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Article

Thermo-regulation Of Fuel In Diesel Engines Using Mathematical Models Yamz-238

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Abstract
The technological scheme of the machine diesel engines used in the agriculture parts recovery process is provided by electric welding using the middle layer of the article. Experimental studies of the properties of coatings obtained after conducting electrode welding using an intermediate layer were described. The results of the studies are presented and analyzed. Technical and economic evaluation of the application of electric welding on the example of crankshafts of diesel engines used in agriculture. As a result, the main results of the studies are given.

Keywords: Recovery methods, mounting methods, electrolysis, middle layer, metallic powder, welding tape.

Introduction

Tilling is one of the main processes on the soil to break the surface layer and create suitable conditions that allow water and air to penetrate[1]. The tillage is the most considerable consumable energy of the tractor[2] Also, the development of new and developed ways and means to reduce the toxicity of exhaust gases with a high degree of purification and long-life service, as well as minimal fuel impact and economic indicators of diesel engines used in Agriculture. Diesel engines are one of the primary energy sources for mobile vehicles and can also be used as stationary or mobile power sources[3]. The process of electrocontact coating formation The welding processes have different functions, including abrasion resistance, anti-friction, wear-resistant m. P.

With this concentration, the production of the coating on the electrocontact welding bar using intermediate layers and their analysis properties, including those that are common to all methods of electrocontact soldering step, in particular, the preparation of the tape, the middle layer and the target surface, etc., Figure 1.

Electrocarbon welding mainly uses units of type 011-1-02, "Remedetal," with different types of head welding devices to restore and stiffen the details of agricultural technology. The rigidity of the structure and the quality of the surface to be constructed or hardened during the welding process are achieved by reinforcing the wheels and significantly reducing the dimensions of the cylinder electrodes. Increased speed exceeds the allowable limits of the machine being damaged or consumed as a result of exposure to tensile strength resulting from increased dust resistance[5].

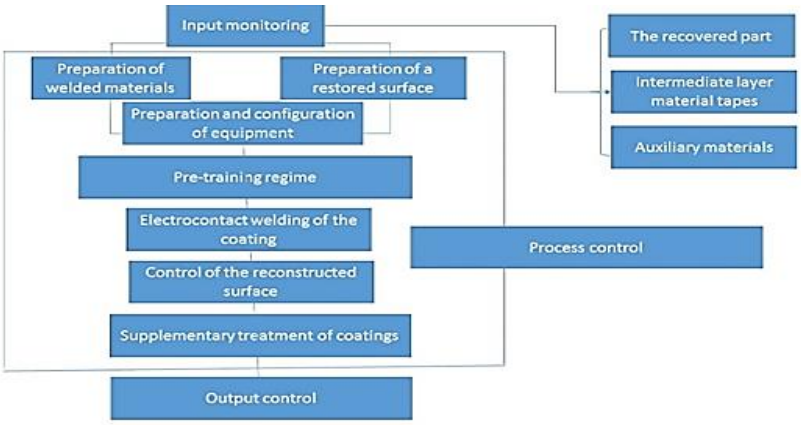

Figure 1. Scheme of the technological process of electrically soldering a metal bar using an intermediate layer.

Materials and Methods

The electrode adhesives were sold using an intermediate layer in the structures 011-1-02 and 011-1-10 Remdetal. The paint quality evaluation was carried out through a total analysis of the structure on an MBE-2 microscope with an increase of 30 times in the surface of the macros, which were cut and prepared from these coatings.

Microscopy was performed on a microscope called Neofot 21, MetamPl, MIM-8 and Axiovert 40 MAT. SAMEVAH was performed, and polished sections were cleared with an accelerated voltage of 15 kV and a current of 10-9 A. The hardness of the welded layer was tested on the test specimens through the Vickers method with a load of 49 n hardness measurements. The photometer was made on the FOM-2-16 micrometer lens of the ZM Diamond PMT box with an angle at its peak of 136 and makeover-Domer «Duramin 2 "In H.V. load 0.5 N and load time 10s[5,6]. The ribbon amount of precipitation using different types of intermediate layers after electrocontact welding is determined by the British company TAYLOR-HOB SON. The control of the ripple precedes the TALYSURF 4 model (TALIMIN model). Profile log was created with an increase of x50 - the dividing price was 0.04 mm. Corresponds to the horizontal scale of the part (x10). The radius at the tip of the probe head was 0.1 mm. The accuracy of the device is 0.25 μm.

Surface roughness is determined using the performance model scale 170623 (TU 2.034.5748542.02-04), which allows measurement of the rough profile and roughness parameters in the middle line system (GOST 25142-82) according to the value ranges specified in GOST 2789-73. The hardness of the samples was tested in the initial case and after electric welding at room temperature on the Pendulum 2130MK-03 at the maximum power of 300 J pendulum effect. Fatigue tests were conducted on the MUI-6000 electromechanical testing machine. The material's corrosion resistance was determined by the following methods: Learning curves The potential changes over time, obtained during rapid analysis. Long-term corrosion tests through mass loss method. Climatic tests in the temperature and humidity chamber KTVE-04-002 and heat and heat chamber KHT0,4-004 according to GOST 20.57.406-81)1(. The corrosion resistance of the coating applied to the cylindrical parts of friction machines II 5018 (T.U. 25-7701 00061-90) was tested according to the "roller shoes" plan, and the flat parts in MTU-01 (T.U. 4271-001-29034600-2004).

Justify The Way The Middle Layer is Installed:

In order to achieve the initial mechanical characteristics of the metal used in the structure's design, it is necessary to additionally apply renovation technology such as heat treatment after casting, welding, and pressure treatment[7].

The preparation of an intermediate layer of metal powders for electric welding may have its peculiarities because of the complexity and intensity of applying a layer of powder to one of the adjacent surfaces at the base or tape. To do this, an analysis was made of possible methods (galvanic deposition, spraying, mesh application, alcohol solution, glue, etc.) to fix the powder on the welded surface of the tape. The studied methods enabled the use of new methods when installing an intermediate layer of metal powders on the surface of a material. The technical cork gel was used to repair the middle layer of metal powders, which was evenly distributed on the surface of the tape by the roller.

At the same time, it was considered that the deposition layer of the superconductor must ensure that a layer of powder was retained ,as described in Figure 2 [8]. In the second case, an electrolysis method was applied in a bimetallic band (a patent of the Russian Federation of Invention No. 2385207).

The welded side of the metal tape is processed by forming a microrelief on its surface with a high particle size inside of the powder used to apply the monolayer (5.0 to 50 microns).

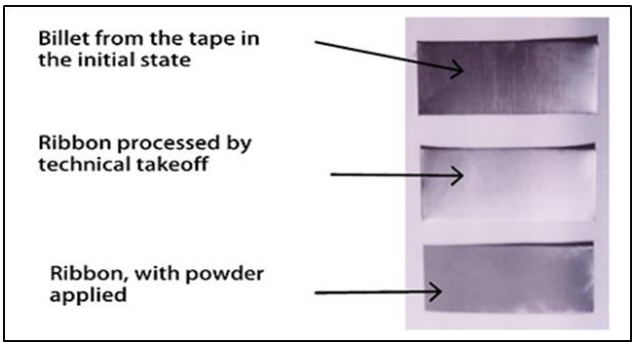

Figure 2. Install a metallic powder on the surface of the tape with petroleum jelly.

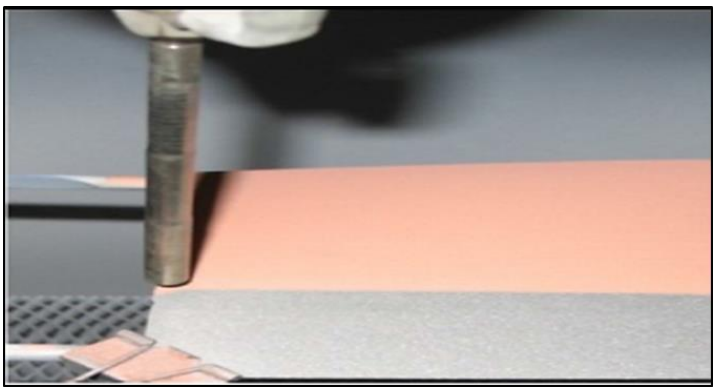

Figure 3. Fixing the metallic powder on the linen surface with dynamic spraying with cold gas.

Investigate The Coatings Properties Obtained In Electrocontact Welding

The electrode welding was chosen using the intermediate tape based on the recommendations by which the following part of the methods was chosen for the part of the diameter of кА, с, с, кН, l / min Figure 4[8].

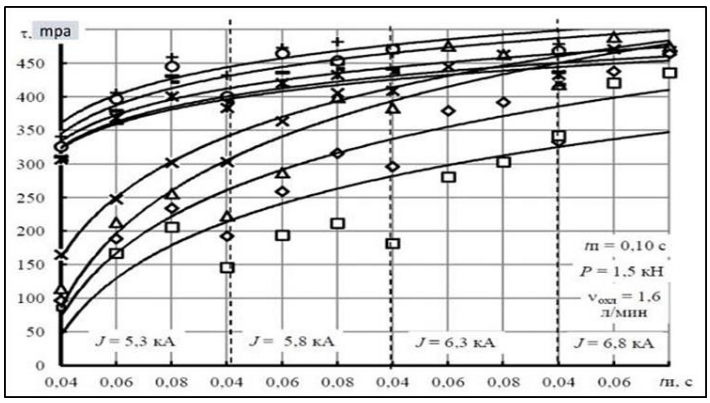

Figure 4. The strength of steel bonding 45 - Metal tape with the middle layer.

The strength of the coating binding of the base in the kN period is maximum with the maximum, the maximum strength of the 50HPA steel coating joint using the intermediate layer of metal powder No. 3-00-02, as well as the 50HPA steel and the amorphous bar of the Stemet 1311 with 45 steel are set in kilo Newton Figure 5.

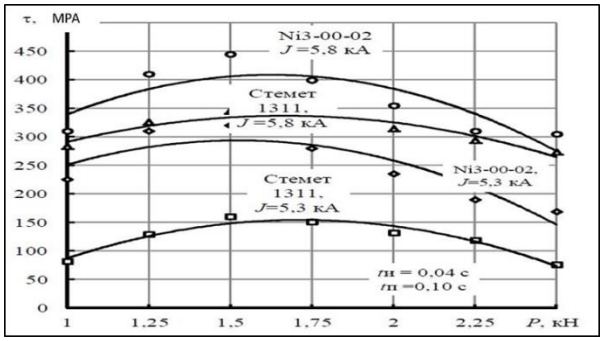

Figure 5. Effect of force on joint strength.

The stopover duration in the extensive range affects the appearance of any coating on the properties of the steel under consideration and 50HFA-Mykh metal powders and amorphous tapes with stainless steel 45.

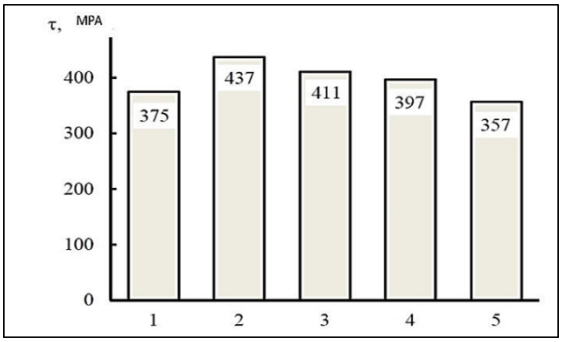

Figure 6. Effect of surface preparation on bond strength.

Figure 7 shows the effect of the partial composition of the powder and the value of the middle layer on the bonding strength of the coating with the base metal.

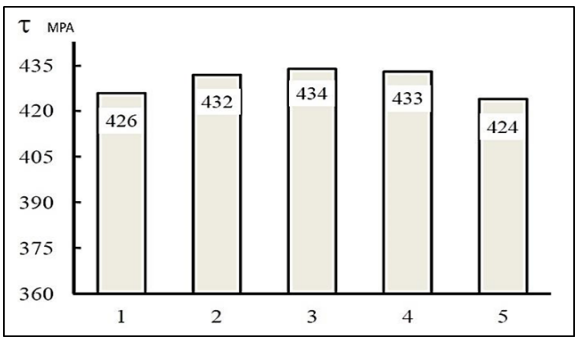

Figure 7. Effect of fractional powder formation on compound strength.

Figure 7 shows that the increase in particle size in the powder from 5 μm to 60 μm has no significant effect on the strength of the composite coating with the parent metal, which appears to be due to the favorable conditions that arise in the joint area to deform the joints—the surface layers of the Semitranic substances that are combined and powdered.

Regardless of the number of layers of coatings welded from the tape and the middle layer of each piece, the fracture occurs during the test through the tape or base metal material, indicating the characteristics of the high strength of the coating, which consists of electric welding. The test results indicate the formation of a strong metal bond at the base of the metal base coating[16]. When the study of micro-hardness changes in micro-hardness

Studies on the microstructure and patterns of variation in the partial hardness of the welded paint thickness have shown that the surface layer formed of 50HFA steel formed a fine --- dispersed homogeneous martensite structure (Figure 8a, b).

In the common area, martensitic resistance zone and behind the thermal effect zone, a structure of ferrite-pearl (Fig. 8a, b). The coating tape was 12X18H10T structure: austenite and chrome carbide (Figure 8C, d). - Steel 50HFA - Ni - 3 - 3 - Steel 45 - B - Steel 50HFA - Stemet 1311 - Steel 45 (surface roughness h = 250 m); - Steel 121818H10T - Stetem 1301 - Cast iron. - Steel 121818H10T.

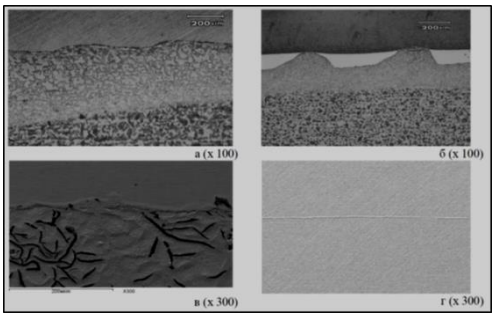

Figure 8. Microstructure of the joints.

The metal examination revealed that one-, two-, and three-layer coatings in the common area, obtained using medium layers, were completely free of defects such as cracks, pores and gaps between joined materials (Figure 8D).

Based on the analysis, it can be concluded that metal powders PG-CP2, Ni-00-02 and amorphous stet 1301 and 1311 on nickel based on [9] procedure. Almost the same strength as the link between the paint and the base, the scope (depth) of the joint area is relatively minor (about 20 ... 36%), and the depth of the affected area of heat occurs (about 30 ... 80%). In addition, the microhardness bond area obtained using electrode welding using powders of 14 B.H. and 15 M.F. has high enough values (HRC 56 ... 59), significantly reducing the bond area's ductility and viscosity. When iron-based materials are used as an intermediate layer, there is a high probability of oxidation of iron in the composition, which leads to the appearance of defects in the area of the joint. Also, the intermediate layers, the main

component of copper (Stemet 1108, 1202), can cause joint fragility, which is unacceptable for reconstructed parts operating at high temperatures.
The metallurgical examination confirmed the results of Ray's structure analysis results to show that the 50HFA tape compound coating area using the middle layer of NM3-00-00 mineral powder with a core set of 45 steel is a solid alloy D-Si solution, chromium, manganese, Ni, O, Al in iron (Fe). Coating compound Zona 50HFA steel with an intermediate layer of amorphous STEMET 1301 strip with a core set of 45 steel is a solid solution of Si, chromium, manganese and nickel in iron (iron). Similar results were obtained in the study of other compounds.
Based on the X-ray diffraction analysis performed, we can draw the following conclusions:
- Chemical compounds for paint and alkali were found in the vehicles under study;
- Change in the concentration of the steel elements of the 50ФФА steel and 45 steel base occurs in the joint area and at a distance of 50 μm thereof, depending on the type of middle layer used;
- In the conduction area using intermediate layers of metal powders C-01-01 NH3-00-02, AlO can be used as residues from the gas-dynamic treatment of the welded surfaces.
X-ray spectroscopy showed that the transfer of middle-layer elements to paint and base metal is very important, but, in the case of other things, it depends on the brands of the welded tape and the substrate and their chemical composition.
Reasons that explain this phenomenon:
- Small amounts of metal are involved in the connection since the heat solder heat is translated into small sizes.
- Transient welding of electricity. The conversion factor of the chemical elements of all test materials is very high - from 0.6 to the core elements. A percentage of the combination of the increase of middle-layer elements in the coating, the region must have bond and base metals have a positive effect on improving the mechanical properties of the welding layer[5,6]. The durability tests of the samples (Figure 9) showed that the strength of the effect of the samples after welding was reduced by approximately 13.1% - 50ФФА steel paint without intermediate layer and 6 ... 11% - using medium layers of metallic powders ПГ-СР2, 3-3- 00-02 and the non-crystallized tape at Statement 1311.

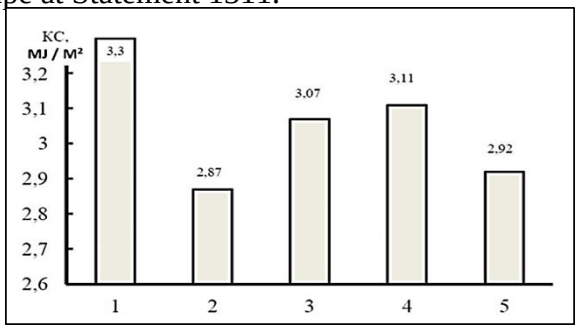

Figure 9. Impact strength of samples.

Steel 45; 2 - with steel coating 50ФФА; 3 - with steel coating 50ФФА and ПГ -СР2; 4 - with steel coating and Ni3-00-02; 5 - with steel coating 50 ФФ and 1311 Стемет. A reduction in the hardness of the coated samples occurs due to the thermal effects of the electrocontact welding process on the base metals. It should be noted that the destruction of samples with the latter coating of linings was not observed. Results of the fatigue tests (Fig. 10A, B) showed that the fatigue strength of the 50HFA coated steel samples obtained electrocontact welding using the intermediate layer with optimal mode parameters is Mega Pascal, which is approximately 6.0% less than the fatigue strength of 45 steel samples in the starting state (Pascal).

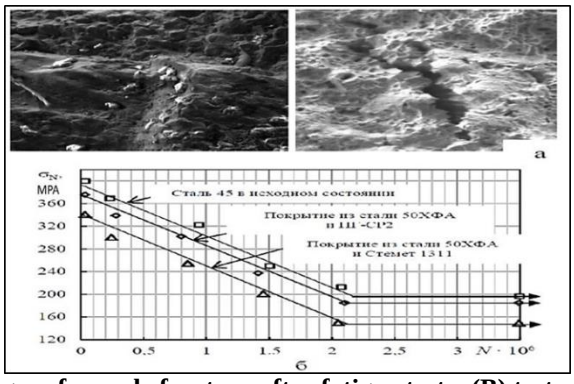

Figure 10. Results of fatigue strength tests : (A) images of sample fracture after fatigue tests; (B) test results.

Andic Analysis Polymotion Solution:

The composite solution "Steel 45 - 50HFA Steel Coating" obtained electrocontact welding using a medium layer of PG-CP2 powder, with optimized mode parameters showing that the corrosion resistance of the compound has no less area of corrosion resistance for metal bonding.

When examining the corrosion resistance of samples in a fixed solution of NaCl for 60 days, the lowest corrosion rate obtained by a sample obtained electrically sold for 12X18H10T tape was found using an intermediate layer of the Stemet 1311 non-crystalline tape. In order to increase the tribal properties of the coatings obtained by electrically welding the tape through an amorphous intermediate layer, powders of the following grades were sprayed with cold-water spraying: C-01-11; A 80-13. N3-00-02. The coating resistance of the paint on IM-01 was determined using flat samples and on the 5018 II machine according to the roller system. Sampled spray samples from the N3-00-02 have the lowest corrosion rate, while indicators such as oil temperature and friction coefficient were also low.

2.4. Economic Efficiency Assessment:

The economic efficiency of the welding electrode can be estimated by subtracting the surface value of S = 1 CM2 as a traditional cylindrical member. The base (current) variant reviewed the recovery process of a cylindrical theoretical member by an electrode-welded steel bar, followed by an underground glass engagement, but the new (expected) version - the theoretical recovery process of a cylindrical member by an electric steel bar weld using intermediate layers of subsequent milling.

(1) Where - the cost of restoring the annual installment of parts in the basic version, $;

Where - the cost of restoring the annual installment of parts in the basic version, $;

- Cost price to recover the annual installment of parts in a new version. The base cost price for parts recovery can be determined based on the unit cost of work performance for surface area processed according to the formula:

(2) Where the unit cost to restore the surface area in the base and the new variables, USD / cm^2;

- Surface area to be rebuilt, cm^2;

- The number of parts per lot, pcs.

The surface area to be reconstructed is determined by the following equation:

(3) Where - diameter rebuild the shaft, mm

- Offer the reconstruction of the spear neck, mm.

That is, as applied to the crankshaft, we get:

мм2 =220,485 см2

Replace the expression (2) in formula (1), we will receive the annual economic impact of the performance on the outside of the bar with the use of the intermediate layer:

(4) With an annual program of 600 crankshafts, the restoration of the parts by electrolysis will generate additional profit:

American dollar

Thus, the calculation of the comparative economic impact of the use of projected technological processes showed that with the annual program to recover 600 column columns, the additional profit would be $ 2645.8.

Results

The thickness of the middle layer of 5 to 60 micrometers does not significantly affect the bonding strength of the base metal coating. The optimum setting of the surface of the segment is the removal, conversion, and grinding (p= 0.1... 35m 35).

The higher the precise hardness of the coating layer corresponds to the edge and near the common area, the minimum micro hardness corresponds to the middle of the welding layer coating layer, moving from minimum to maximum smooth microhardness. In paint and in common areas, obtained using medium layers, no imperfections such as cracks and pores are obtained.

The optimum material to be used as an intermediate layer under electric welding steel strips and steel-based metal powders are PG-CP2, Ni-00-02 and amorphous tape STEMET 1301, 1311 based on nickel.

The effect of samples after welding was reduced by 13.1%. The spiral strength of the 50HPA-coated steel samples is 185 MPa, 6.0% lower than the periodic strength of the 45 steel samples in the initial case. The most significant resistance to KORRO Sion samples has a joining area obtained using the intermediate layer of the amorphous tape 1311. The high tribological properties are the coating of Ni3-00-02 brand powder.

Economically sound technological scheme for electrical tape welding process using intermediate layer. The annual economic impact of the application of the system to recover parts of the machine was $ 2.645.8.

Discussion

The results showed that the monolayer is applied with a thickness of 5.0 to 50 mm of metallic powder on the treated surface of the strip in a non-molten case, thus obtaining a bimetallic tape with the following electrode welding [9,10,11]. However, sufficient heat is generated at kA and constant values, which is required to form a high-strength composite of steel bars and metal powders. Results are achieved by forming a layer made of a metal tape using an intermediate layer of non-crystallized tapes but with kA at constant values. The increased fixed values lead to an intense increase in coating contact with the substrate [12,13]. In the study of the effect of surface roughness on the steel component 45 on the quality of the coated compound with 50HPA, using an intermediate layer of PG-CP 2 metal powder, it was established in Figure 6 that the highest strength of 50 HPA- мкм), rotation (мкм) and grinding (мкм) [5,14,15]. This is due to the more advanced surface interaction of the coating with the substrate compared to other types of surface treatment. Some decrease in the periodic strength of the samples obtained compared to 45 steel samples occurs due to the formation of fatigue cracks in the thermal effect zone under the influence of cyclic loads. With fatigue failure, coating peeling was not observed [9,18,19].

Conclusions

Long-term corrosion tests have shown that the most significant impact on the strength of bond-operated corrosion processes occurred during the first five days of finding samples at room temperature and humidity. The corrosion rate is then fixed [17]. As welding materials were used, a mixture of mineral powder was attached to the surface of the welded dynamic gas spray strip

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