CONTACT RESISTANCE AND QUALITY GLUE-WELDING CONNECTION WITH ELIMINATION OF CRACKS IN CAST IRON PARTS

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Abstract. *There are **t**he results of experimental studies of conditions – determining by contact resistance of the necessary contacts in the welding area of research glue-welding for secure connections*

steel-iron when used in eliminating cracks in the cast iron body parts chassis tractors. Their use in the formation of compounds glue-welding steel-iron to eliminate cracks in large parts is limited technologically and economically irrational. This is due to the difficulty of creating local baths in areas with cracks configuration defects, difficulty of forming a uniform coating on the work piece surface chemical composition, which leads to an uneven distribution of forces of the adhesive bond between the contacting surfaces and reduced quality of the connection.

Most low resistance contact area was obtained at realization of the method of combined – mechanical and chemical. Its use is limited by technological problem was the difficulty of obtaining the local baths in areas with cracks (complex configuration of the surface). The greatest resistance in the contact zone is obtained by milling, develop uneven structure. Less resistance to the contact zone was observed in the treatment of surfaces with a wire brush or abrasive wheel. This is due to a decrease in the microprotrusion and increase contact area.

Key words: ***body parts, steel, iron, electric-welding, spot welded, contact area, adhesive layer quality, contact resistance***

Introduction. Conditions of formation of such a compound is determined on the basis of the results of research to establish the impact on the quality of the connection of various factors: the state of the surfaces of the parts, electric-welding regime parameters and the composition of the steel lining of the adhesive composition. To do this, conducted: mechanical tests under static and cyclic loading, metallographic studies of the fusion zone and glue and more.

Formulation of problem. Common methods of surface preparation of parts in forming glue-welding compounds are chemical, mechanical, and their combination. Chemical methods, as noted in his works: Shavyrin V.

V., Belokur I. P., Orlov B. D., Ryazantsev V. A., Gulyaev A. I. et al. [1, 2, 3, 5] suitable for the welding of aluminum, titanium, magnesium alloys and stainless steels. They are technologically complex processes, involving several steps: degreasing, pickling, passivation, oxidation, clarification and electromechanical processing. However, their use in the formation of compounds glue-welding steel-iron to eliminate cracks in large parts is limited technologically and economically irrational. This is due to the difficulty of creating local baths in areas with cracks configuration defects, difficulty of forming a uniform coating on the work piece surface chemical composition, which leads to an uneven distribution of forces of the adhesive bond between the contacting surfaces and reduced quality of the connection. Presumably, there is a rational use of mechanical means, or combinations thereof. Researchers conducted at tension of the purpose-made standards that consisted of two elements : cast-iron plate (SCH-18) with the sizes of 100x 60x a 10 mm and steel protective straps (Steel 20) with the sizes of 100x 60x 0,8 mm. In connection with unavailability of reliable data about nature of the cyclic loading that test cast-iron details during exploitation, tests are conducted at axial tension – compression on symmetric and asymmetric to the cycles of loudening. Analysis of the literature [4, 5], and preliminary studies have shown that the objective criterion of the quality of the surface at the contact point and seam welding has a contact resistance at the junction.

Objective: to explore the possibility of glue-welding steel-iron compounds (welding on wet glue) using it in eliminating cracks in the cast iron body parts chassis tractors.

Results of researches. Practical experience and conducted experimental studies have shown that an objective indicator of the quality of surface preparation for gluewelding connection resistance spot and seam welding is a resistance value in the contact zone. To select the method of surface preparation and its applicability in the formation glue-welding connection steel, cast iron and measure the contact resistance of the weld zone thermal ways: milling cast iron parts and processing sanded steel plates, grinding abrasive wheel cast iron parts and steel plates, grinding of cast iron parts, followed by chemical treatment the standard method and steel plates and cast iron parts and steel plates with a wire brush. The experiments showed that all methods allow a satisfactory surface quality of the formation on the surfaces of stability and low resistance. However, most low resistance contact area was obtained at realization of the method of combined - mechanical and chemical. Its use is limited by technological problem was the difficulty of obtaining the local

baths in areas with cracks (complex configuration of the surface). The greatest resistance in the contact zone is obtained by milling, develop uneven structure. Less resistance to the contact zone was observed in the treatment of surfaces with a wire brush or abrasive wheel. The surface roughness is Rz = 60...90. This is due to a decrease in the micro protrusion and increase contact area. structure. The causes of failures in the operation of cabinet cast iron parts are loss work ship of status as a result of wear of rubbing surfaces workers, who make up 0.02 ... 10.0 mm. Moreover, 83% of them are wearing no more than 0.6 ... 0.08 mm, and the destruction of these parts is the presence of fatigue loading and accompanied by a decrease in strength by 42%. Revealed that the deformation and damage parts of 21% is due to jamming of mobile conjugations under considerable stress, and destruction and damage parts accompanied corrosion and aging of materials to 10%. The loss of operability of the compatible parts under the influence of the above factors and the environment by 23%. However, its application is limited at the closing of cracks due to reasons. The experimental data by this method correlated with the results of [4, 5]. Resistance highest value in the contact area gives the milling of the surfaces. This is due to that after milling on the surface of the parts is formed strongly developed, rough surface with R_z 120...166. The main source of internal tensions, which are linked with metallurgical processes, is thermal shrinkage brake cooling down at different speeds elements details. The nature and magnitude of this inhibition is due to the fact that at 600–650 °C iron passes from elastic to plastic state. At high temperature thick of complex configuration details usually tangentially compressed and thin – arm stretched. A characteristic feature cast iron body parts are also extremely molecules under deformation forces with different nature, size and direction of action. The combination of internal pressure from the effects of stress and residual stress leads to violation of the integrity of the material and the appearance of cracks, holes and calving.

The experimental results revealed that the contact resistance is reduced by increasing the compression force electrodes. Drag reduction was observed up to a certain value of the quantity of compression. Then, the contact resistance stable and did not decrease further. With further increase of electrodes compression force increased slightly. Increased resistance in the contact zone with increasing force up to 2.8...3.0 kN and then decreases. This phenomenon can be explained as follows: the initial contact form macrostructures having a limited contact area with increased pressure on the contact areas of these microstructures are crushed and the

contact area increases and the resistance weld zone – is reduced. When you reach a certain plastic deformation under the pressure of the electrodes, almost all projections are crumpled and micro surface – aligned and form a complete contact area.

Thus, the contact resistance have the smallest value. A further increase in contact pressure leads to plastic micro currents metal contact zone and formed by partial destruction site. Formed disparate plots and resistance increases. Further increase of pressure causes them to smoothing and a compound that leads to the formation of a new more complete contact area. Based on these results were determined conditions for the formation of the contact surface, provided that high-quality glue-welding compound used in eliminating pops into cast iron housing parts. The optimum is to prepare the surfaces (including production capacities of repair shops) with an abrasive wheel or wire brush. These methods allow to obtain low and stable resistance area landfills, the value of which is Rk = 80...120 mkOm.

Experimental studies have made it possible to establish the relationship between the compressive force of the electrodes and the diameter of the welding point and the heat affected zone. It is established, by increasing the clamping force of electrodes, and the nugget diameter core, respectively, the heat affected zone decreases. This phenomenon is caused by the fact that with increasing pressure on the mating parts, a large contact area and reduced contact resistance. With decreasing resistance in the contact area decreases the amount of energy together with the decreasing diameter core weld.

Changing the duration of the compression of the electrodes is less affected by the passage of welding processes. If you change the duration from 0,48 to 0,84 with a core diameter of the weld has changed (decreased) by 0,6 mm, and the heat-affected zone by 0,64 mm.

On the other hand, the duration of the contraction of the electrodes has a decisive impact on squeezing the adhesive layer during the formation of the necessary resistance in contact. Glue welding high quality can be obtained only if the complete or nearly complete squeezing it with the pad. It is found that the magnitude of the compressive force of the electrodes to achieve optimum conditions for forming the necessary connections and glue-welding contact zone varies within 2.0...2.2 kN.

It was established experimentally that the increase in welding current values of 6,0 to 11,0 kA leads to an increase in core diameter and the weld heat affected zone. In this area the definition of these values is in the range: 7,7...5,62 and 0,46...1,89 mm, respectively, however, the use of a

low current values lead to the formation of defects in the core: small – lack of fusion, biggest – cracks and splashes. Increasing the core and the weld thermal zone due to an increase of heat in the welding zone during the formation of large areas of the superheated molten metal and sizes.

It should be noted that the implementation of these parameters (of equal value) for the welded joints and glue welding their character is different with different values of the unknown parameters. For example, the core diameter of the weld is 12% and the heat affected zone is 15% longer in glue welding. this is due to the change in conditions of heat removal from the heated metal. The adhesive layer of absorbing a certain amount of heat decreases the temperature gradient in the weld zone, creating conditions more uniform cooling of the metal mass. A process of concentration of the melt around the axis of the nugget and its diameter decreases. heated metal concentration in a small area contributes to the heating of large areas, close to the cast kernel - heat-affected zone.

Conclusions. For the implementation of the proposed methods of surface preparation necessary to fulfill the following conditions: grit abrasive circle- M14, the circumferential speed – 30 ... 40 m/s, cutting depth – 0.3...0.6 mm, the diameter of the wires of the brush – 0.2...0.6 mm, length delay – 50...60 mm, etc. Final steps of surface preparation of the parts are: the removal of abrasive particles and fracture of metals with compressed air and then – degreasing. Application glue-welding connection to eliminate cracks determines these operations carefully.