**AP19174909 "Improving the quality of contact butt welding of reinforcing bars and heterogeneous cylindrical blanks by means of optimizing the modes", p.m. Yessirkepova A.B.**

***Relevance:***developing technological opportunities in the method of butt welding of joints.

***The project objective*** is to improve the quality of contact butt welding when joining different metal workpieces.

***Expected and achieved results***

When joining different metal blanks, the structure of the welded samples was studied with the help of metallographic studies and defects were revealed: white spots, metal burns, the presence of oxides, clogging of non-metallic compounds, microscopic cracks, bubbles and the other structural defects. A metallographic examination (control) of welded joints obtained by butt welding (melting) of the base metal and various materials was carried out. Grits were made from different samples made by butt welding in different modes. As a result of the analysis of the macro- and microstructure of the cut, it was established that cracks, melts and non-joined defects, holes and bubbles, as well as slag and other inclusions were found in the welded seam (sample included in optimal welding modes). Based on the results of the research, an article was prepared and is currently being reviewed for publication in the journal Scopus.



**Figure 1 –** Testing composite samples on a bursting machine

Then the composite samples were tested on the bursting machine.

Simulation of the stretching process to determine the strength of the welded seam also showed high strength of the (welded) joint.

The results of experimental studies showed high quality and wide technological possibility of contact butt welding. It was established that there was no discrepancy in the obtained results of experimental, test and computer research.

|  |
| --- |
|  |
| *а)* |
|  |
| *b)* |

**Figure 2 —** The process of testing welded samples

The modes optimization for contact butt welding of various metal blanks using the MATLAB software complex was provided. The optimal modes of contact butt welding of various metal blanks were determined. Response surfaces were constructed to determine the optimal mode of contact butt welding: total installation length (on both workpieces); the amount of sediment allowance for two blanks; specific capacity; current density of melt and precipitate; melting speed; precipitation rate; specific pressure of sediment. As a result, optimal modes of contact butt welding of various metal blanks were established that allowed ensuringe high quality and strength of the joint.

A metallographic examination (control) of the base metal and welded joints obtained by contact butt welding (reflow) of various materials was carried out. These were prepared grinding wheels from different samples connected by contact butt welding in different modes.

As a result of the analysis of the macro and microstructure of the cut, it was established that cracks, non-welding and non-welding, fistulas and pores, as well as slag and the other inclusions were found in the welded seam (a sample of the welded joint in optimal welding conditions).

 *Expected results*

A method of contact butt welding will be developed that differs from the existing ones in terms of versatility, productivity, high accuracy and quality of welding, as well as wide technological possibilities. A database will be developed to select the parameters of the welding mode depending on the material and diameter of the metal workpieces to be joined.

***Research team***

1. Yesirkepova Aiym Bakytbekovna, project manager.

Scopus Author ID 57219115360, Researcher ID Web of Science HGD-3044-2022, ORCID 0000-0003-4524-5135); https://www.scopus.com/authid/detail.uri?authorId=57219115360

2. Sherov Karibek Tagayevich, scientific adviser.

Scopus Author ID 55330253200, ORCID 0000-0003-0209-180X, https://www.scopus.com/authid/detail.uri?authorId=55330253200

***List of publications***

1. Yessirkepova A.B., Sherov K.T., Akhmedov H.I. The problem of increasing the efficiency of joint welding of reinforcements. Proc. of international scientific and practical conference "XV Saginov’s readings. Integration of education, science and production", Part 3. Karaganda: KSTU PH, 2023. P.164-166. https://www.kstu.kz/wp-content/uploads/2023/06/Sbornik-2023-CHast-3.pdf

*Future publications*

- 2 articles in journals in the top three quartiles of the Web of Science impact factor or with a CiteScore of at least 50 percentile in the Scopus database, in 2025;

- 1 article in journals recommended by the UBSC and (or) in other domestic peer-reviewed scientific publications in 2025.

***Information for potential consumers***

As potential consumers of the proposed method of contact butt welding, domestic engineering and construction enterprises are considered. The project studies the processes of welding various metal blanks using the butt welding method.

***Scope***

Mechanical engineering and construction industries.

*Date of information updating: 08/11/2024.*