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**INVESTIGATION OF REGULARITIES OF ACCUMULATION OF  
OPERATIONAL DEFECTS IN STEEL STRUCTURES OF TRACTORS**

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The modern approach to operational reliability of agricultural machines provides a periodic monitoring of the state of metal parts of the machine when the estimated size of the defects that arise and develop in the operation, in order to avoid the destruction of the metal construction. Having technological and operational

defects requires systematic maintenance of mobile agricultural machinery in all phases of operation. The system approach is aimed at detecting defects in critical zones of metal structures (parts) with the highest probability of fatigue failure, determining the optimal duration of inter-repair periods, outlining the basic requirements for the availability of nodes to control their condition, increasing the likelihood of detecting defects in structural elements.

In this paper, in order to establish the patterns of accumulation of operational damage in steel structures, data was used on the existence of operational cracks in the array of parts of tractor's units. To detect cracks, a portable vibration eddies current flaw detector, developed by the National University of Life and Environmental Sciences of Ukraine together with the Institute for Problems of Strength of the National Academy of Sciences of Ukraine named G.S. Pisarenko was used in this paper.

In this portable defectoscope possibility is provided to switching the range of sensitivity and selectivity of the device, that is, you can detect cracks, the size of which is more than a certain value, which is especially important for defectoscopy of parts and aggregates of self-propelled agricultural machines.

This portable flaw detector has the ability to switch the range of sensitivity and selectivity of the device, it is possible to detect the cracks size of them larger dimensions are a certain size, which is especially important for flaw detections parts and components of self-propelled agricultural machines.

The results of the defectoscopic control regarding the presence of small cracks in the details of wheeled tractors of different years of release are presented in Fig.1. In general, defectoscopic control was performed on 1117 tractor parts, where 217 small cracks were detected.

With the increase in the duration of operation due to the adverse effects of power and corrosion factors of the production environment, the degree of degradation of the structure of the material of metal structures (parts) increases, which leads to an increase in the intensity of the origin of fatigue and corrosion cracks. In fig. 1 shows a graph of intensity of occurrence of operational cracks with increasing durability of tractors, described the trend line (polynomial 4 degree) with the accuracy of approximation  $R^2 = 0.70$ .

The coordinates of the plot are as follows: the ordinate axis – the probability of occurrence of the critical state  $P = n_d/N$  (the ratio of the number of cracks detected  $n_d$  in the total number of investigated details  $N$ , meaningful in terms of the limiting condition of operation safety); axis abscissa – relative longevity  $D = t_{ex}/t_{base}$  (the ratio of the length of operation of tractors  $t_{ex}$  relative to the base  $t_{base}$ , which in the calculation is 17 years). Experimental data are described by the trend line of the polynomial type. Its equation and the accuracy of approximation  $R^2$  are written in Fig. 1.

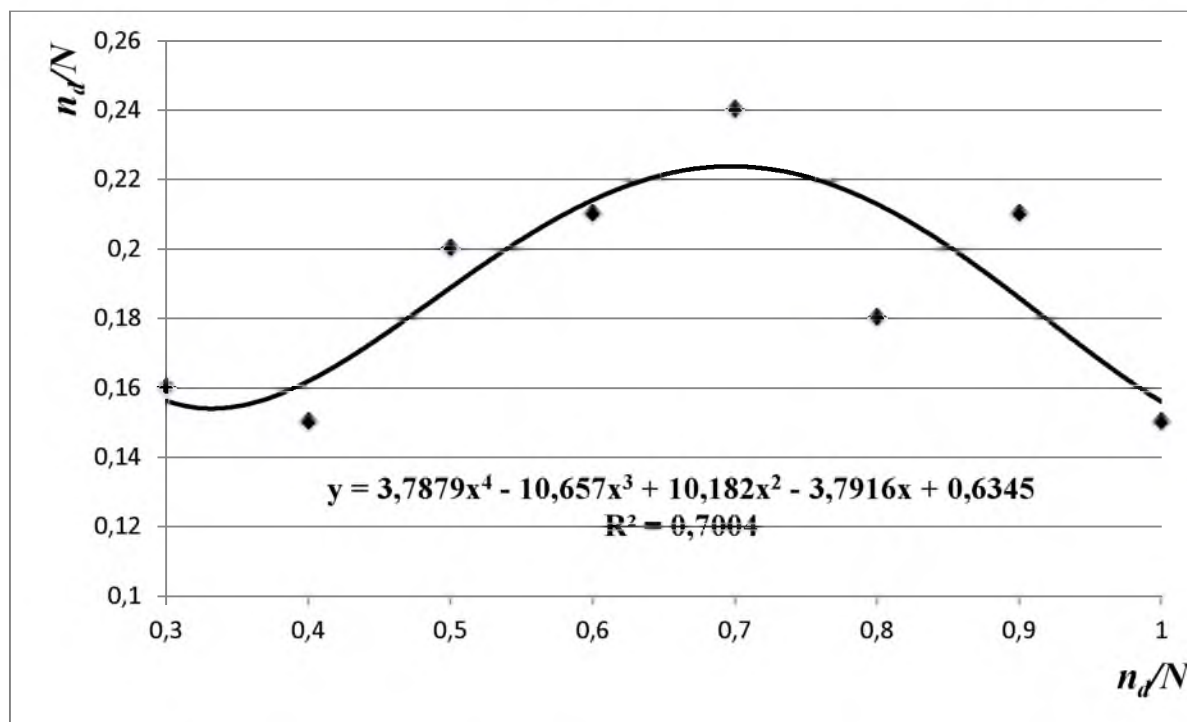


Fig. 1. Kinetics of intensity of occurrence of operational cracks in details of knots of wheeled tractors of different durability of operation

From Fig. 1 shows that the kinetics of the intensity of the origin of operational cracks in an array of tractor parts is not monotonic and is characterized by a maximum, which is in the range of 0.6-0.7 relative durations of operation, that is, about 11-13 years. Consequently, this indicator can serve as a criterion for the discontinuation of the tractor operation, the flaw detection of parts in order to detect cracks and eliminate (replacement of defective parts). This maximum corresponds to the greatest probability of sudden destruction of tractor units and the creation of emergency situations on mechanized or transport jobs.