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Short Communication

Resource-saving and Environmentally Friendly Technology for Applying Anti-friction Coatings

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Today, issues of ecology, environmental protection are highlighted among the global priorities of human activity in all areas, including the operation of agricultural machinery (ACM). It has been proved [1] that the content and emission of harmful components increases sharply during the worn out engines operation of a mobile ACM, which leads to contamination of agricultural lands, a decrease in the quantity and quality of products and, in general, a deterioration in the environment. Consequently, the issues of quality improving of ACM friction parts and improving the ecology of the environment are both modern and urgent tasks.

The problem of increasing the ACM friction parts durability can be successfully solved by applying antifriction coatings (AC) [2]. In addition to its main functions of increasing the surface antifriction properties, AC can be used as restorative; running-in, solid lubricating and multifunctional coatings. Among the known schemes for applying AC [3], the simplest to implement and does not require the use of complex equipment is the method of finishing anti-friction non-abrasive treatment (FANT), the features of which include: low consumption of coating material and mechanical energy during rubbing, relatively short process duration when using automated equipment, high stability and quality of the coating, and most importantly - environmental friendliness. FANT allows: to reduce the running-in time of parts by 1.5 - 2 times, to eliminate scuffing of parts friction surfaces, to increase the bearing capacity of parts and joints, to protect the friction surface from hydrogen wear, to reduce the friction temperature and to extend the operating period of the friction unit when the lubricant supply is turned off, to reduce coefficient of friction and thereby reduce the consumption of ICE fuel and the emission of harmful substances into the atmosphere [4].

The feasibility of using FANT in relation to the ACM units is convincingly proved in the works [5,6], which indicate a wide list of friction units for grain harvesters and other mobile agricultural machinery. At the same time, it should be noted that the existing FANT technologies are characterized by low productivity, uneven coating thickness, heavy loads on the tool and significant heat generation. So the current FANT process of cylinder liners does not provide sufficient hardening of the parts surface, and, therefore, wear resistance for a longer period.

To solve the problem of increasing the wear resistance and adhesion strength of the coating to the base, we propose the use of a combined processing method. The possibility of combining FANT with the methods of cold plastic deformation, in particular with deforming broaching, made it possible to increase the productivity of the process, as well as the quality of finishing processing of the sleeves holes [7].

The performed operational tests showed that the developed resource-saving and environmentally friendly technology of applying antifriction coatings FANT of cylinder liners using deforming broaching made it possible to reduce the wear of the part surface, reduce the cost of its restoration, and also increase the cylinder-

piston group resource of mobile ACM engines during operation. The proposed technology of combining FANT and deforming broaching can be recommended in the manufacture and restoration of agricultural machines friction parts.

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