eISSN: 2229-3213 pISSN: 2229-3205
The Journal of Applied Science and Social Science
Volume 16,Issue 06 June, 2026

RESEARCH AND ANALYSIS OF FLUXES FOR SURFACING TRAVELING WHEELS OF OVERHEAD CRANES

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https://doi.org/10.5281/zenodo.20607047
Technological Machinery and Equipment

Abstract: The article deals with the issue of surfacing under the ceramic flux of the wheels of overhead cranes. Worn parts cause the machines to work with a deviation from the specified parameters, reduce the efficiency of the machines, lead to the emergence of additional load units of the machines, due to which it leads to a deterioration in the working conditions and weakening of the mechanisms of the machines. To prevent these shortcomings of worn parts, submerged arc surfacing is used in place of replacement with new ones, which is economically beneficial.

Key words: ceramic fluxes, surfacing, welding, melt, Scat,

Obtaining a wear-resistant deposited metal is achieved by alloying it with various elements (substances). This is most reliably carried out using an alloyed electrode wire. However, the manufacture of such a wire is difficult, and for many grades of steel it is generally impossible [1–3].

The scarcity and high cost of this wire make it necessary to find new ways of alloying metal with automatic surfacing. From this point of view, alloying ceramic fluxes are of considerable interest, when used during surfacing, non-deficient, cheap carbon welding or surfacing wire grades Св-08, Св-08А, Нп-30, Нп-40, etc. are used. The deposited metal is alloyed by alloying substances passing from the ceramic flux into the molten metal bath [4].

Welding fluxes are called specially prepared metal granular powders with a grain size of 0.25-4 mm. In mechanized arc submerged welding methods, the protection of the welding bath and its metallurgical treatment are carried out with welding fluxes. Fluxes, melting, create a gas and slag dome over the welding arc zone, and after chemical and metallurgical action in the arc space and the welding bath, they form a slag crust on the seam surface, into which oxides, sulfur, phosphorus and gases are removed [5].

Fluxes are divided into fused and ceramic according to the method of their manufacture.

Fused fluxes are obtained by fusing its constituent components. Fused fluxes are essential for automatic metal welding. Fluxes of the AH-348-A, AH-348-AM, AH-348-B, AH-348-BM, AH-60 and ФЦ-9 types are designed for mechanical welding and surfacing of carbon and low-alloy steels with carbon and low-alloy welding wire. AH-8 grade flux is used in electroslag welding of carbon and low-alloy steels and welding of low-alloy steels with carbon and low-alloy welding wire. Fluxes of the AH-15M, AH-18, AH-20, AH-20CM and AH-20П grades are used for automatic arc welding and surfacing of high-alloy and medium-alloy steels. The AH-22 flux is designed for electro slag welding and automatic arc welding and welding of low and medium alloy steels. AN-26C, AN-26SP and AN-26P fluxes are used for automatic and semi-automatic welding of stainless, corrosion-resistant and heat-resistant steels. Fluxes of the AH-26C, AH-26СП и and AH-26П grades are designed for arc welding and surfacing of carbon, low and medium alloy steels of increased and high strength [6].

The main disadvantage of fused fluxes is that they cannot contain alloying elements in their pure form, since they inevitably oxidize during the smelting process. Alloying with fused fluxes occurs by reducing elements from oxides in the flux [7].

Ceramic fluxes are a mechanical mixture of crushed alloying, deoxidizing, modifying and slag-forming components; cemented with a solution of liquid glass. Liquid sodium glass with a density of 1.3 is used as a binder. It is introduced in an amount of 17-18% of the weight of the dry components. The composition of the ceramic flux can include any substances (for example, carbonates, ferroalloys, pure metals, etc.) in the required quantities, regardless of their mutual solubility. The use of such fluxes significantly expands the possibilities of alloying, deoxidation and modification of the deposited metal [8].

Ferrochrome, ferromanganese, ferrotitane, nickel, etc. are used as alloying elements of the flux. Carbon is added, if necessary, in the form of carbon black graphite, charcoal [9].

Ceramic fluxes contain up to 50% of non-oxidized elements in their composition, which makes it possible to actively influence the metallurgical processes of the welding bath, control them and obtain the deposited metal of the required chemical composition [10].

It is impossible to do this with the help of fused fluxes, since they consist mainly of oxides such as SiO_2, CaO, MnO, Al_2O_3.

For the formation of slags, marble, limestone, fluorspar, titanium dioxide, quartz are most often introduced into the ceramic flux. The silica content in the flux is limited to give the slag neutral properties. The slag in which all chemical reactions take place weakly or almost does not oxidize alloying elements and helps to remove sulfur from the molten metal bath [11].

Based on the above, the use of ceramic fluxes for surfacing the running wheels of overhead cranes gives a good result.

Likewise, overhead cranes that serve high-productivity technological processes in various workshops have travel speeds of up to 125 m/min and loads exceeding 100 tons. Therefore, their running wheels (rollers, Fig. 1) operate under very heavy conditions. In addition to the lifted load, they bear the entire weight of the crane, which is why they are considered highly critical components.

Depending on the level of responsibility of these parts, different grades of steel can be used for manufacturing the rollers, such as: St3, St5, cast steel L-45, cast steel L-55, steel 60G, and others.

Also, overhead cranes serving high-performance technological processes of various workshops have travel speeds of up to 125 m/min. and loads over 100 tons, then their running wheels (Fig.1) have a very heavy mode of operation. In addition to the load, they carry the entire weight of the crane and therefore belong to very responsible details. The material for the manufacture of ramps, depending on the degree of responsibility of the latter, can be various grades of steels: Articles st.3, st.5, st.Л-45, steel Л-55, 60G steel and others.

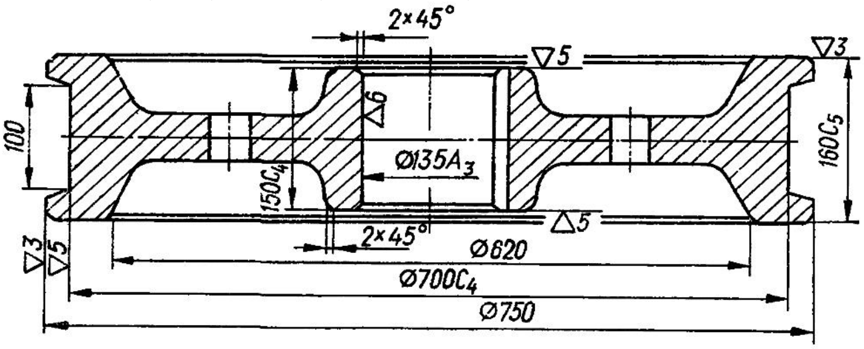

Fig.1. Running wheel of overhead cranes

Requirements are imposed on the deposited metal: the hardness of the deposited layer must lie within the range between the hardness of the slope surface and the hardness of the crane track (300-400HB), so that the slope surface is more resistant compared to the base metal and at the same time is softer than the crane rails and does not break the crane tracks.

The surfacing of the running wheels made of st.3 and st.5 steels can be carried out without preheating. With the base metal of the running wheels with a carbon content of more than 0.3%, it is advisable to preheat to a temperature of 200-300^{0}C

The recommended surfacing mode for the running wheels of overhead cranes is as follows

Table 1.

Welding current	500-550 a
Arc voltage	26-30 V
Surfacing speed	20-22 M / H
Wire feed rate	40-45 M / H
The magnitude of the electrode departure	50-60 mm
Diameter of the electrode	5.0 mm
Offset from the zenith against rotation	30-40 mm

The chemical composition of the recommended flux. %;

Table 2.

Marble	53
Fluorspar	21
Ferrochrome (60%)	5
Ferrotitane (T i-2 20%)	8
Ferromanganese	3
(Mp-2 85%)	3
Ferrosilicon	7
(Si-45 45%)	16
TiO2 – makes the slag "short".	

The chemical composition of the weld metal deposited follows

Table 3.

Flux	C	Cu	Mn	Si	S	P	Hardness after surfacing, HB
KCT -320	0,25 -0,30	4,5 -5,0	1,6 -1,8	0,1 5	0,0 3	0,0 4	260-320

KST-320 surfacing of running wheels of overhead cranes, steel rolls, crimping cages, roller roller bandages.

With a small rim thickness and a significant current strength, the heat input of the arc exceeds the heat output to the surrounding atmosphere and the body of the ramp. The surface of the ramp can be heated to a temperature of 7000C and above. In this case, the properties of the deposited metal will not correspond to the required one, the seam department deteriorates sharply, the formation of seams will become unsatisfactory. For example, it is possible to reduce the welding current to 400-450A, if this method also has disadvantages, it is necessary to make short-term breaks in the surfacing in order to cool the deposited product.

The temperature of the undercarriage wheel is controlled at the same time with the help of thermal pencils and should not exceed 350-400^{0}C.

Conclusion

Chromium ore introduced into the flux together with ferrochrome. Increases the transition of chromium from the flux in the seam metal. The introduction of chromium ore into the flux also contributes to obtaining a good slag base of the flux, improves the formation of the seam, the separability of the slag crust and other technological properties of the flux.

Fluctuations in the mode parameters during the surfacing process usually do not exceed = 2 V in voltage and = 20 A in current.

The presence of a large number of strong ionizers in the flux ensures very good arc stability. The high stability of the arc combustion contributes to a good formation of the roller, allows you to continuously conduct the surfacing process during the shift. Gorenje

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