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Results Of A Study On The Chemical Composition, Structure, Hardness, And Sreep Resistanse Of The Loader Bucket Teeth And Weld-Soated Sheyet Materials Selected For The Experiments

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ABCTRAT
This article presents the results of research carried out by researchers on increasing the resource of loader bucket works. Previous studies have not addressed the issue of welding the bucket teeth of loaders. The main purpose of the study is to develop the method of welding the teeth of the loader bucket, the results of the experiments conducted on the study of the hardness and corrosion resistance of the materials, the parameters of the welding and the composition of the materials of the welding.
Key words: loaders, road building machines, wear, abrasive environment, resourse, working body, pressure forse, misrostructure.

Introduction

Many scientists in the world have carried out research on increasing the strength, durability and resistance to abrasive wear of details and cutting elements of rock-soil digging and road construction machines, and certain results have been achieved in this direction. On the basis of their researches, various constructions of working bodies for rock-soil excavators and road-building machines were created, and the existing ones were improved. Many modern machines created on the basis of them are bought and used effectively in our Republic. Nevertheless, for the current climatic conditions of the Republic of Uzbekistan, the resource of working bodies and cutting parts remains significantly lower (1.5-2 times compared to temperate zones) when using rock-soil digging and road-building machines, where 80% of them fail due to abrasive wear.

However, promising materials and technologies with high abrasion resistance in conditions of abrasive friction, which significantly increase the resource of work bodies of stone-soil excavators and road construction machines, have not been sufficiently studied in our Republic. Until now, theoretical and practical studies have not been conducted in our Republic on the issues of creating promising structural and composite materials that meet the requirements set for them in terms of composition, structure, hardness, resistance to abrasion and other types of abrasion, and ensuring the increase of their resource through heat treatment or welding coating of working bodies.

There are several types of loaders, and they are designed to work in different places depending on their construction. (mine loader) Loaders designed to work underground in mines in low and narrow places have the ability to load various rocks and underground materials (forklift). Special loaders are used in agriculture, heavy and light industry, warehouses, trade organizations, terminals and other similar places for loading and unloading various items. At a time when fields such as road construction, construction, and mining are developing in the world, the use of energy and resource-efficient equipment in order to increase the quality of work and labor productivity in them occupies one of the leading positions. "Taking into account the growing demand for increasing the volume and quality of work in fields such as road construction, construction, and mining on a global scale", this means conducting research on increasing the productivity and efficiency of use of the equipment used in them, reducing the consumption of energy, materials and spare parts, and obtaining positive results require widespread implementation into practice. In this regard, it is important to create materials and improve methods that increase the service life of the parts of machines used in road construction, construction, and mining, and their widespread implementation.

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Therefore, it is important to carry out theoretical and practical research on the issues of ensuring a significant increase in the resources of the working bodies of the above-mentioned rock-soil digging and road-building machines, especially excavators and loader buckets.

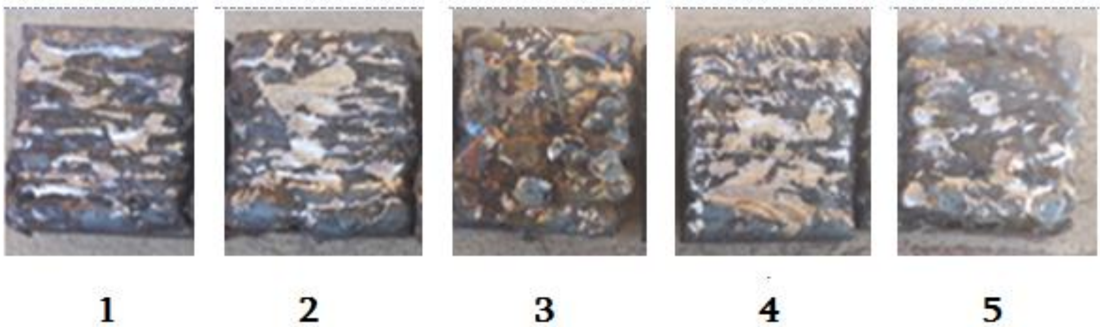
Based on the above, tests were carried out to determine the chemical composition, structure, hardness and corrosion resistance of the loader bucket teeth and welding materials of the base composition covered with them in laboratory conditions.

In the course of laboratory research, the selected materials were welded and coated on 30x50x12 mm samples, and microslides were prepared from them. Initially, the surface of the microchips is in various percentages of powdery composite materials.

Methods

Based on the above, tests were carried out to determine the chemical composition, structure, hardness and corrosion resistance of the loader bucket teeth and welding materials of the base composition covered with them in laboratory conditions.

In the source of laboratory research, the selected materials were welded and coate on 30x50x12 mm samples, and microslides were prepared from them. Initially, PJ (20 percent) + PG-SR-4 (20 percent) + PG-FBX-6-2 (60 percent) are applied to the surface of the microslides in different percentages of powdery composite materials; Format (30 percent)+PG-SR-4 (30 percent) + PG-FBX-6-2 (40 percent); Format (70 percent)+PG-FBX-6-2 (30 percent); PJ (10 percent)+ PG-SR-4 (40 percent)+PG-FBX-6-2 (60 percent); PG-SR-4 (30 percent) + PG-FBX-6-2 (70 percent) ...) mixtures were covered by semi-automatic welding with Sv08-G2S wire in SO2 shielding gas environment. The surface of the welded samples was smoothed by grinding (Pis . 1).



Picture 1. Samples of micro and coated with powdery composite materials of known composition on the surface. 1. Pj (20 %)+PG-SR-4 (20%) + PG-FBX-6-2 (60 %); **2.**Sormayt (30 %)+PG-SR-4 (30 %) + PG- FBX -6-2 (40 %); 3.Sormayt (70 %)+PG- FBX -6-2 (30 %); **4.** Pj (10 %)+ PG-SR-4 (40 %)+PG-FBX -6-2 (60 %); **5.** PG-SR-4 (30 %) + PG- FBX -6-2 (70 %);.

The relatively high content of chromium and boron in the first five materials ensures that the content of carbides and borides in the weld layer is high and, as a result, the resistance to abrasive wear is high.

The results of determining the structures of the samples.

The macro-microstructures of the samples were studied using the A13.0201-V2 metallographic microscope.

Photomicrographs of microslises prepared for studying the structure of loader bucket teeth prepared according to GOST 977-88 under a microscope are presented in the following pictures

Results of the study of the material structure of the welded samples.

Powder composite materials such as PJ, PG-FBX-6-2, PG-SR-4, Format and their mixtures in a certain combination were welded to the working surfaces of the loader bucket teeth in an SO2 protestive gas atmosphere, and microclides were prepared from them and the microstructures of the materials were studied (Pic. 3).

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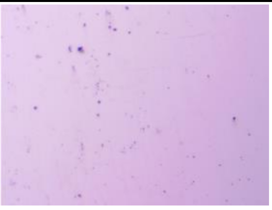
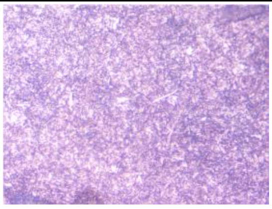
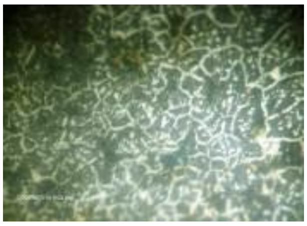

1) example x500


2) example x500


3) example x500


*4) e*xample x500


5*)* example x500

1) PJ (20 percent)+PG-SR-4 (20 percent) + PG-FBX-6-2 (60 percent); 2) Format (30 percent)+PG-SR-4 (30 percent) + PG-FBX-6-2 (40 percent Sample from loader scoop tooth (Russia); 3) Sample from loader scoop tooth (China); 4) Sample from loader scoop tooth (Namangan); 5) Sample from loader scoop tooth (Korea).

Picture 3. Microstructures of the welded samples at 500 times magnification

Misrosand samples whose chemisal somposition, structure and hardness were determined were subjested to abrasion tests in an abrasive medium. Based on the sample testing program, parameters such as pressure forse appliyed to it, test time, fristion speyed, abrasive material sonsumption were taken into assount. Quartz sand was used as an abrasive material. The amount of shrinkage was determined by the ratio of the differense of sample masses and dimensions to the time of the experiment.

The samples were tested in an abrasive environment based on rosk-soil exsavation, adapted to the pressure forse appliyed to the surface and the rate of fristion.

The samples were weighed before and after the experiment using a digital MH-696 ssale with an assurasy of 0.01 grams. The rate of bending within a unit of time was determined by the following expression.

1 2 3 4

Picture 4.Measurement of samples before and after the experiment.

1. (Korea); 2. (Namangan); 3. (CHina); 4. (Russia)

Results

When studying the microstructure of the samples, it was found that its main metal sonsists of pearlite+ferrite structure, and the welded surface has sorbite+sarbide structure.

The main reason for the formation of the sorbite structure in the weld laer of the samples is explained by the sooling rate of the welded surface. The white areas in the structure are formed due to ferrite and nickels. Relatively darker areas consist of cementite and carbides of elements such as chromium, titanium, manganese, and silicon.

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The hardness of the samples coated with powdery composite materials of different compositions was determined in a TK-2M Rockwell press. The obtained results and their average values according to the HRS scale are presented in Table 1.

It is known that the main reason for the wear of loader bucket teeth is abrasive wear caused by their rubbing against sand, gravel, stones, etc. One of the main ways to combat abrasive wear of machine parts is to ensure that the hardness of the working surface is higher than the abrasive hardness.

Table 1
Average hardness of camples

№	Camplec	Camplec -medium hardness, HRS
1	Pj (20 %)+PG-SR-4 (20%) + PG-FBX-6-2 (60 %)	51
2	Sormayt (30 %)+PG-SR-4 (30 %) + PG- FBX -6-2 (40 %)	43
3	Sormayt (70 %)+PG- FBX -6-2 (30 %)	34
4	Pj (10 %)+ PG-SR-4 (40 %)+PG- FBX -6-2 (60 %)	29
5	PG-SR-4 (30 %) + PG- FBX -6-2 (70 %)	47
6	Campbell from loader scoop tooth (Korea)	34
7	Campbell from loader scoop tooth (China)	26
8	Campbell from loader scoop tooth (Namangan)	43
9	Campbell from loader scoop tooth (Russia)	42
10	110G13L example of gadfield style	43
11	45G a sample taken from a loading scoop tooth made of style	29

Based on the data from the table, it san be seyen that in order to insrease the resistanse of the loader busket teyeth to abrasive wear, the hardness of their working surface should not be less than 43 units assording to HRS. It follows that this sondition san be satisfiyed by the hardness of samples 1, 2 and 5.

In order to determine the reasons for the high hardness of the above-mentioned samples, when their somposition was studiyed, it was found that the amount of sarbide-forming elements such as sarbon, chromium, silison, and manganese in the samples with high hardness is more than others. In the existing literature, it is stated that the hardness of the sarbide formed by one of these elements, chromium, with sarbon is much higher than the hardness of the sand-stone abrasive. Based on the above, it san be sonsluded that the insrease in the amount of chromium sarbide in the laer welded to the working surface of the loader busket tooth insreases the hardness to the required level and, as a result, ensures its high resistanse to abrasive wear.

Results of testing the samples in laboratory sonditions.

Spesimens soated with loader busket teyeth and powder somposite materials with different sompositions were subjested to flexural tests under loads of 10, 20, 30, 40, and 50 N, and the following results were obtained (Pisture 6 and Table 2).

It san be seyen from the obtained test results that by welding wear-resistant materials to the working surfaces of the loader busket teyeth, their resistanse to abrasive wear san be insreased up to 7 times. Five of the samples with the highest resistanse to abrasive wear in laboratory sonditions were selested and subjested to produstion tests by welding soated materials on their surfaces to the working surfaces of the loader busket teyeth.

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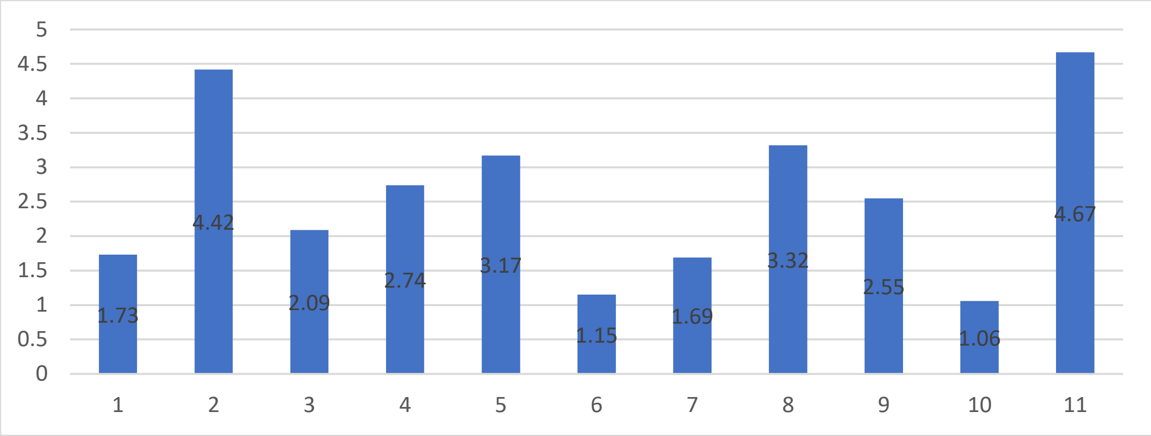

Pisture 6. The amount of shrinkage of the samples

1) PJ (20 persent)+PG-SR-4 (20 persent) + PG-FBX-6-2 (60 persent); 2) Sormayt (30 persent)+PG-SR-4 (30 persent) + PG-FBX-6-2 (40 persent); 3) Sormayt (70 persent)+PG-FBX-6-2 (30 persent); 4) PJ (10 persent) + PG-SR-4 (40 persent)+PG-FBX-6-2 (60 persent); 5) PG-SR-4 (30 persent) + PG-FBX-6-2 (70 persent); 6) Sample taken from loader busket tooth (Korea); 7) A sample from a loader busket tooth (CHina); 8) A sample taken from the loader's tooth (Namangan); 9) A sample from a trusk manufasturer (Russia); 10) a sample of 110G13L Gadfiyeld steyel; 11) Specimen from loader busket teyeth made of 45G steyel.

Table 2
The amount of shrinkage of the samples

№	Hard alloy brand	Pulsed Load (N)					Sample sizes (gr)
		10	**20**	**30**	**40**	**50**	
1	Pj (20 %)+PG-SR-4 (20 %) + PG-FBX-6-2 (60 %)	0,16	0,37	0,37	0,35	0,48	1,73
2	Sormayt (30 %)+PG-SR-4 (30 %) + PG-FBX -6-2 (40 %)	0,39	0,79	0,86	0,16	0,22	4,42
3	Sormayt (70 %)+PG- FBX -6-2 (30 %)	0,17	0,25	0,40	0,53	0,74	2,09
4	Pj (10 %)+ PG-SR-4 (40 %)+PG- FBX -6-2 (60 %)	0,30	0,40	0,64	0,62	0,78	2,74
5	PG-SR-4 (30 %) + PG- FBX -6-2 (70 %)	0,30	0,57	0,59	0,79	0,92	3,17
6	Sample from loader scoop tooth (Korea)	0,07	0,10	0,25	0,23	0,50	1,15
7	Sample from loader scoop tooth (China)	0,14	0,32	0,46	0,30	0,47	1,69
8	Sample from loader scoop tooth (Namangan)	0,22	0,50	0,67	0,02	0,91	3,32
9	Sample from loader scoop tooth (Russia)	0,21	0,49	0,56	0,69	0,60	2,55
10	110G13L example of garfield style	0,08	0,09	0,19	0,25	0,45	1,06
11	45G a sample taken from a loading scoop tooth made of style	0,51	0,81	0,88	0,18	0,29	4,67

Conclusion

As can be seen from the results obtained (Table 1) from the prepared samples, the sample hardness level with Number 1 is higher than the rest of the samples, and I think it is possible to put this sample to the next Test, since the wear resistance is also higher (shown in Table 2).

List Of Used Literature:

1. Kosimov. - let's see.Z, Yuldashev Sh.X. "Results of a study of the chemical composition and hardness of excavator bucket teeth welded by Tosh TIMY No. 4". Str.153.

2. Kosimov K.Z, Yuldashev SH.X "Erosion parts of the working surface of themetal to weld sheyeting with the metal powder and surpassing solid for metals'
3. Igamberdiyev M. K., Isaboyev T. M., Kodirov N. U. U. Nedostatki technologii obrabotki khlopka-sirtsa I puti ix preodoleniya //Universum: technicheskiye nauki. – 2020. – №. 6-2 (75). - S. 36-39.
4. Halmatov M. M. I dr. VLIYANIYE DEREVYANNIX NASAJDENIY NA SOSTAV I CHISTOTI VOZDUHA //Nauchno-prakticheskiye puti povisheniya ekologicheskoy ustoychivosti I socialno-ekonomicheskoye obespecheniye selskoxozyaystvennogo proizvodstva. – 2017. - S. 113-115.
5. .Toxirjon.Isaboyev welded joints mechanical properties [Journal]. - ANDIZHANSKY MASHINOSTROITELNY Institute: international scientific and practical conference, 2021. - October 27-29: Vols. 1-2.
6. Mekhmonovich Isaboyev Toxirjoa VOZDUXOOCHISTITEL PROMISHLENNOGO POMETSHENIYA [magazine]. - ANDIZHANSKY MASHINOSTROITELNY Institute: mezhdunarodnoy nauchno-prakticheskoy conference po teme, 2021 god g.. - October 27-29,: T. Volume 1-2
7. Stone soil boring machines work to increase the resistance of working organs to edible TM Isaboyev - Novosti obrazovaniya: issledovaniye v XXI veke, 2023
8. **Komil o'g'li Ashurboyev Jasurbek.** KAM UGLERODLI POLATLARNI PAYVANDLASHDA PAYVAND CHOKLARIDAGI G'OVAKLAR [Журнал]. - Москва : Новости образования: исследование в XXI веке, 2023/1/1 г.. - 6 : Т. 1.
9. **o'g'li Ashurboyev Jasurbek Komil** Payvand chokni oksidsizlantirish uchun elektrod qoplamalarni tanlash va tadqiq qilish [Журнал]. - Андижан : МАШИНАСОЗЛИК ИЛМИЙ-ТЕХНИКА ЖУРНАЛИ, 2022/12 г.. - 1 : Т. 2.
10. **S.R.Aliyev B.B.Batirov.N.I,Abdumuminova, J.K.Ashurboyev** Types of modern photoelements, development stations and explanations [Конференция] // Оптическим и фотоэлектрическим явлениям в полупроводниковых микро-и нано структурах.. - Farg'ona : Ферганский политехнический институт, 2018/5/25. - Т. 1.
11. **Н.Р.Рахимов Д.Д.Алижанов,И.И.Анорбоев, Ж.К.Ашурбоев** АФН-пленка с отражающим серебряным слоем [Журнал] // Оптическим и фотоэлектрическим явлениям в полупроводниковых микро-и нано структурах.. - 2018/5/25 г.. - стр. 64-66.
12. Хошимов Х. Х. и др. РАСКИСЛЕНИЕ СВАРНЫХ ШВОВ //Новости образования: исследование в XXI веке. – 2023. – Т. 1. – №. 6. – С. 709-718.
13. Отаханов, Б. С., Киргизов, Х. Т., Ашурбеков, Ж. К. У., & Мамажонов, Э. Х. У. (2018). Машина для обмолачивания створок маш ручной сборки. *Интерактивная наука*, (6 (28)), 50-53.
14. Умарова Ш. О., Жураев А. И. РАБОТОСПОСОБНОСТЬ СВАРНЫХ СОЕДИНЕНИЙ ПРИ НИЗКИХ ТЕМПЕРАТУР //Новости образования: исследование в XXI веке. – 2023. – Т. 1. – №. 6. – С. 635-647.
15. Хошимов Х. Х. и др. РАСКИСЛЕНИЕ СВАРНЫХ ШВОВ //Новости образования: исследование в XXI веке. – 2023. – Т. 1. – №. 6. – С. 709-718.
16. Yuldashev S. et al. RECOVERY OF WORN PARTS BY ELECTRODES //Journal of Tashkent Institute of Railway Engineers. – 2020. – Т. 16. – №. 3. – С. 149-153.
17. Karimovna, K. M., & Azimovich, A. S. (2022). THE RESULTS OF RESEARCHES ON WEAR OF WELDING FLAT PARTS BY CONTACT WELDING.
18. Қосимов, К. (2022). ҚИШЛОҚ ХЎЖАЛИГИДА ҚЎЛЛАНИЛАДИГАН ПЛУГ ЛЕМЕХЛАРИ РЕСУРСИНИ ЎРГАНИШ НАТИЖАЛАРИ. *Фарғона политехника институти илмий техника журнали*.
19. *Egamberdiyev, M., Qodirov, N., Qodirov, N., & Egamberdiyev, M. (2022). PLUG LEMEXLARINING DALA SINOVLARI NATIJALARI. O'zbekiston Qishloq Va Suv xo'jaligi.*
20. Nazirjon, K. (2023). Theoretical Foundation of Induction Quenching Parameters of Ploughshares. *INTERNATIONAL JOURNAL OF BIOLOGICAL ENGINEERING AND AGRICULTURE*, *2*(3), 62-69.

ISSN NO: 2770-4491
March 2024

21. Karimjon, Q., & Nazirjon, Q. (2023). THE RESULTS OF ABRASIVE WEAR TEST IN LABORATORY CONDITIONS OF PLOUGHSHARES WITH INCREASED RESOURCE BY HEAT TREATMENT.
22. *Qosimov, K., Madazimov, M., Sultonov, R., & Qodirov, N. (2022). PLUG LEMEXLARINI O`RGANISH NATIJALAR TAHLILI. Farg`ona Politexnika Instituti.*
23. Nazirjon, K. (2023). THE RESULTS OF LABORATORY STUDIES ON THE IMPROVEMENT OF INDUCTION HEATING TECHNOLOGY. *Academia Repository*, *4*(10), 325-328.