



Automatic submerged arc welding

Smirnova, Z.V.¹, Kutepova L.I.², Vaganova O.I.³, Cherney O.T.⁴, Romanovskaya E.V.⁵

¹Minin Nizhny Novgorod State Pedagogical University (Minin University), Nizhny Novgorod, Russian Federation, z.v.smirnova@mininuniver.ru

²Minin Nizhny Novgorod State Pedagogical University (Minin University), Nizhny Novgorod, Russian Federation, lubovkutepova@mail.ru

³Minin Nizhny Novgorod State Pedagogical University (Minin University), Nizhny Novgorod, Russian Federation, vaganova_o@mail.ru

⁴Minin Nizhny Novgorod State Pedagogical University (Minin University), Nizhny Novgorod, Russian Federation, fiolet1975@mail.ru

⁵Minin Nizhny Novgorod State Pedagogical University (Minin University), Nizhny Novgorod, Russian Federation, romanovskaya_ev@mininuniver.ru

ABSTRACT

The article reveals the technology of automatic submerged arc welding. The purpose of some grades of fluxes and wires. An example of a circuit for automatic submerged arc welding is given. The technical characteristics of the surfacing wire with the help of which the restoration of machine parts takes place are given.

Key words: Submerged arc welding, technological process, welding arc.

1. INTRODUCTION

The welding process is understood as a technological process, as a result of which non-permanent compounds are obtained which use interatomic atoms and intermolecular bonds in the surfaces of the manufactured product.

Welding technologies have advantages over other compounds; on the basis of this, such a connection is widely used in various industries and provides a leading place as a metal processing process.

There are several welding methods that are divided into pressure welding (cold, friction, ultrasound, explosion, contact, gas press) and melting (electric arc, plasma, electroslag, gas, laser, electron beam, etc.) [1].

If the surfaces of two connected products are thoroughly cleaned and assembled under high pressure so that an interaction occurs between the ionized atoms, a strong weld will be obtained. This is the essence of cold welding of ductile metals.

To date, industrial development is widely used automatic flux welding, especially electric arc welding, which is widely used in the restoration of parts.

2. RESEARCH

The process of submerged arc welding, Figure 1, determines the burning of the arc between the welding wire 1 and the surface of the product 5 under the layer of granular flux 4. Special rollers 2 feed the electrode wire into zone 6 of the arc.

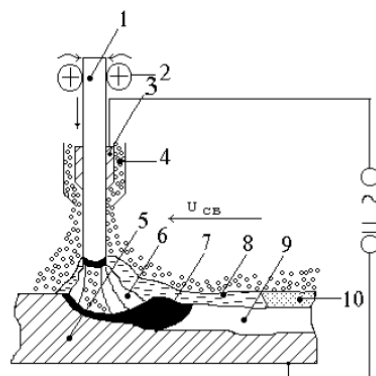


Figure 1: Scheme of automatic submerged arc welding

Welding current (alternating or constant direct or reverse polarity) is supplied to the wire using a sliding contact 3, and to the product - a constant contact. The welding arc burns in a gas bubble, which is formed as a result of melting of flux and metal.

In addition, the molten metal is protected from the environment by a layer of molten flux 8. As the arc moves away from the welding zone, the molten flux solidifies and forms a slag crust 10, which subsequently easily separates from the surface of the weld.[2].

The flux is filled in front of the arc from the hopper with a layer 40–80 mm thick and 40–100 mm wide. Unmelted flux after welding is reused. The molten electrode and base metals 7 in the weld pool are mixed and upon crystallization form a weld 9.

Welding with wire (wire electrode) is predominantly used. However, in recent years, surfacing with tape or combined electrodes is becoming more common.

The advantages of submerged arc welding include: high productivity of the process, due to the use of high currents, deep penetration, an almost complete absence of metal loss due to fumes and spatter (no more than 3%); high quality of the deposited surface as a result of good flux protection of the weld pool; a small amount of non-metallic inclusions in the weld metal; the possibility of alloying deposited metal through a flux; better use of arc heat (compared to manual welding, energy consumption is

reduced by 30–40%); the best working conditions of the welder and a number of others [3].

- however, this type of welding has a number of disadvantages: significant heating of the product;
- increased fluidity of molten metal and flux, which allows welding only in the lower position and surfacing parts with a diameter of at least 40 mm;
- the need for individual cases of repeated heat treatment;
- impossibility of direct observation of the formation of the weld.

Submerged arc welding is used in the manufacture and repair of structures and critical parts that must be reliable when operating in low and high temperatures [6].

3. RESULT AND DISCUSSION

For the type of welding and surfacing under consideration in the repair of rolling stock, fluxes of the AN-348A, AN-348V, OSTs-45, ANTs-1 brands and others are most widely used [4]. Such fluxes are recommended for welding low- and medium-carbon steels. For welding and surfacing of low- and medium-alloy steels, fluxes AN-348A, AN-60, AN-22 and others are used in combination with wires of the Sv-08A, Sv-08GA grades and wires alloyed with chromium, molybdenum, nickel.

Table 1 shows the purpose of some grades of fluxes and wires [6].

Table 1: Fluxes and wire for automatic welding

Flux grade	Flux appointment	Featured Brands wire
AH-348A, AH-348B, АНЦ-1, AH-60, AH-22, AHK-30	Welding and surfacing of products wide carbon and nomenclature items low alloy steels Welding carbon and low alloy steel Welding of low and medium alloy steels Welding carbon and low alloy steels, including cold-resistant fine-grained high strength	CB-08, CB-08A, CB-08GA, CB-10Г2 CB-08, CB-08GA; CB-08XM, CB-10HMA CB-08GA, CB-08XM, CB-08XMΦ, CB-08XГHMTA CB-08, CB-08GA, CB-08XM, CB-08XMΦ, CB-08XГHMTA

In order to obtain layers with enhanced physicomechanical properties during restoration when surfacing under flux, surfacing wires are used, which are divided into 3 groups: from carbon steel of the type Np-30, Np-40, Np-80 and others; from alloy steel Np-30Kh5, Np-30GSA, Np-40KhFA and others; from high alloy steel, for example, Hn-4X13, Hn-45X4B3Φ, Hn-45X2B8T and others [5]. To increase the productivity of submerged-arc surfacing, solid or powder strips 0.3–1 mm thick and 20–100 mm wide are used as surfacing material.

4. CONCLUSION

Thus, table 2 shows the technical characteristics of some brands of surfacing wires recommended for the restoration of rolling stock parts.

Table 2: Surfacing wire specifications

Steel band wire	Brand wire	Hardness deposited metal	Sample Nomenclature recoverable of details
Carbon	Hn-30	HB 160-220	Axles, Shafts Also Support rollers Crankshafts, universal joints
	Hn-45	HB 170-230	
	Hn-50	HB 180-240	
	Hn-85	HB 280-350	
	Hn-40Г	HB 180-240	
	Hn-50Г	HB 200-270	
	Hn-65Г	HB 230-310	
Alloyed	Hn-40X2Г2M	HRC 40-44	Crankshafts of internal engines combustion spline shafts Crankshaft journals, plungers Hydraulic presses. Engine exhaust valves internal combustion
	Hn-50XΦA	HRC 56-57	
highly alloyed	Hn-30X13	HRC 46-52	
	Hn-X20H80T	HRC 40-47	
		HB 180-220	

The creation of an automatic submerged arc welding is the largest achievement of modern welding equipment. The original idea of the submerged arc welding method belongs to the inventor of the arc welding method N. G. Slavyanov. He used crushed window glass as a flux.

The development of automatic submerged arc welding has changed the idea of the scope and possibilities of automating the arc welding process. In a number of industries, automatic welding has almost completely replaced manual welding.

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