10. *Hertz A.* Chad and John D. Hibbard. "A Preliminary Assessment of the Economics of Variable Rate Technology for Applying Phosphorus and Potassium in Corn Production," Farm Economics iss. 14, Department of Agricultural Economics, University of Illinois, Champaign-Urbana. – 1993. – P. 218–231.
11. *Applying* nitrogen site-specifically using soil electrical conductivity maps and precision agriculture technology. Lund ED ; Wolcott MC ; Hanson GP, Thescientificworldjournal [ScientificWorldJournal] 2001 Oct 16; Vol. 1 Suppl 2, pp. 767-76. Date of Electronic Publication: 2001 Oct 16.
12. *Small* Scale Spatial Variability of Apparent Electrical Conductivity within a Paddy Field. Aimrun, W.1, Amin, M. S. Ezrin, M. H., Applied & Environmental Soil Science; 2009, Vol. 2009, P. 1–7.

Формализированы основные положения и определены технико-экономические показатели применения интегрированных систем автоматизированного управления технологическими процессами для обеспечения надлежащего качества выполнения технологических операций в растениеводстве.

Агротехнологии, точное земледелие, средства автоматизации, сенсор, система мониторинга, оперативное управление.

Formalize guidelines and determine the technical and economic characteristics of integrated systems of automated control of technological processes to ensure the quality of performance of technological operations in crop production.

Agrotehnology, exact agriculture, facilities of automation, sensor, system of monitoring, operative management.

УДК 631.3:620.172

LEAKS AND CORROSION RESISTANCE COMPOUNDS USING IN ELIMINATING CRACKS

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The paper presents the methodology and results of comparative tests for leaks and corrosion resistance of joins used in elimination of cracks in cast iron body parts. Investigations were carried out to determine the necessary parameters using glue welding, welded and glued joints.

Glue welding, welding, adhesive compound, sealing, corrosion resistance, tests, studies, results.

Introduction. During operation, they are subjected to different loads, which appears as a result of a defect intractable as cracking, resulting in a loss of tightness, and as a result - contamination of lubricants abrasive particles and poor lubrication conditions [6, 9, 12]. Leakage of body parts also causes great damage to agriculture as well as spill oil and fuel materials lead to an annual yield loss [2, 5, 10].

When repairing cracks (their elimination) in cast iron body parts, special attention is paid to the creation of a dense and tight connection [14, 17, 18]. This is achieved by using gaskets, seals, sealants, composite compounds and applying welds adhesive compounds [1, 3, 4, 8]. The problem of creating connections that can effectively recover from cast iron parts paid: Paton E.B., Lobanov L.M., Belyiv I.P., Vavilov V.P., V.P. Lyalyakin, Dorofeev A.L., Kluev V.V. Molodik N.V., Tel'nov N.F., Selivanov A.I., Artemyev Y.N. [9, 11, 14] et ct.

Among the range of recoverable parts occupy an important place items made of cast iron with lamellar graphite. They make up about 70% of the total mass of parts of agricultural machinery. The analysis showed that there is no agricultural machine, which would not have cast iron parts. The percentage of such products in a proportion for different units of agricultural machinery is 3,5…45%. And in most cases they determine the life of the machine. This applies in particular to the case details, the percentage of which is from 1,7…24% [11, 17, 19].

These products are characterized by a large diversity: mass, complex geometry, volume, working conditions and the price of a few to several thousand rubles.

Numerous details of gray cast iron is due to several factors: technological material (good casting properties and machinability), performance characteristics and sufficient reliability.

Research aim. A comparative study for leaks and corrosion resistance glue welding welded and glued joints and identify possible areas for their use in the removal of cracks in the hull iron details.

Results and discussion. To obtain objective data on the tightness of joins carried out comprehensive studies including: testing of samples in the laboratory bench and operational recovered body parts [7, 13, 19]. Tests were conducted on the hollow cylindrical samples with a diameter of 150 mm. In this case, the crack imitated 4 drilled through holes with a diameter of 4 mm.

In the welded joint decompression occurred at an overpressure of 0,3 mPa through 0.36 hours after application of the load pressure of the liquid. This indicates the need for the sealing layers. Adhesive collapsed at a pressure of 0,4 mPa. Tests were carried out according to the scheme: loading at each stage discretely increased to 1,0 MPa, delayed 0,5 hours.

The tests showed that fluid leakage when using glue welding joins did not happen at all of this work. As expected, the use of an adhesive layer in such a compound ensures perfect seal while eliminating cracks.

Stand for testing leak tests recovered using glue welding cast iron parts in a specialized workshop. Reconditioned gearbox housing in the amount of 10 pieces were mounted on the stand break-after full cure of the adhesive composition [20]. Tests were carried out on the stand-by cycle for 2,0 hours. Depressurization join did not happen. Past bench tests, parts have been installed on the machine, which was sent to the service. During the 10 months of observation were behind them. Machinery (tractor T-150 K) operated under different conditions, according to the regulations on energy-performance test machines.

In operation failure due to depressurization of the plot to eliminate cracks were found. Currently, these parts are further performance tests.

In accordance with the established methodology, conducted the study to the effects of corrosive environments of fuel and oil. Each batch of samples (glue, glue welding and welded joints) was aged for 30, 60 and 90 days. The exposure was performed in: air, 3% solution of salt, water, oil and diesel fuel. Based on the results of experimental studies determined the amount of softening of each of them.

It is established that a greater reduction in strength occurs in 3% aqueous Nacl solution. This environment has the greatest softening effect on the compared connection. As shown by the research results, glue welding has better resistance to softening the effects of the corrosive environment, and the adhesive is the smallest. During 30, 60 and 90 day strength glue welding reduced, respectively: 1,5%, 2,7% and 3,7%; welded – 3,9%, 7,7% and 9,2% adhesive to 8,0%, 14,0% and 18,0% were.

The magnitude of strength loss glue welding connection associated correlation relationship for all kinds of tests in the test environments. This confirms the assertion that reducing their strength is associated only with the defeat of the edge zones of the adhesive layer. The presence of the adhesive layer protects the weld point from damage by corrosion. Its absence in welding connection increases its loss of strength in comparison with glue welding.

Studies have shown high corrosivity of the water, however, the salt solution causes more destruction. In real operating conditions, the external environment is composed of a pair of various salts, dissociation which ions makes them aggressive and corrosive. Therefore, it is of great scientific interest of reducing the strength of the connections after holding them in the air. Studies have shown that glue welding connection has sufficient protection against the action of the atmosphere.

Test joins after exposure to diesel fuel and mineral oil showed that softening under their influence does not occur. In process of experiments, we studied the nature of reduction strength of every of them (Fig. 1).

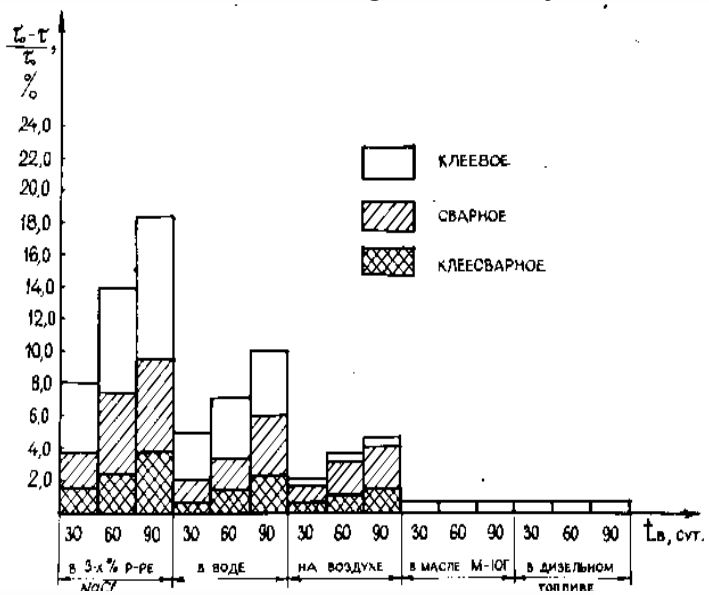


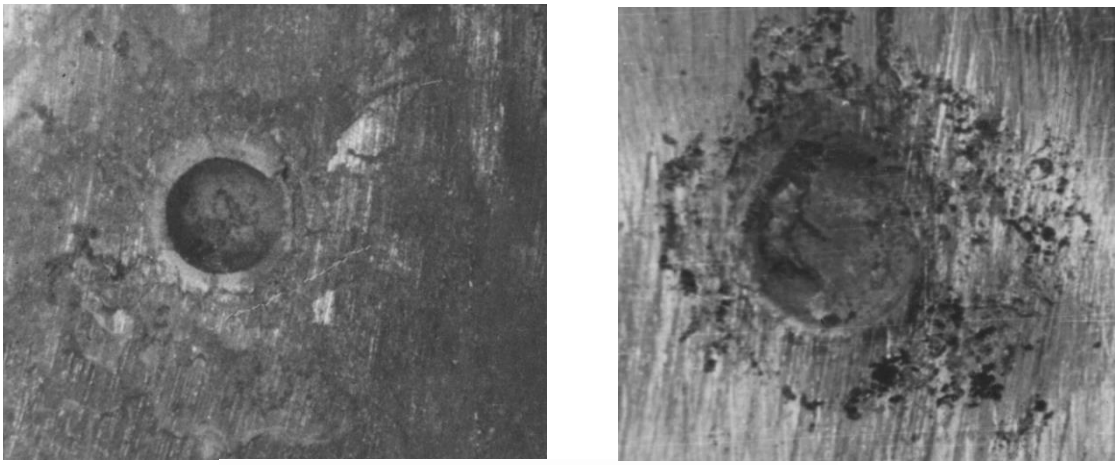
Fig. 1. Softening compounds in corrosion tests.

It was established that in conjunction glue welding joins hearth of destruction at the time of application of the load originates in the marginal zones of overlap on the adhesive bead. Was formed several main cracks propagating at an overlapped area to disbands, with a further full peeling the adhesive layer. Increasing the load resulted in a cut of molten core welding points or snatching it from the iron (sample material).

Investigation of the cut surface of the welded core point and its microstructure showed a complete absence of corrosion in it and heat-affected zone. Corrosion damage is detected on the outer parts of the adhesive bead with little penetration under overlapped. This is due to the diffusion of molecules penetration of aggressive environment at the contact area of the adhesive roller to the connecting portion of the sample in vulnerable areas. Thus, the adhesive roller detected microscopic cracks penetrating medium line section glue cast iron item. This causes a wedging compound with corrosion products within the range of corrosive environments. Decrease in strength glue welding joins under the influence of corrosive environment associated with partial loss of strength of the adhesive joint, thus, the welding point – protected from destruction.

In the weld – softening held on zone of broken away from the cast iron welding point. On the outer side of the lining in places of print electrodes corrosive deposits found in the form of concentric rings with the highest concentration in peripheral areas of welding points. This, apparently, is connected with the processes of the current distribution at the contact welding. The combined effect of external and internal areas of

corrosion damage in the zone of broken and wedging effect of corrosion products, lowers the strength of the join. Character of corrosion damage of joins for which comparative trials is shown in Fig. 2.



a) b)

Fig. 2. Nature of defeat of corrosive environment: a) glue welding, b) welded joints.

In adhesive bonding, corrosion damage caused by the diffusion of molecules penetration defeat hostile environment under cover. In the outer surface of the adhesive bead were found microscopic cracks disposed across the platen. Start the destructive action of aggressive environment on the adhesive bonding takes place at the interface between the adhesive metal. Penetration occurs medium under overlapped on those areas where the adhesive bonds are broken with adhesive metal and replacing them with the connection metal corrosive environment.

When the connector connection found corrosion damage the surface of the steel plates in the edge zones overlap (pitting). The adhesive layer behind the cast iron parts, which is accompanied by softening joints. Thus, the decisive factor in determining the strength of the adhesive layer in conjunction glue welding is the change of adhesive forces at the interface between the adhesive metal.

An important stage of the research was the definition of resistance comparable types of connections to the effects of oil and fuel environments. Upon exposure of the samples in all types of environments, the lowest softening observed in glue welding, the largest - in the adhesive. Reduction in strength due to glue welding softening the adhesive joint in the edge zones overlap. Statement of welding points at a distance of no more than 8 mm from the free end lining significantly reduces the harmful effects of media on the strength glue welding joint.

The results of these studies show that water is an aggressive medium with dissolved ions, salts and acids. This leads to the need for protection, particularly welded.

Conclusions

Conducted comparative tests of specimens with cracks Eliminated adhesive, welded and glue welding joint compounds showed that only glue welding joint has sufficient resistance to the pulsating load, the value of 0,1 - 1,0 MPa. Welded connection depressurized overpressure 0,3 MPa is obtained, and the adhesive – 0,4 MPa.

Study of the surface joins showed that under an overlap occurs corrosion centers, particularly strongly expressed in the vicinity of the welding points (general corrosion).

Thus, our studies revealed glue welding joint compound has a high resistance to aggressive media, water, diesel fuel and mineral oil, which guarantees the durability of body parts in operation. Found that a greater reduction in strength occurs in 3% aqueous Nacl solution. For 30, 60 and 90 day strength glue wtlding reduced, respectively: 1,5%, 2,7% and 3,7%; welded - 3,9%, 7,7% and 9,2% adhesive to 8,0%, 14,0% and 18,0% were.

References

1. *Repair* of machines. 1992: / Under prof. N.F.Telnov. – M.: In Agropromizdat. – 550.
2. *Tchernoivanov V.A., Andreev P.I.* 1983: Renewal of details of agricultural machines. – M.: Kolos. – 238.
3. *Kakuevitskiy V.M.* 1983: Rational methods of welding of details from cast-iron / V.*M.Kakuevitskiy* // Motor transport. – №7. – 43–45.
4. *Karabinosh S.S.* 1985: Renewal of cabinet-type details by the glueweldsng method / *S.S.Karabinosh* // Motor transport. – №7. – 38–39.
5. *Unified* process recovery cylinder blocks tractor engines. 1982: – M.: GOSNITI. – 36.
6. *A. Popov, B. Butakov, D. Marchenro*. 2011: Opredelenie napryzonodeformirovanogo sostoyniy tel pri ix kontaknogo dzaimodeystviy / *A. Popov, B. Butakov, D. Marchenro* – Lublin, MOTROL, 13AP. – 13–24.
7. *Technology* and equipment of the pin welding. 1975: /Under prof. *Orlov B.D.* – M.: Engineer. – 536.
8. *Guliyv A.I.* 1978: Technology of the point and relief welding of steel / *A.I. Guliyv*. – M.: Engineer. – 647.
9. *Zolotarev B.B.* 1996: Tensions on-loading in flat connections on lining. / *B.B. Zolotarev* // Automatic welding. – № 9. – 35–39.
10. *Kargin U.B.* 1975: Metodika rascheta prochnosti kleesvarnix soedineniy s uchetov koncetracii napryjeniy / *U.B. Kargin*. – Saratov, Saratovskiy universitet. – 17–22.
11. *Shavirin V.V.* 1988: Glutwelding constructions / *V.V. Shavirin. V.A. Ryzantsev.* – M.: Engineer. – 231.
12. *Poliachenko A.B.* Progressive way to restore the basic details. 1985. / *A.B. Poliachenko, S.S. Karabinesh* // Technique in agriculture. – №2. – P. 47.
13. *Suhova E.F.* 1981: Sealing cracks in body parts / *E.F. Suhova, V.P. Mikhailov, V.D. Andrianov* // Technique in agriculture. – №3. – 43–45.

14. *Karabinosh S.S.* 2001: Non-distracted control glue-weed joining by computer holography / *S.S. Karabinosh*. – Motrol. – Vol. 4. – 144–147.
15. *Karabinesh S.S.* 1985: Recovery of body parts glue welding method / *S.S. Karabinesh* // Road Transport. – №7. – 38–39.
16. *Vinokourov A.F.* 1982: Sealing cracks in body parts // Technology in agriculture. – №4. – 49.
17. *Boyko A.I.* 2001: To question about determination energy of distraction body at there border state / *A.I.Boyko.* Zb. naukovikh prats KDTU. – Kirovograd. – 45–47.
18. *Dobrovolskiy S.B.* 2000: Methods of estimation of influence of structural concentration on малоцикловую durability / *S.B. Dobrovolskiy* // Motor industry. – № 6. – 19–23.
19. Towar I. 2006: Dynam calculation of machines / *O. Lytvynov, W. Tana*. – Motrol. – T. 8A. – 210–223.
20. *Kudryvcev I.V.* 1981: Ustalost krupnix detaley mashin / *I.V. Kudryvcev, N.E. Naumchenko*. – M.: Mashinostroenie. – 257.

У статті наведені методика й результати порівняльних випробувань на герметичність і корозійну стійкість з'єднань, використовуваних при усуненні тріщин в чавунних корпусних деталях. Дослідження проводили для визначення необхідних показників з використанням клеєзварних, зварних і клейових з'єднань.

Клеєзварювання, зварювання, клейка, з'єднання, герметичність, корозія, стійкість, випробування, дослідження, результати.

В статье приведены методика и результаты сравнительных испытаний на герметичность и коррозионную стойкость соединений, используемых при устранении трещин в чугунных корпусных деталях. Исследования проводили для определения необходимых показателей с использованием клеесварных, сварных и клеевых соединений.

Клеесварка, сварка, клейка, соединение, герметичность, коррозия, стойкость, испытания, исследования, результаты.

УДК 538.21.3

ЕФЕКТИВНІ СТАЛЕБЕТОННІ ПЕРЕКРИТТЯ ДЛЯ КРУПНОПАНЕЛЬНОГО БУДІВНИЦТВА

М.О. Давиденко, кандидат технічних наук

У статті наведені пропозиції щодо створення ефективного сталебетонного перекриття у вигляді ригелю з порожнинами в