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Corrosion of Agricultural Techniques under the Influence of Chemicals

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Annotation: Practical determination and analysis of the reasons for the loss of working capacity of agricultural machines working in aggressive agricultural conditions in the machine-tractor park were carried out. Working parts of existing cultivators, seeders, plows, harrows, fertilizing machines, chemical plant protection machines, work in an active corrosion environment and maintain significant mechanical stress. This, in turn, leads to the rapid failure of machines due to corrosion and corrosion-mechanical impact of working bodies.

Keywords: Organic, mineral, chemical, technical, composition, rust, modifier, soil, oxygen, hydrogen, formula, laboratory, reaction, machine-tractor, agricultural machinery, cultivators, seeders, plows, fertilizing machines, chemical plants, corrosion, corrosion-mechanics

Practical identification and analysis of the causes of loss of ability of agricultural machines operating in aggressive agricultural environments was carried out in the machine-tractor park of Izbaskan district of Andijan region. Available cultivators, seeders, plows, harrows, fertilizer machines, working parts of chemical plant protection machines (one-sided flat cutting claw, arrow claw, scythe claw, rotary claw, spear claw, feed knife, spring tooth, pin-disk star , disc softener, rotary mat, hopper, seed drill, bunker, sowing machine, frame), operates and maintains significant mechanical stress in an active corrosion environment. This, in turn, leads to rapid failure of machines due to corrosion and corrosion-mechanical wear of the working bodies [1, 2].

The condition of seed drills, cultivators, plows, harrows and chemical plant protection machines was studied during their use. The condition of agricultural machinery KXU-4 cultivator, AN-2M seeder, stored by the above-named farms and agricultural machinery with promising means of protection on the new technology was also analyzed.

The seeders in the district machine-tractor park are stored in the condition shown in Figure 1. As can be seen from the picture, within 15 days after the seedlings were brought from the field, signs of rust appeared on its details. This is due to the fact that the drill was not washed and cleaned at the required level, was not protected with protective equipment, and was not stored at the required level.

According to the observations, the protective coatings of the seeders' seed hoppers were eroded by 64-55 % of the metal corrosion (see Figure 2-3). This is due to the fact that in the process of preparing MTP seeders for the next season, the rusted surfaces are covered with PF-1155 enamel. During operation, the bunkers are filled with treated seeds. Atmospheric moisture dissolved the herbicide in the seeds that touched the bunker and moistened the protective layer, resulting in rust reaching through the capillary holes of the protective coating. Under the influence of moisture, rust products swelled and expanded, and cracks appeared in the protective coating [1].

After that, the corrosive medium with atmospheric air reached the metal surface and carried out the corrosion process. Such preparation of metal surfaces always leads to such negative consequences. To prepare a rusty surface for protection, it needs to be perfectly cleaned of rust and other products.

Although the mechanical method of cleaning is laborious, it does not completely clean the rusty surface from debris [2].

Fig. 1. AN-2M- drill

Fig. 2. Rust of AN-2 seed drill

Fig. 3. Seeder for storage

With the new technology and promising means of protection, no negative changes have been observed in the past, ie the integrity of the protective coatings has

not been violated. The main reason for this is that the seedlings are washed at the required level in preparation for storage and thoroughly cleaned of various contaminants. When stored, rusted surfaces are treated with a rust modifier. In addition to neutralizing rust on the surface, the rust modifier has its inhibitory and barrier properties, and the integrity of the protective coatings is not compromised due to the use of promising means of protection. Machine-tractor park, the corrosion rate of the outer side of the sowing machine and the working bodies was 20-30 microns (see Figures 4-5) [3].

Fig. 4. AN-2 seed drill rust

Fig. 5. Corrosion of AN-2 seed drill

Corrosion at this level does not preclude the fulfillment of the requirements imposed on the above working bodies. However, for a spring that ensures that the nesting organ opens and closes, a rust of this size will leave the nesting organ working without opening or closing, resulting in no seeds falling into the nest or a sharp increase in seed consumption. The reason is that the spring rusts and hardens.

Cultivators are more exposed to the external environment during use than seeders. This is because the cotton leaves, its body and weeds also affected the cultivator parts during cotton cultivation [4].

Fig. 6. Condition of KXU-4 cultivator

Fig. 7. Condition of KXU-4 cultivator adjustment part

There were even cases when the cultivator was wrapped around the frames. During the operation of the cultivator, it was observed that its frames were touched by weeds, twisted and the protective coatings moved and rusted under the influence of aggressive environment. In such cases, the springs in the cultivator adjusting elements were replaced in some cases. The reason is that the elastic level of the spring is lost and it is unable to perform its intended function. That is, the working bodies cannot be adjusted after the loss of elasticity. The condition of the protective coatings of the cultivator after 17 days of use (see Figures 6-7) is shown. It was found that the integrity of the protective coatings on the corner parts of the cultivator frames was compromised and rust was forming under it. In addition, the rods on which the cultivator working bodies are fastened are rusted [5, 6].

In the sixth month of observations, 45 % of the protective coatings lost their integrity due to corrosion of the cultivator's frames. The springs from the adjusting elements of the cultivator's working bodies could not perform their function due to corrosion. Due to the rust product, the springs are stretched or stuck together [7].

Fertilizer bunkers of cultivators put in storage by MTP were punctured after seven months by the protective coatings on their outer walls. This condition caused the metal to rust under the protective

coating and begin to move it. It was observed that the inner bottom of the bunker was corroded to 61-72 %, and the inner side walls to 82-88 % [8, 9, 10].

Fig. 8. Rusting of KXU-4 cultivator fertilizer hopper

In particular, the mineral fertilizer distribution plate at the bottom of the bunker is 100 % rusted (see Figure 8). When preparing the bunker for storage at this level of rust, it was not completely cleaned of mineral fertilizer residues and quality protective equipment was not used. It is also prepared for mechanical protection of rusty metal surfaces for laying protective means.

KXU-4 cultivator protective coatings, which have been put into storage with new technology and promising means of protection , has not been violated, and there are no signs of corrosion.

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