Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 08, August 2025
brightmindpublishing.com
ISSN (E): 3061-6964

GENERAL CHARACTERISTICS OF CORROSIVE AGRICULTURAL ENVIRONMENTS

Khojimatov A.A.
Independent Researcher, Andijan State Technical Institute
aziznido20@gmail.com
https://www.webofscience.com/wos/author/record/HKV-1215-2023
https://orcid.org/0000-0003-1238-7989

Abstract
The main factors influencing the durability and performance of agricultural machinery are their mechanical wear, the action of various types of corrosion, and their combination. The fight against corrosion in agricultural machinery is not only a technical but also an economic problem, which can be solved by selecting chemically resistant anti-corrosion paints and varnishes that most fully satisfy the specific operating conditions of agricultural machinery.

Keywords Corrosion, mineral fertilizers, corrosive activity, atmosphere, working parts, agricultural machinery.

Introduction

Widely used to increase fertility, mineral fertilizers, dissolving in the soil and humid atmosphere, form electrolytes that cause intense corrosion of parts and components of agricultural machinery.

Among agricultural machinery, machines for applying mineral fertilizers are most susceptible to corrosion. This is explained by the special physical conditions of their operation, in some mineral fertilizers destroy the protective coating and cause corrosion of the metal.

The study of the influence of mineral fertilizers on the corrosion of agricultural machinery shows (Table 1.1) . that the corrosion of individual working parts of a fertilizer spreader, compared to non-working ones, increases by 30...100%, or 1.5-2.0 times.

Mineral fertilizers are divided into simple and complex. Simple fertilizers (nitrogen, phosphorus, potassium) contain only one main element, all others are in insignificant quantities. Nitrogen fertilizers are divided depending on the form

Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 08, August 2025
brightmindpublishing.com
ISSN (E): 3061-6964

of nitrogen in fertilizers into nitrate, ammonia ammonium nitrate and amide. Nitrate fertilizers contain nitrogen in the form of nitrates - salts of nitric acid. They are highly soluble in water and are very active in terms of corrosion. Sodium (Na NO 3), calcium { Ca (NO3)} and potassium ({KNO3) nitrate. Ammonia fertilizers contain nitrogen in the ammonia (ammonium) form. These include liquid anhydrous ammonia, ammonia water, ammonium sulfate, ammonium chloride.

In terms of corrosion, highly water-soluble salts of hydrochloric (NH 4 CE) and sulfuric {(NH 4)2 SO4} acids are dangerous. Ammonium nitrate fertilizer ammonium nitrate {(NH 4)2 NO 3} contains 35% nitrogen in ammonia and nitrate form. Ammonium nitrate, a salt of nitric acid, is highly soluble in water, very hygroscopic, and has strong corrosion activity. Amide fertilizers include carbamide (urea), calcium cyanide, and urea-formaldehyde fertilizers. Urea CO (NH 2)3 is the most concentrated of solid nitrogen fertilizers, containing 46% nitrogen. The corrosive activity of urea is determined by the presence of its isomer, ammonium cyanide. Calcium planamide and urea are slow-acting fertilizers, their corrosion activity is low.

Comparative corrosion of parts of mineral fertilizer spreader 1RMG-4 (53)

Table 1

Details	**Corrosion area, dm2**			**Corrosion damage, %**		
	Working	**Non-working**	**Increase**	**Working**	**Non-working**	**Increase**
Frame side members	399	105	294	95	25	70
Side boards	280	80	200	85	26	62
Bracket for mounting the spreading device	10	1.5	8.5	100	15	85
Transport rods	200	20	180	100	10	90
Spreader discs	69	45	24	98	64	34
Disc blades	4	2	2	100	50	50
Pulleys	31	10	21	100	35	65
Pipelines	89	5	84	84	5.3	88.7
On average for the spreader	3230	934	2296	86.9	26.7	60.2

Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 08, August 2025
brightmindpublishing.com
ISSN (E): 3061-6964

Potassium fertilizers are divided into three groups: concentrated (potassium chloride KSE, potassium sulfate K2 SO 4, potassium magnesium sulfate K 2 SO 4 – M d S O4); crude potassium salts (kainite, sylvinite, carnallite); 30-40% potassium salts. The main and most concentrated potassium fertilizer is potassium chloride, which contains residues of all forms of potassium fertilizers have increased corrosion activity.

The corrosion activity and wear capacity of mineral fertilizers depend on the composition and physical properties, mainly hygroscopicity, moisture capacity, caking , dispersion , flowability, granulometric composition, solubility in water. These properties of fertilizers are significantly affected by the methods of preparation, conditions and periods of storage.

Table 1.2 provides brief characteristics of the main mineral fertilizers.

As a result of corrosion, the service life of agricultural machinery operating in contact with aggressive environments of mineral fertilizers is reduced compared to the planned terms by up to 40... 60% (24). Their impact affects not only the service life, but also the agrotechnical indicators and productivity of the machines.

Due to the imperfection of the design of agricultural machinery, atmospheric moisture accumulates in certain areas of their lining, where plant residues, fertilizers, and soil particles get into and where conditions for electrochemical corrosion are created. In these places, there are favorable conditions for the development of bacteria that enhance corrosion.

The greatest corrosion activity is exhibited by ammonium nitrate, potassium chloride, ammonium sulfate, nitrophoska, ammophos, containing anions of chlorine, nitric and sulfuric acids. Corrosion activity increases sharply at a fertilizer concentration in the solution of 2...3%, and then decreases significantly. Therefore, even an insignificant content of fertilizers on the metal surface can lead to large corrosion losses. Corrosion destruction of machines begins almost immediately after they are put into operation, regardless of whether they are used or stored.

The presence of dust and pollutants, fertilizer particles in the atmosphere facilitates capillary condensation. In addition, corrosive particles, for example, enhance the corrosion process, as they promote the formation of highly soluble corrosion products, etc., instead of poorly soluble ones. Thus, the presence of

Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 08, August 2025
brightmindpublishing.com
ISSN (E): 3061-6964

ammonium sulfate increases the rate of corrosion several times, which begins in this case at a lower relative humidity.

Agricultural machines are subject to such soil corrosion. The soil's corrosive activity depends on its air permeability, moisture, salt composition, electrical conductivity, and pH value. Soils with pH3 and moisture of 15...20% are especially dangerous in terms of corrosion. In dry soils, corrosion processes occur at a low speed. The soil structure significantly affects the corrosion rate, since the oxygen diffusion rate depends on it. General metal losses are greater in sandy soils, and the depth of local corrosion penetration is greater in clay soils.

The rate of damage by soil corrosion can be 1.5…3.0 mm per year. The difference in the chemical composition of ordinary carbon steels does not affect the rate of soil corrosion. However, different air permeability of soils and the depth of equipment in them, depending on the level of groundwater, are determining factors of corrosion. Soil corrosion is especially dangerous due to the nature of the destruction pitting and caverns of great depth. The main factors influencing the durability and performance of agricultural machinery are their mechanical wear, the action of various types of corrosion, and their combination. The fight against corrosion in agricultural machinery is not only a technical but also an economic problem, which can be solved by selecting chemically resistant anti-corrosion paints and varnishes that most fully satisfy the specific operating conditions of agricultural machinery.

References

1. Asomiddinovich, XA (2025). Agriculture machines worker details rust classification. Best intellectual Iceland , 39 (3), 156-170.
2. Khojimatov, AA (2024). Agriculture techniques storage methods and problems . Global sciences according to education research , 3 (13), 136-144.
3. Khojimatov, AA, & Oripov, G. (2020). Agricultural cluster in systems used of equipment metal parts aggressive from the environment protection to do Uchenyy XXI veka , (12-1 (71)), 3-7.
4. Khozhimatov A. (2023). Analysis of destruction and protection of details of agricultural machinery. In E3S Web of Conferences (Vol. 383, p. 04064). EDP Sciences.

Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 08, August 2025
brightmindpublishing.com
ISSN (E): 3061-6964

5. Khojimatov, A.A. (2023). Agriculture techniques on metal surfaces aggressive of the environment effect Oriental renaissance: Innovative, educational, natural and social sciences , 3 (1), 259-268.
6. Khajimatov A.A., Alibekov R.K. Call active in environments construction of steel to decay resilience //innovative developments and research in education. - 2022. - S. 21.
7. Khojimatov AA, Mamajonov ZA Seasonal agriculture techniques use and storage of the conditions technique to the quality impact //Educational Research in Universal Sciences. - 2023. - T. 2. – no. 1. - S. 40-45.
8. Khojimatov AA Livestock in clusters aggressive in the environment working to techniques service show prospects //Science and Education. - 2022. - T. 3. – no. 11. - S. 599-603.
9. Khozhimatov, A. A. (2021). Animal husbandry in their cars corrosion the environment appearance to be reasons and them analytical. Academic research in educational sciences , 2 (6), 572-577.