European Scholar Journal (ESJ)
Available Online at: https://www.scholarzest.com
Vol. 3 No.5, May 2022
ISSN: 2660-5562

THE RESULTS OF RESEARCHES ON WEAR OF WELDING FLAT PARTS BY CONTACT WELDING

Kosimova Malohatxon Karimovna,
Researcher of Andijan Machine building instutute
E-mail:kosimova.mk.mk@gmail.com
Abdullaev Shavkat Azimovich
Researcher of Andijan Machine building instutute
E-mail:shavkatbek067@gmail.com
Kadyrov Nazirjon Ulugbek oglu
Doctoral student of Andijan Machine building instutute
E-mail:qodirov0104@mail.ru

Article history:
Received: 10th March 2022
Accepted: 10th April 2022
Published: 20th May 2022

Abstract:
The article presents the results of laboratory studies on the corrosion testing of welded flat surface parts by contact welding, which were carried out in order to select the composite material with the desired composition when welding to ploughshares. The subject of research is the composition of the coating materials welded to the surface of flat-surface details of the soil. As a result of research on the corrosion resistance of formed welded composite material welded to the working surface of the flat part, the type and amount of hard alloys in the welded layer, their required composition were determined and selected for production testing. The results obtained on the basis of the above serve as a basis for ensuring that the contact welded layer is resistant to abrasion at the required level and increases the resource of the ploughshare several times.

Keywords: ploughshare, flat details, recovery, contact welding, soldering, composite material, solid alloy.

INTRODUCTION.

Soil is the main means of production in agriculture. To create favorable conditions for the free growth of plants, mechanical wear is carried out: plowing, chiselling, harrowing, leveling, compaction, cultivation. The quality of wear, energy consumption and the total cost of wear will significantly depend on the design parameters and the condition of the working bodies. Therefore, special attention is paid to the improvement of working bodies by well-known scientists and firms. Among them, the work of Academician V.P. Goryachkin should be noted. [1]

Plows play an important role in wear machines. This is because in areas where cotton, wheat and corn are grown, it is important to plow the land. In addition to the important function of plows, such as loosening the fertile soil layer, planting the remains of weeds and seeds deep into the soil reduces their germination and plant diseases in the next year, mechanical weed and pest control. [2]. No other similar wear tool equivalent to a plow has yet been found for such complex tasks.

Analyzes show that plowing the soil creates a soft soil layer that allows the free development of the vascular system of the plants, resulting in a consistently high yield from the planted plants. [4]

However, because the flat parts of the tiller work in abrasive soil conditions, they are rapidly eroded by changing their initial dimensions and shape. That is why they often have to be replaced and repaired. This is especially true of ploughshare plugs, as they are used to perform the most important, heaviest, and least productive work. [1,6]

Today, the most basic wear is wear, which uses working structures designed half a century ago. If at that time the plowing speed did not exceed 5 km / h, today this speed has increased to 8-10 km / h. If we take into account that the weight of the harvesting machines increased up to 4 times and as a result the soil was compacted, the amount of load on the working bodies of the drive units increased by 4 times. These working bodies have remained unchanged in terms of both structure and material over the past period [5].

METHODS.

Numerous tests of serially produced ploughshare plows on working bodies show that the amount of work to be carried out depends on the physical and mechanical properties of the soil. reaches The working bodies of other similar wear machines also have limited resources: 8 to 20 hectares for disc harrows and 7 to 18 hectares for cultivator shovels [5].

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As can be seen from the above, the resource of the working bodies of wear machines is very low. Therefore, research aimed at increasing the resource of flat parts (especially plug ploughshares) of wear machines is relevant, and it is of great economic importance.

It is known that the friction surfaces of flat parts of agricultural machinery work under abrasive wear conditions. Therefore, it is required that the ground surfaces of these working bodies have a layer resistant to abrasive abrasion. In order for a corrosion-resistant layer to meet the requirements for it, it must be based on its interrelated properties, such as material, chemical composition, hardness, corrosion resistance.

The working organs are welded and coated with a material of a certain composition to increase the abrasion resistance of the surface layer, especially in the restoration of the eroded ones. At the same time, the welding equipment should differ from other methods by such advantages as high productivity, low consumption of welding material, small thermal impact zone, lack of space for mechanical processing, level of mechanization, good sanitary and hygienic environment. The contact welding coating meets these requirements to a certain extent (Figure 1).

A number of structural changes were made to the contact welding device to weld the working surfaces of flat parts of wear machines: the longitudinal movement speed was increased, the roller-electrodes were turned at an angle of 900, a device for fixing flat parts was installed.

Figure 1. Remdetal-011-1-02N contact welding machine

It is known that the eroded parts are mainly made of well-known steels, in some cases cast iron, and their working surfaces are thermally or chemically treated to increase their corrosion resistance. Typically, the working surfaces of these parts are welded to a metal that matches the base metal composition. However, in recent years, in order to increase the working life of these parts, it is recommended to cover their working surfaces with a layer of high hardness and abrasion resistance, which is much higher than that of the main detail. Therefore, in the restoration of worn details, the practice of coating with a layer different from the composition and properties of the base metal is used.

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Table 1
011-1-02N Technical specifications of the contact welding machine "Remdetal"

Indicators	Value	Unit of measurement
Productivity	60	cm^2 / mm
Weld layer thickness	0,15...1,5	mm
Recoverable detail diameter	20...200	mm
Distance between centers	1250	mm
Workforce	75	kW
The number of revolutions of the spindle	0,15...15	min^{-1}
Longitudinal movement speed	0...450	mm/min
Overall dimensions	2730x860x1280	mm
Mass	900	Kg

Based on this, samples were taken from ploughshares of plows used for plowing in the Fergana Valley regions of the Republic for research (Figure 2).

MATERIALS FOR WELDING. In order to ensure the desired properties of the weld seam on the working surface of flat parts, various grades of steel tapes (such as 50XFA, 65G, U8), powder grades of certain brands and heat-formed composite materials were selected, their chemical composition and welding regimes were determined.

Figure 2. Samples of ploughshare sold in the markets.

Tests on the abrasion resistance of coated specimens were performed on an abrasive abrasive device. This device was created in the laboratory of the "Technological machines and equipment" department of Andijan Institute of Mechanical Engineering (Figure 3).

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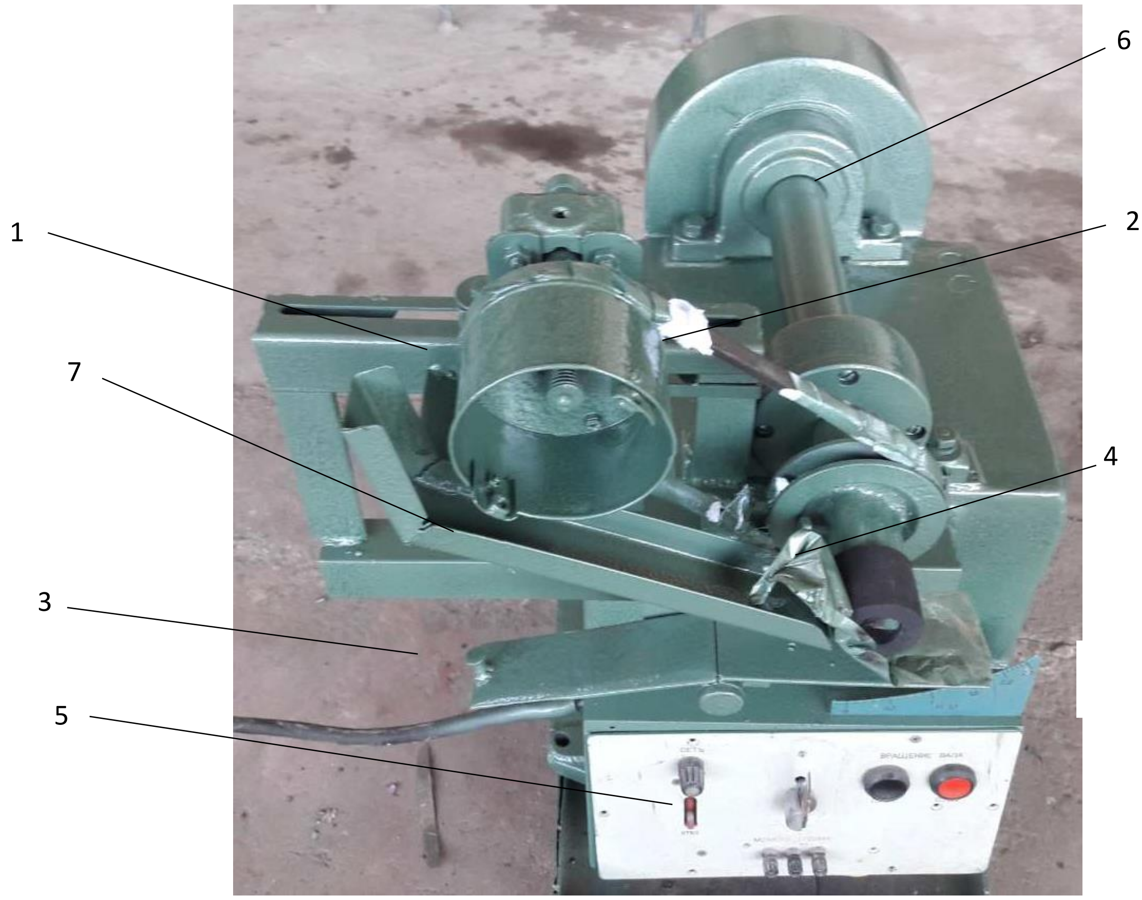

Figure 3. Abrasive tester device:

1 - sandbox; 2 - belt extension; 3 - load; 4 - rubber bushing (roller); 5 - control panel; 6 - electric motor; 7 - device housing.

Figure 4. SF-400 scale.

According to the sample testing program, parameters such as compressive strength, test time, friction speed, abrasive material consumption were taken into account. Quartz sand was used as an abrasive material. The mass of the samples was determined before and after the experiment (model SF-400) on a digital electronic scale (Figure 4), and the size was determined by the micrometric method. The bending rate was determined from the ratio of the mass and size of the sample to the time of the experiment.

The reference sample was 45 grade steel (185 HB). Samples cut from the selected ploughshare and tested by welding were compared to the performance of this standard steel.

Testing of the samples was carried out in quantities close to the compressive strength and friction velocity (6-9 km/h) applied by the soil to the unit surface of the ploughshare. The test time was 2 hours, i.e. the friction path

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was 10,000 meters at each interval, and the rotational speed of the elastic roller involved in the friction was determined according to the given friction speed. The bunker of the friction device was filled with quartz sand.

RESULTS.

The following table shows the wear rates of samples welded with certain types of materials. It can be seen from the table that the corrosion resistance of other samples is 5.5 to 20 times higher than that of 45 grade steel.

Table 2
Erosion performance of the samples tested

Test times, hours	Samples tested and their wear values, mm3					
	45 steel	PG-SR-4 PJ-4 (50 50%)	PG-S-27	PG-FX-800 PJ-4 (30 70%)	PG-FBX6-2 PG-SR-4 PJ-4 (50 30 20%)	VK-8
0	0	0	0	0	0	0
2	30	5,4	5,3	3,5	3,3	1,5
4	47	8,5	8,3	5,5	5,1	2,3
6	57	10,3	10	6,7	6,2	2,8
8	66	11,9	11,6	7,8	7,2	3,3
10	72	13	12,7	8,5	7,8	3,6
45 relative to steel	1.0	5.5	5.7	8.7	9.2	20

Figure 5. Below shows the erosion graphs of the samples tested.

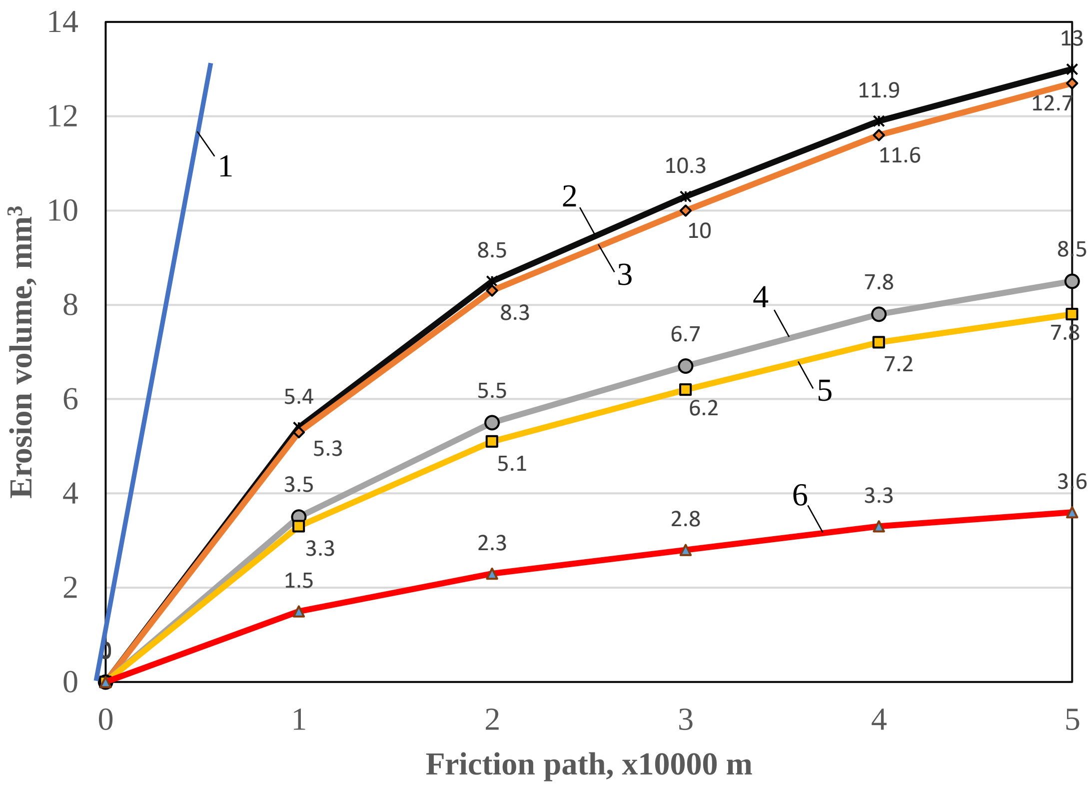

Figure 5. Erosion intensities of hard alloys and steels.

1- 45 steel; 2 - Powder composite material (50% PG-SR-4 50% PJ-4); 3 - Powdery mildew (100% PG-S-27); 4- Powder composite material (30% PG-FX-800 70% PJ-4); 5- Powder composite material (50% PG-FBX6-2 30% PG-SR-4 20% PJ-4). 6- VK-8 hard alloy.

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From the picture you can see that the more carbides of elements such as chromium, tungsten, the more they are resistant to corrosion.

CONCLUSION.

Based on the results of laboratory studies, it can be concluded that the corrosion resistance of flat surface parts depends on the type and amount of hard alloys in the coating layer welded to their friction surfaces.

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