

Features and Application of Hypersonic Metallization

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Hypersonic metallization (**HM**) combine the advantages of arc spraying and high-velocity metal spraying with compact high efficiency propane-air mix combustion chamber.

Supersonic jet of the mix has at the output the speed of 1500 m/sec and the temperature of 2200 K. That causes the particles are speeded up to 500 m/s. As a result a coating adhesion strength is twice improved in comparison with traditional metal spraying. This is enough to work in the most extreme conditions and in cases of shock-abrasive wear. Original design of the combustion chamber, use of an effective combustion catalyst, absence of chamber water cooling and presence of automatic mix firing make the unit more reliable and the personal work more easy.

A wire used as material for spraying can be made of any metal (zinc, aluminum, copper, brass, bronze, carbonated and stainless steel, nickel-chrome alloy etc.) as well as powder wire. A combination of any two wires is also possible.

*Advantage of **HM** technology: high speed of particles - 500 m/s*

- low porosity of coatings (porosity of steel coatings 2 - 4 %);
- low prime cost of the process;
- fast and easy replacement of wire and transfer from one diameter to another;
- no need to adjust equipment, fast access to all parts of the unit;
- simple and fast replaceable current collectors;
- replacement of feed rollers without disassembling of the unit.

Industrial application fields:

- restoring shaft journals of all types of crankshafts, including those of heavy loaded diesel engines;
- applying of anti-corrosion coatings at tube and plain surfaces, interior and exterior surfaces of vessels stationary and in field;
- restoring places for installation of bearings, stuffing-boxes etc.

By present time in many European Union countries it is forbidden to use metallization process in galvanic baths, and for deposition of corrosion and wear resistant coatings it is used the methods gas-thermal spraying. Instead of galvanic coatings of chrome the coatings are formed by dispersion of chrome-containing steel or powder composite wires. Operating experience of gas-thermal coatings on the rods of hydro equipment, pump plungers etc., shows that gas-thermal coatings surpass the galvanic ones on a number of parameters. We offer the technology to **HM** instead chromium electroplating. The principal reasons for replacement galvanic technology by **HM** are listed below:

- refusal of galvanic baths at many enterprises has been caused by complexity of recycling of galvanic waste and the general high harm of galvanic manufacture;
- using galvanic method it is possible to receive a qualitative chrome coating by thickness no more than 80 microns; formation of layer in the size from 100 to 1500 microns does not cause any difficulties for **HM**;
- adhesion tensile strength of galvanic coatings makes 10 - 20 MPa; adhesion tensile strength of **HM** coatings makes 45 - 65 MPa;
- under high specific loadings the galvanic chromic coatings, being put on details of sliding friction units, wear out and damage very quickly; in spraying the non-uniform structure is formed by level-by-level packing of fused drops of sprayed material; after tribological tests within 9 hours it is not revealed appreciable wear of sprayed coating while on the galvanic coating there were numerous sites of damage.