

UDC 621.791.7:338.24

Slupska Yu. S. Assoc. Assoc. Prof. of the department of mechanical and biomedical engineering, PhD.
(Dnipro University of Technology, Dnipro, Ukraine)

ECONOMIC ADVANTAGES OF WELDING IN CONSTRUCTION

Modern welding technologies have become an integral part of the construction industry. They provide effective solutions for joining structures that require high reliability and speed of assembly. Welding allows for the creation of rigid, non-detachable connections, which are ideal for various construction projects, ranging from small structures to large-scale infrastructure facilities.

The aim of this work is to analyze the economic benefits derived from the use of welding in construction and to identify the key factors that influence its economic efficiency. In today's market, where the demands for cost reduction and increased productivity are becoming increasingly relevant, the issue of the economy of joining technologies assumes particular significance.

Welding offers numerous advantages that directly affect the overall project costs. Firstly, welding results in a significant reduction in material expenses. The use of welding methods allows for a decrease in the number of metal components used, as welding enables the creation of more complex and lightweight structures that require less raw material. This is especially important in the context of rising raw material prices [1-3].

Secondly, shortening the duration of work is also of great importance. Thanks to welding technologies, builders can reduce the time required for assembly, which, in turn, allows for lower overall project costs. In large projects where deadlines are critical, the ability to weld on-site without the need for transporting finished structures is particularly valuable [4].

According to the data provided in Table 1, welding allows for a reduction in material costs, a decrease in the time required for work, and a reduction in the number of workers needed compared to traditional joining methods, such as riveting.

Table 1
Example of Cost Reduction Through the Use of Welded Structures [4].

Parameters	Welding	Riveting
<i>Material Costs</i>	Reduction by 20%	Standard Costs
<i>Work Completion Time</i>	Reduction to 15 hours	Typically 30 hours
<i>Number of Workers</i>	Reduction to 2	Typically 4-5
<i>Reliability of Connections</i>	High	Average
<i>Transportation Costs</i>	Decrease by 25%	Standard Costs

In addition to saving metal, welding also helps reduce labor costs. Through the automation of welding processes, it is possible to decrease the number of workers needed for assembly, further lowering the overall project costs. For example, automated welding tasks can be completed in a shorter time frame, allowing for savings not only in money but also in time [3,5].

Moreover, welded structures possess high strength, which reduces the weight of construction elements. This, in turn, lowers transportation and installation costs, as lighter structures require less lifting equipment and incur lower moving expenses. Lightweight

welded components can be easily maneuvered, which also reduces the time needed for assembly work.

The reduction in the weight of structures positively impacts the overall logistics of a project, allowing for decreased delivery and storage costs. Consequently, welding can also contribute to the optimization of all stages of the construction process, from initial design to final installation [5].

An important aspect to note is the impact of welding on the quality and durability of structures. Welded joints have high strength and stability, significantly reducing the risks associated with accidents and failures. Compared to other methods, welding provides a more reliable connection, which is critically important for infrastructure projects where safety is a priority.

It is also necessary to compare welding with alternative joining technologies, such as riveting or bolting. While these methods may be applicable under certain conditions, welding outperforms them in many parameters. For instance, welding achieves better joints in cases requiring high strength, whereas riveting may be less effective in comparable situations [4].

Conclusions. Welding in modern construction offers significant economic benefits; it reduces material costs, shortens work durations, optimizes labor usage, and enhances the quality of connections. As a result, welding has become an integral part of the contemporary construction process, ensuring high reliability and efficiency of structures. In the competitive construction market, the application of welding technologies is becoming a crucial factor for the success of many companies.

Therefore, welding not only contributes to cost reduction and increased efficiency but also holds potential for further development in the construction sector, considering innovative technologies and automation. This positions welding as a key element in the evolution of construction processes, providing quality and economic solutions for modern infrastructure needs.

REFERENCES

1. Slupska Yu.S. Features of modeling the processes of structure formation in welded joints of low-carbon low-alloy steels: Ph.D. thesis: 132 - Materials science / State Higher Educational Institution Prydniprov's'ka State Academy of Civil Engineering and Architecture. Dnipro, 2021. 263 p. [In Ukrainian].
2. Krauss G. Steels. Processing, Structure and Performance. Ohio: ASM International, metals park, 2006. 593 p.
3. Olasjuk V.S. Economics of Construction [Text]: Lecture notes for students of the 3rd and 4th years in the field of study "Construction" of full-time education. – Lyubeshiv: Lyubeshiv Technical College of Lutsk NTU, 2015. – p. 73.
4. Rogozhin P.S., Hoiko A.F. Economics of Construction Organizations. – Kyiv: Publishing House "Skarby," 2001. – 448 p.
5. Zhvan V.V. Lecture Notes on the Course "Fundamentals of Construction Economics" (for students of the educational and qualification level: Bachelor's degree in full-time education in the field of study 6.060102 "Architecture"). – Kharkiv: Kharkiv National Academy of Municipal Economy, 2009. – 112 p.