

ELEKTRIC-ARC METALIZING IN SUPERSONIC FLOW

Characteristic features of the process of supersonic electric-arc metallizing are crushing and acceleration of particles of the metal melted in the arc gap in a supersonic high-temperature gas flow of the combustion product. The gas flow rate in excess of the sound velocity provides a high level of stabilization of the arc, as well as intensive acceleration and crushing of the molten metal particles.

Finely dispersed particles of the molten metal are transported to the surface of a part in a controlled atmosphere, which heads to a dramatic decrease in the level of their oxidation in flight and in the amount of metal lost for evaporation.

Along with a high cost effectiveness (use a small addition of methane) and a relatively high specific power factor, the above peculiarities of the process enable a substantial increase in strenght of adhesion of the coating to the substrate, decrease in porosity and increase in bond between coating particles.



As compare with standard metallizers which use air as the blowing gas, the new metallizer provides coatings improved service properties:

- Strength of adhesion of steel coatings deposited by the flux0cored wire method to the steel substrate increases from 25-30 to 40-60 MPa,
- Porosity of coatings decreases from 10-15 to 1-3%,
- Oxidation of the coatings material decreases 2 times.



The railway has accumulated a large experience during the 7-year period of the operation of over 200 diesel with crankshafts repaired by the supersonic electric arc metallizing method. No defects have been reported. The run of the repaired locomotive crankshafts is over 1000 000 km.

The process line intended for spraying of protected coatings and repair of worn out pins of crankshafts of cars, diesels of locomotives, ships and other parts of the type of bodies of revolution.

The process line comprises:

1. Supersonic electric-arc metallizing machine USM-5

The machine consists of the metallizing unite with a built-in supersonic torch, control panel, wire feed mechanisms and power supply

It is intended for electric-arc wire spraying in a supersonic flow of hot air+methane combustion products, and is used as a part of the automated and mechanized lines.

2. Semiautomatic device for spraying and repair of worn out of crankshafts and other parts of the type of bodies of revolution.

The device consists of a metallizing chamber, control panel, aspirator and fan. It is intended for spraying of coatings on crankshafts and other parts of the type of bodies of revolution, using machine USM-5.

Specifications:

No	Parameters	Values of parameters
1	Dimensions of crankshafts (details), mm -Length - Diameter in rotation relative to centre	1904 580
2	Maximum mass of a details, kg	240
3	Rotation frequency, rpm	15-75
4	Flow rate of compressed air, m ³ /h	10
5	Maximum power consumption, kVA	15
6	Mass of semiautomatic device, kg	4200

3.Semiautomatic device for abrasive-jet blasting of pins of crankshafts and other parts of the type of bodies of revolution.

The semiautomatic device consists of an abrasive-get chamber, control panel, aspirator and fan. It is intended for abrasive-jet blasting of worn out pins of crankshafts of cars, diesels of diesel0trains and other parts of the type of bodies of revolution.

Specifications:

No	Parameters	Values of parameters
1	Dimensions of crankshafts (details), mm -Length - Diameter in rotation relative to centre	1904 580
2	Maximum mass of a details, kg	240
3	Rotation frequency, rpm	15-75
4	Flow rate of compressed air, m ³ /h	1000
5	Maximum power consumption, kVA	15
6	Mass of semiautomatic device, kg	4800

