

PAINT COATINGS FOR CORROSION PROTECTION OF LIVESTOCK MACHINERY

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Abstract The machinery in livestock farming works in a highly aggressive environment, increased ammonia content and high humidity. Anticorrosive protection of machines and equipment is widely used on the basis of lacquer materials. Their effectiveness is mainly determined by the selection of the varnish materials according to the type and degree of corrosion hazard.

Modern lacquer-based materials based on melamine, pentaflal, nitrocellulose, butyl methacrylate, chlorovinyl, epoxide and other resins are characterized by high protective properties and the possibility of renewal.

KEY WORDS: LIVESTOCK FARMS, MACHINES, CORROSION, PAINT COATINGS, ANTI-CORROSION MATERIALS, TECHNOLOGIES.

The machinery in livestock farming works in a highly aggressive environment, increased ammonia content and high humidity. Therefore, wear is intense (aluminum corrosion reaches 10 mm per year and steel up to 1 mm), and failures are common [1,2]. The degraded performance of the machines is the reason for the increased costs of maintaining and shortening the terms for their use on the one hand and the animal husbandry regimes, which is a prerequisite for reducing the quantity and the quality of the produce

Destruction and damage to machine components in the most common case is due to the action of:

- Physical field (environment) - power, heat, etc.;
- chemical field-surfactants; chemical-active substances; the simultaneous operation of physical and chemical fields (Figure 1).

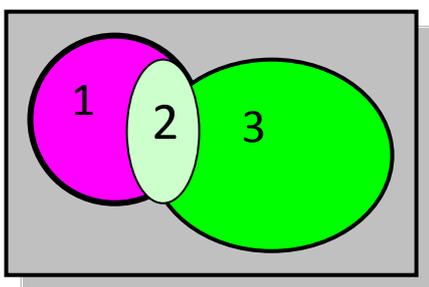


Fig. 1. The mode of action of the causes inflicting damage and destruction of the details: 1- physical field, 2-chemical field, 3-physical and chemical field

Types of destruction and damage under chemical field action are given in Figure 2. Corrosion is an unacceptable type of surface destruction of the material [3,4] as a result of its static interaction with liquids or gaseous media. The main cause of corrosion is the thermodynamic instability of the metal compounds.

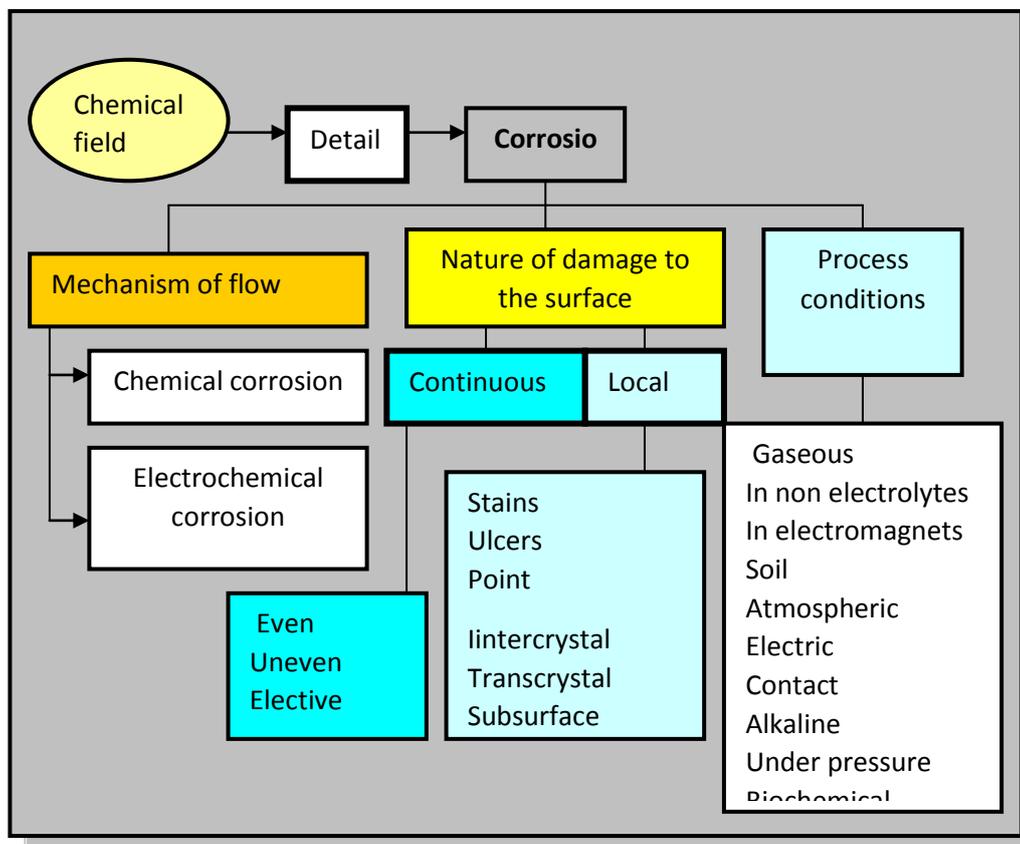


Fig.2. Types of damage and destruction under the influence of chemical field

Corrosion protection as a whole is a complex of activities to prevent and inhibit the corrosion processes, to maintain the working capacity of the machines and equipment within the nominal lifetime. Methods for protecting metals from corrosion are based on effects that lead to total or partial reduction of activity of factors contributing to the development of corrosion processes [6,7,8]. It is possible to divide into methods that affect metal, the environment and combined methods. The most widespread application of the first group of methods has been the application of permanent coatings, conservation coatings, alloying. Among the second - complete or partial chelation, removal of moisture (drying) removal of environmental pollution, maintenance of optimal temperature regimes. If these methods do not achieve a good result, the combined methods based on the complex effect of the metal through protective coatings and the environment are applied.

Among the most common methods of protection against atmospheric corrosion and the effective method of applying protective lacquer coatings is sufficiently effective.

Survey data on the total cost of corrosion protection of lacquer coatings accounts for 39% of these costs and almost doubled the cost of developing and producing corrosion-resistant materials [5]. All varieties of lacquer coatings refer to the group of organic coatings and are a solid layer of organic matter with pigments and fillers obtained during the drying of the applied material. The coatings depend on the continuity and density of the layer insulating the surface of the metal from the environment as well as the nature of the interaction of the coating with the surface of the metal. The thickness of the coating depends on its purpose and on the need for good adhesion to the surface of the metal.

The main advantages of lacquer coatings are:

- An application can be used to protect any type of construction, directly on the assembly and construction sites
 - Simplicity and ability to automate the process
 - Possibility to repair and recover the coatings immediately during the operation
- low cost of materials per unit area and low cost compared to other types of coatings

A major indicator determining the effectiveness of applying one or another type of coating is its durability, namely: the ability of the coating to maintain its protective properties to a marginal state defined by a repair service system. The durability of the coating is determined by many factors, such as: physical-mechanical and chemical properties, surface preparation prior to painting, the correct type of coating selection or coating system for specific operating conditions.

Regardless of the good results with the use of the anti-corrosion protection materials, there are technological imperfections that reduce the durability of the coating. The analysis of such gaps shows that the main reasons are:

- the choice of type of coating or coating system is made without taking full account of factors such as technology of operation, operating conditions, storage and impact of climatic factors. Climatic factors include temperature, humidity, solar radiation, relatively rapid temperature change, the presence of salt mist, and the degree of corrosion of airborne substances.
- when choosing an anti-corrosion coating material, the focus is often set on the financial side, respectively. material with a lower price. The "rule" in such cases is that a product will be re-processed. The practice of restoring protective coatings of a certain type is limited to removing corrosive defects by applying a layer of the same material without completely removing the old coating.
- disturbed technology for applying the protective coating. For each particular type of coating, there are technological requirements that determine the degree of preparation of the surface to be treated, the maximum and minimum operating temperature, the drying time of a separate layer of the coating and many other parameters of the process. Technological deviations in the process result in a significant reduction in the protective capability of the coating and, as a rule, in lower

durability. For example, synthetic resin based coatings provide reliable and long-lasting anti-corrosion protection only when strictly adhering to the technological requirements (pre-sanding, degreasing on the surface to be treated, a certain temperature drying regime, etc.).

The complexity of the technological process providing high-quality coatings places significant constraints on wider application (eg in field conditions) where there are no suitable conditions for preparing the protected surfaces, providing optimum temperature and humidity for coating application and drying. That's why modern painting materials require stationary working conditions.

Conclusion

Anticorrosive protection of machinery and equipment in agriculture is widely used on the basis of lacquer materials. Depending on the operating conditions, these coatings must provide protection against the effects of atmospheric, biological, mechanical and thermal factors.

The effectiveness of anticorrosion protection depends primarily on the selection of the varnish materials, depending on the type and degree of corrosion hazard.

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