more parts by establishing interatomic bonds between these parts, by the method of their local or general heating, plastic deformation or synthesis of the whole, and which is also characterized by relatively low cost, high productivity and fairly high mechanization of the process. Since the welding process occupies a very significant niche in modern mechanical engineering and engineering, a lot of devices and methods have been developed for it. The main and most common welding methods are:

- manual arc welding;
- submerged arc welding;
- consumable electrode welding;
- non-consumable electrode welding;
- electroslag welding;
- etc.

The purpose of the work is to conduct a survey analysis of existing rotary welding installations, the conditions for

their effective use and directions for future research to improve methods of planning and organizing work, with the prospect of wider implementation of such equipment in the Ukrainian mechanical engineering industry. At the moment, there are successes in the manufacture of axle boxes, rods and other elements of hydraulic cylinders, but the problem of high-quality welding remains, since this requires an installation that will allow you to get not only a beautiful seam, but also ensure uniform and complete penetration and, accordingly, complete tightness of the hydraulic cylinder. Creating a quality product will not only allow it to be successfully installed and operated on its own equipment, but will also allow the domestic product to enter the foreign market. Automatic welding is a technological process for obtaining an inseparable connection of two or more parts, characterized by relatively low cost, high productivity and fairly high mechanization of the process. The welding process requires the rotation of the workpiece in space, so these movements have led to the need to create mechanisms that are able to automatically orient the workpieces, quickly and reliably fix them and then rotate them at the welding speed. This is the task of automatic rotary welding machines. In general, such installations can be used in almost all welding operations, such as surfacing, assembly, welding, etc., so they will be useful in other areas where welding production is present [2]. Of course, the rotary installation itself without a good welding machine will not bring the desired result, therefore, when considering the welding installation as a whole, one must not forget about this and consider the actual operation of two machines in a pair. Today, the market mainly presents installations that are quite simple and understandable in their design and somewhat similar to a lathe (Fig. 1).

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*Fig. 1. Joda Horizontal welding machines from the Italian manufacturer Carpano Equipment [1] and WWDKM-1000 from the Turkish manufacturer WelkonWelding [3]*

Such installations are usually equipped with a relatively simple CNC system that not only controls the rotational movement of the workpiece, but can also move the torch, which, with proper adjustment, allows you to get a seam of

any configuration. In addition to welding the covers of hydraulic cylinders, it is also important to weld the fittings to which the hydraulic hoses will be connected, this

technological process also requires mechanization, so separate installations have been invented for this case.



Fig. 2. Automatic welding machine for fittings from the Chinese manufacturer HAOYU [4]

Installations of this class are more like a vertical milling machine (Fig. 2), here the workpiece does not rotate, the fitting itself is pressed by a conical clamp to the hydraulic cylinder and the torch welds the part in a circle around the vertical axis at a uniform speed. Such installations are also controlled by software.

## CONCLUSIONS

As a result of the analysis of this type of installations, one can notice the main problem, namely the lack of one universal layout, which would allow performing all operations on one machine and possibly even in one installation. The presence of a layout in the form of a combination of both installations, as an option with a modular design, would significantly expand the functionality and, accordingly, the consumer could buy one installation instead of two and get the same functionality. This solution would be ideal for single, small-scale and possibly even serial production.

## REFERENCES

- [1] <https://www.carpano.it/2017/07/17/hydraulic-cylinders-welding/>
- [2] Kuznietsov Yurii. Morphological synthesis of the universal rotary welding device. Journal of the Technical University of Gabrovo 66 (2023) 1-4
- [3] [https://www.welkonwelding.com.tr/circular-welding-machine-circular-welding-automation-systems-circular-welding-systems-tank-welding-machine-cylinder-welding-machine\\_5\\_u\\_en.html](https://www.welkonwelding.com.tr/circular-welding-machine-circular-welding-automation-systems-circular-welding-systems-tank-welding-machine-cylinder-welding-machine_5_u_en.html)
- [4] <https://www.haoyuwelding.com/automatic-welding-machine/automatic-pipe-welding-machine/pipe-and-nipples-automatic-welding-machine.html>