ON THE TECHNOLOGY OF ANTI-CORROSION GALVANIZING BY ZINC SPRAYING

Khaydarov Ahmadali Kambarovich

Associate Professor of Namangan Engineering Construction Institute,

Muhammadaliyev Bekzodbek Dilmurod ugli

Master student of Namangan Engineering Construction Institute

Abstract: *The article deals with the destruction of metals under the influence of the chemical or physicochemical influence of the environment. Methods for its prevention are also proposed.*

Key words: *corrosion, galvanizing, saturation, rust, galvanic steam, metallization, spraying.*

In the modern world, the corrosion of metals and their protection against corrosion is one of the most important scientific, technical and economic problems. Its relevance is especially manifested in enterprises that use metal structures, equipment, machinery, tools and vehicles with significant wear and tear of their service life. Corrosion processes have a different nature of their occurrence, but they all have one thing in common - they appear as a result of contact and interaction of metals with the environment.

Corrosion (Latin corrosio) is the spontaneous destruction of metals under the influence of the chemical or physico-chemical influence of the environment. The process of destruction of metals and their protection against corrosion is one of the most important scientific, technical and economic problems. In many areas of industry, technical progress is hampered by the unresolved, and sometimes unsolvable, of a number of corrosion problems. And they are becoming especially relevant today, when the use of metals in various industries has reached a historical peak.

Numerous studies of corrosion have made it possible to develop a number of methods for its prevention. One of the most effective is the galvanizing method.

Galvanizing is the application of a layer of zinc or its alloy to the surface of metal products or the saturation of surface layers with zinc to protect against corrosion. The protection method is based on the fact that zinc in the coating composition enters into corrosion reactions first, without exposing the metal itself. Zinc is able to protect iron from rust, which inevitably appears during the operation of metal objects. And this protection is not purely mechanical in nature - together with iron, zinc forms a galvanic couple, and the result of the interaction of zinc with oxygen provides even greater protection - a surface crust forms on zinc. Anti-corrosion coatings using zinc, namely galvanizing, have a number of obvious advantages: an increase in the service life of the metal up to 60 years; covering the entire product with a uniform layer; peel resistance.

Galvanizing is used in construction, oil and oil refining industry, energy, gas industry, automotive industry, and agriculture. Modern technologies provide for several types of galvanizing. Each of them differs in operation time, properties, equipment used and the thickness of the resulting zinc film. The choice of one or another application method is determined by protection requirements, operational factors, application conditions and economic aspects.

ISSN2277-3630 (online),PublishedbyInternational journal of Social Sciences & Interdisciplinary Research.,January-2022 https://www.gejournal.net/index.php/IJSSIR

Today, production processes associated with the use of various metals and their alloys are growing rapidly. Technologies for their production, methods of obtaining them are developing, while issues of an economic nature are being solved in parallel, i.e. energy costs are reduced, the cost of the final product is reduced. The task of galvanizing structural steel and parts in modern conditions is solved in different ways. The relevance of the issue for our reality is obvious.

The introduction of new technologies into the production process currently has no alternative. When solving high-tech problems, there is a need for a set of requirements, without which the expected result is not obtained. Firstly, the question of raw materials, secondly, the methods of using it in a particular technological process, thirdly, the energy intensity in the implementation of this work, and in the aggregate the final result. According to experts on a global scale, the production of zinc and its consumption is about 10.0 million tons per year. Demand for metal remains strong, thanks to the rapid growth in the production of anti-corrosion coatings. Various methods are used to obtain such coatings. Approximately half of all zinc produced is used for the production of galvanized steel, one third - in the hot dip galvanizing of finished products, the rest - for strip and wire. Over the past 20 years, the global market for these products has more than doubled, adding an average of 3.7% per year. The possibility of long-term use of metal and steel products depends on the ability to prevent corrosion of these materials. Zinc coating lasts longer, the more zinc it contains. The coating method is chosen depending on the conditions for further use of the product and the necessary properties of the protective layer.

We have proposed metallization, i.e. spray galvanizing. Coatings are applied by spraying with a jet of air or hot gas of molten zinc. Depending on the spraying method, zinc wire (rod) or zinc powder is used. In industry, gas-flame spraying and electric arc metallization are used. All types of galvanizing have a wide scope. We note the main consumer sectors and specific areas of use of this type of protection: energy, communications, road, industrial and civil construction, industry, oil production and oil refining, urban infrastructure and utilities. Examples of metal products recommended for applying anti-corrosion coatings by gas thermal spraying: oil and gas storage facilities, gas tanks, pipelines in heating mains, mine car bunkers, profiled roofing and wall panels, car bodies, mufflers, large-sized building profiles (channels, double-sided T-bars, corners) , steel sheets, embedded reinforcement, welded and prefabricated building structures of bridges, chimneys, tanks, hydraulic structures, oil rigs, metal road fences, road signs, high-voltage transmission supports, deck equipment, piers, pontoons, locks, docks, refrigerators, containers for storage and transportation of chemical reagents metal ornaments, gratings, fences, street lighting poles, gates of hydroelectric power plants, metal structures of the contact network of railways (supports, brackets, suspensions, rigid crossbars), rolling stock chassis, wheel rims, elements of rail skr heating, communications of livestock farms, etc. It should be noted that the process is environmentally friendly due to the absence of production waste.

Gas thermal spraying of anti-corrosion coatings has the following advantages: barriers to the penetration of corrosive pathogens, long service life, the possibility of coating parts of any size and complex configuration, the absence of warping and deterioration of the properties of the base metal due to the occurrence of hydrogen embrittlement due to treatment with an etchant (etching, as a method surface preparation, when gas thermal spraying is not required), increased fatigue strength

ISSN2277-3630 (online),PublishedbyInternational journal of Social Sciences & Interdisciplinary Research.,January-2022 https://www.gejournal.net/index.php/IJSSIR

characteristics due to the creation of compressive residual stresses, the microscopic porosity of the anti-corrosion coating contributes to the preservation of corrosion products in the pores, ensuring good adhesion to concrete in various embedded elements, the possibility of providing additional protection for welding zones , processed products directly at the site of installation of structures, the relative simplicity of the process, which does not require advanced qualifications of maintenance personnel.

The economic efficiency of the process is expressed in the service life of a particular product. The use of gas anti-corrosion thermal spraying of coatings provides long-term protection of metal structures operating both in atmospheric conditions and in water and other media. This eliminates the need for frequent restoration, which, in addition to high labor and material costs, may also be associated with a temporary cessation of operation of facilities. The cost of gas thermal spraying compared to painting is about 250%. However, such coatings require refurbishment only after 30-50 years, and the cost of its repair is only 25% of the cost of restoring the paintwork.

As shown by the data on the comparative cost of various types of anti-corrosion protection, depending on the service life, provided that the service life of the protected product is at least 20 years, the cost of gas thermal spraying is less than half of the cost of painting.

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ISSN2277-3630 (online),PublishedbyInternational journal of Social Sciences & Interdisciplinary Research., January-2022 https://www.gejournal.net/index.php/IJSSIR