Modern problems of radio engineering, telecommunications, and computer science.
6. Viunytskyi, O. & Shulgin, V. (2017) Signal processing techniques for fetal electrocardiogram extraction and analysis. *37th International Conference on Electronics and Nanotechnology (ELNANO)*. 325–328.
7. Sameni, R, Jutten, C. &Shamsollahi, M.B. (2008) Multichannel electrocardiogram decomposition using periodic component analysis. *IEEE Transactions on Biomedical Engineering*. vol.55(8), 1935–1940.

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STUDY OF THE INFLUENCE OF CONTROLLED ELECTRODE METAL TRANSFER DURING ELECTRIC ARC SURFACING ON THE CONTACT FATIGUE OF THE DEPOSITED LAYER

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The deposited working layer of the rolling rolls of hot and cold rolling mills, crane wheels, guides and other equipment units should have high values of not only wear resistance, but also contact fatigue resistance. The main ways to increase the resistance of weld-up equipment nodes in this case are the development of new compositions of surfacing materials, as well as the improvement of restoration technology. Despite a large number of studies in these areas, the operational stability of the deposited working layer requires a search for ways to further improve.

The use of controlled transfer of electrode metal during electric arc surfacing allows one to increase the melting coefficient of the electrode, reduce the participation of the base metal in the deposited, and also stabilize the depth of the penetration zone for both wire [1] and strip electrodes [2, 3]. However, according to the literature, studies on the effect of controlled transfer parameters on the resistance of the deposited layer to contact fatigue have not been previously conducted.

The need to reduce the cost of manufacturing products requires the development of technology to use the methods of testing the properties of the deposited layer on the samples when simulating the operating conditions of the deposited products. A known method of testing materials for contact fatigue according to the scheme of a three-contact roller machine [4] with the location of the contact rollers at an angle of 120º relative to each other. Tests are conducted on cylindrical specimens with a diameter of up to 200 mm in an oil bath. This test

procedure leads to a significant increase in the cost of testing and, consequently, the design of technology.

It is proposed to use a rolling method for determining the contact fatigue of the deposited metal [5]. The use of the modern mathematical apparatus of the mechanics of a deformable solid, taking into account the empirical dependences of the mechanical and thermophysical properties of the basic and deposited materials, will reduce material and labor costs for the manufacture of samples and research, significantly reduce the time it takes to design a new technology.

In fig. 1 the results of contact fatigue tests of the working layer deposited with 24Cr7Mn2VMoSi alloy are presented using wire and strip electrodes with mechanical transfer of electrode metal and using traditional technology.

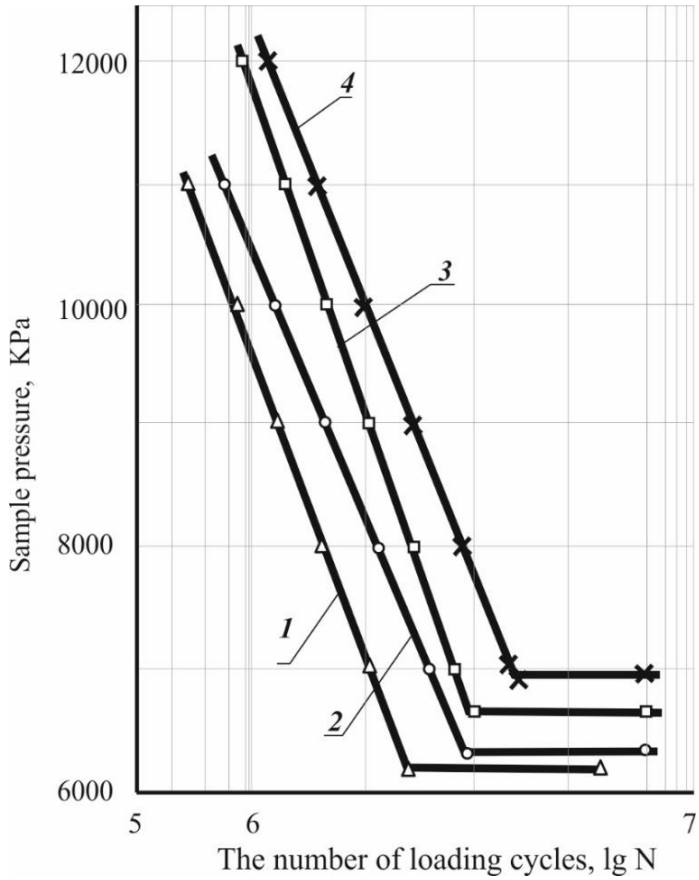

Fig. 1. **Contact fatigue deposited metal 24Cr7Mn2VMoSi test results:**
1, 2 – wire and strip electrodes without controlled transfer, respectively;
3, 4 – the same, using controlled transfer of electrode metal

The data presented confirmed the positive effect of controlled transfer on the contact endurance of the deposited layer.

As can be seen from fig. 1, the use of mechanical vibrations to control the transfer of electrode metal leads to an increase in the number of test cycles until surface defects occur. The use of a strip electrode in this case allows you to get a greater effect of contact endurance due to the minimum HAZ and minimal stresses in the surface layer.

The contact fatigue test specimens were deposited and strip electrodes of low carbon steel under a light ceramic flux in order to obtain the chemical

composition of the working layer, the corresponding material deposited on the rolls of rolling formation.

It is also necessary to take into account that plastic deformation is also used to increase the operational properties of the deposited layer. This will allow the use of the proposed testing equipment in order to improve the operational characteristics of the weld joints.

Conclusions: The effect of controlled transfer on the contact endurance of the deposited layer during surfacing by wire and strip electrodes is studied. The positive effect of mechanical vibrations on the indicators of contact endurance and operational characteristics of the samples is shown.

It is proposed to use the method of rolling rollers for testing contact fatigue of the working layer of parts and assemblies operating under conditions of wear and contact loading in order to reduce the cost of designing and developing new recovery technologies.

References:

1. Paton, B.E., Lebedev, V.A. (2002). Analysis of technical and technological capabilities pulsed wire feed processes in arc welding and surfacing. *Welding production,* (2), 24-31.
2. Ivanov, V.P., Lavrova, E.V. (2014). Improving the Efficiency of Strip Cladding by the Control of Electrode Metal Transfer. *Applied Mechanics and Materials*, (682), 266-269.
3. Ivanov, V.P., Lavrova, E.V. (2018). Development of the Device for Two-Strip Cladding with Controlled Mechanical Transfer. *IOP Conf. Series: Journal of Physics*, (1059), 012020.
4. Полухин, В.П., Николаев, В.А., Тылкин, М.А. (1976) Надежность и долговечность валков холодной прокатки. М.: Металлургия.
5. Sadeghi, F., Jalalahmadi, B., Slack, T.S., Raje, N.N., Arakere, N.K. (2009) A review of rolling contact fatigue. *ASME J. Tribol.*, (131), 041403. DOI: 10.1115/1.3209132.