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Mechanics and technology background reduce losses weight of root during their harvesting

The experimental results and performance testing process sugar beet conducted in recent years have shown that the beet modern machines that were produced in Europe and America, working with significant losses on sugar mass. These losses are due to generally poor quality cut tops with bits of sugar beet in the bud. Therefore, now is the urgent search for technical solutions that will avoid these losses.

The purpose of research is to reduce the losses of sugar supply in the process of separating the tops of the heads of sugar beet roots. As a result of the experimental investigation of the distribution of height protruding heads of root crops above the ground confirmed the hypothesis that it can not deny the law of normal distribution.

The results of the measurements set limits changes in its statistical characteristics, which are as follows: average statistical deviation $\sigma = 20 \dots 30$ mm, the expectation $m = 40 \dots 60$ mm. Designed and conducted laboratory setting her experimental studies have every reason to develop a new system of automatic cor.

sugar beet harvesters, loss, weight sugar, the statistical distribution of the height of protrusion

Одержано 06.11.15

УДК 621.891.539.375.6

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Effectiveness increase in application of FANT of the components of mobile agricultural machines

Friction and wearing of moving joints is an important problem in agricultural machine building. The application of tribotechnical methods which realize wear-free transfer in friction units allow increasing the durability of components of the mobile agricultural machines. FANT provides increase in wear-resistance of components and decrease in wear-in time. At the same time FANT has a low productivity. The article presents tendencies in the improvement of FANT of internal cylindrical surfaces due to the application of deforming stretching which allows increasing the productivity and quality of treatment. As a result the effectiveness of FANT increases.

wear-free transfer, finishing antifriction nonabrasive treatment, mobile agricultural machines, deforming stretching, antifriction coating

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Повышение эффективности применения ФАБО деталей мобильной сельскохозяйственной техники

Трение и износ подвижных сопряжений является актуальной проблемой сельскохозяйственного машиностроения. Применение триботехнических методов, реализующих в узле трения избирательный перенос, позволит значительно повысить долговечность деталей мобильной сельскохозяйственной техники. ФАБО обеспечивает повышение износостойкости деталей, сокращение времени приработки, однако обладает низкой производительностью. В работе представлено направление по совершенствованию ФАБО внутренних цилиндрических поверхностей за счет использования возможностей деформирующего протягивания, что позволит повысить производительность и качество обработки, а следовательно эффективность применения ФАБО.

избирательный перенос, финишная антифрикционная безабразивная обработка, мобильная сельскохозяйственная техника, деформирующее протягивание, антифрикционное покрытие

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Problem description. One of the essential problems of present-day agricultural machine building is the friction and wearing of the moving joints. The efficiency and endurance of agricultural machines considerably depend on the intensity of wearing of friction parts and about 80% of machine parts become disabled as a result of the wear [1].

The problem of durability increase of the parts of mobile agricultural machines can be successfully solved by application of the tribotechnical methods which realize the process of wear-free transfer (WFT) in a friction unit [2, 3]. The main point of WFT is that under certain conditions there is a wear-free dissolution of the metal surface layer of the part as a result of its interaction with lubricants. Due to the electrochemical activity of the ions of the dissolved metal, the friction surfaces of the “counter body” are covered with special protective film which got the name “servovite film” [4]. The application of tribotechnical methods which realize WFT allows providing the increase of wear resistance of the parts in 1,5-2 times. It also improves antifriction and anti-scuff properties of friction surfaces, decreases the wear-in time and increases the durability of agricultural machines by 30%.

One of the methods of the increase of the durability of the components of mobile agricultural machines which realizes WFT in the process of friction is finishing antifriction nonabrasive treatment (FANT). FANT presupposes different ways of finishing treatment based on the application of the frictional seizure and WFT [5].

The technological process of FANT is the process of coating the surface of a part under treatment with a thin layer of brass bronze, bronze or copper with the help of a honing head or a spring-supported rod in the anti-friction lubricant which contains the salts of the plating metal and the surface-active substance.

As a result, a uniform antifriction coating of plastic metals and polymer chains are formed on the surface under the treatment [2].

There are many ways of applying FANT [6, 7 and others]. But according to the analysis of some works [8, 9] the traditional ways of FANT and the appliances for its usage have low productivity.

Literature and patent analysis allowed putting forward basic disadvantages of the existing appliances for the antifriction coating with the help of FANT method. They are the following:

- the developed designs of the appliances and equipment do not provide the necessary productivity because the galling element (instrument) has only one – three brass bronze rods with the diameter of 3...4 mm. Thus, there is a need to make several passes by the instrument in order to coat the whole surface of the part with the brass bronze film;
- the used technologies and appliances for FANT do not provide the hardening of the component surface and consequently its durability;

It is possible to increase the productivity of the process and the quality of treatment with the help of application of new FANT schemes and the new instruments which enable to eliminate the above-mentioned problems.

Objective of research. The objective of the work is to increase the efficiency of FANT application for components of the mobile agricultural machines.

Research results. In spite of the doubtless advantages, the FANT technology was not used widely because of the low productivity of the process. Taking into account the above-mentioned facts it is reasonable to do research on improvement of friction and mechanical methods of FANT in order to increase the efficiency of their application.

One of the directions to improve FANT is the work aimed at the improvement of the process productivity and quality of treatment due to the application of modern materials and new instruments.

Thus in work [10] the author used the honing principle and changed the ceramic hones in the honing head for the brass bronze rolls which have working rims. The design of the

instrument together with the increased productivity provided linear contact while treating the working surface of the component. That enabled to create high unit load of the instrument on the material of the component.

To our mind the problem of the productivity increase and FANT quality of friction surfaces can be solved by using the advantages of deforming stretching. It is traditionally used to get better size accuracy and surface roughness, to improve resistance of pressing transition of the components and to compress the surface layer [11]. The work presents the trend to improve FANT of the internal cylindrical surfaces of the components with the help of application of deforming stretching.

The realization of the trend requires the development of the technological process and equipment for its implementation.

The treatment of the internal cylindrical surfaces of FANT presupposes the following sequence of operations:

- preparation of the process liquid which is a special surface-active medium (SAM). Glycerin is the basic component of the liquid which realizes the WFT during the friction. Glycerin is a constituent part of many kinds of surface-active media;
- degreasing of the surface under treatment;
- FANT;
- washing the component from the process liquid;
- quality control of the coating;
- drying.

A special attention was given to the development and approbation of the special instrument for FANT which enables to use all characteristics of the deforming stretching.

The design of the instrument (Fig. 1) is made in the form of a collet with a set of elastic blades of the antifriction hones. They press themselves to the treated surface while the instrument is moving in straight lines and under the influence of the processing liquid form the uniform coating.



Figure 1 – FANT of the internal cylindrical surfaces

Source: created by the author

The availability of special appliance for fixing the treated component provides its discrete rotation and as a result the antifriction coating covers all the internal surface of the treated component.

The reason to use FANT technology in the joints of the mobile agricultural machines is undoubtedly proven in the works [2, 3, 12 and others] which contain a wide list of the friction joints of grain harvesters and other mobile agricultural machines.

Conclusion. The application of the above-mentioned technology enables to:

- increase the productivity and quality of treatment and as a result the efficiency of FANT of details of the mobile agricultural machines;
- use simple, inexpensive equipment and appliances at small and big repair shops;
- increase the efficiency and durability of friction parts in the process of operation;
- increase the resource of tribo-couplings of the mobile agricultural machines.

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Підвищення ефективності використання ФАБО деталей мобільної сільськогосподарської техніки

Метою даної роботи є підвищення ефективності використання ФАБО деталей мобільної сільськогосподарської техніки. Підвищити продуктивність процесу та якість обробки можливо за рахунок нових схем ФАБО, а також розробки пристроїв для їх реалізації.

У роботі запропонований напрям по удосконаленню ФАБО внутрішніх циліндричних поверхонь деталей шлямом використання можливостей деформуючого протягування.

Використання запропонованої технології дозволить підвищити продуктивність і якість обробки, а отже і ефективність використання ФАБО деталей мобільної сільськогосподарської техніки, збільшити працездатність, довговічність деталей тертя в процесі експлуатації та в цілому ресурс трибоспринжень мобільної сільськогосподарської техніки.

вибіркове перенесення, фінішна антифрикційна безабразивна обробка, мобільна сільськогосподарська техніка, деформуюче протягування, антифрикційне покриття

Одержано 19.10.15