Paint Compositions for the Upper Layers of Paint Coatings

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ABSTRACT

This article provides information on the composition, properties and corrosion protection of metal surfaces when using paints and varnishes. There is information about layers of paint that provide adhesion to metal and improve its protective properties when coating the working surfaces of parts with paints and varnishes.

KEYWORDS: *coatings, metal surfaces, water resistance, cast iron, magnesium aluminum, oil resistance, heat resistance, frost resistance, weather resistance, paint coatings, material.*

More than 90% of the metal surfaces of machines (steel, including galvanized and coded; cast iron; aluminum; copper; magnesium) are finished and protected from corrosion by paint and varnish coatings (LKP).

The decrease in the intensity of corrosion during the application of paintwork is explained by the following factors: 1) the diffusion of corrosive agents to the metal surface slows down, 2) the ohmic resistance of corrosion pairs operating under the coating layer increases; 3) the anodic process under the film is retarded; Painted metal has a more positive electrode potential than uncoated metal.

For effective and reliable protection, the following requirements are imposed on the LCP: a long period of protective action; high mechanical characteristics; good adhesion to metal; without porosity; minor internal stresses; certain micro hardness; water resistance; oil resistance; heat resistance; frost resistance; atmosphere resistance; ability to meet environmental requirements. Some of these requirements are realized when using multilayer coatings.

The disadvantages of LKP include efficiency decreasing over time as a result of the permeability of an aggressive environment; the toxicity of most of the solvents used; dependence of the quality of coatings on meteorological conditions (temperature and air humidity); the impossibility of protecting narrow and hard-to-reach places in structures; low versatility and, as a result, a wide variety of coatings for various purposes.

LCPs are formed from liquid materials, which include the following components: film formers, pigments, fillers, solvents, plasticizers, desiccants, thinners, etc. High protective ability and desired performance of coatings can be ensured only with strict observance of the regulated composition of materials (formulation), technologies for their preparation and application to the surface.

The layer of paintwork adjacent to the metal, which provides adhesion to the metal and improves the protective properties, is called a primer, or a primer; its thickness is 10...20 microns. From 1 to 4 layers of paint are applied over the primer (the thickness of a single-layer coating is at least 15

microns, a two-layer coating is 35 microns; a three-layer coating is 55 microns; a four-layer coating is 65 microns).

In some cases, to correct defects in the surface to be painted, after priming, before painting, selective filling is performed in several layers.

The minimum thickness of the paintwork should be 20% higher than the maximum height of micro roughness. With excessive roughness, the consumption of applied materials increases, but the service life of the coatings does not increase. Most often, corrosion begins at surface peaks that have a minimum coating thickness. The limiting value of roughness acceptable for paintwork is 40 μm.

In the future, technological compositions for priming, puttying and painting will be referred to as the single term "paints and varnishes", if necessary, highlighting each of them separately.

The main factors on which the reliability, durability and decorative appearance of the paintwork depend are the properties of paintwork materials, the applied scheme for constructing the RFP system, i.e. a combination of layers of sequentially applied materials for various purposes; mode and conditions of formation of each coating layer; type and condition of the surface to be painted, etc. Based on these factors, the technology for applying paintwork includes the following main stages: preparing surfaces for painting, priming, puttying, applying the top layers of the coating, and drying.

The general classification and designations of the paintwork in the design and technological documentation are given in GOST 9.032-74.

After priming and puttying, the top painting (covering) layers of paintwork are applied, which perform decorative and protective functions. Together, all layers (primer, putty and paint) are a paintwork system.

As a material for top layers in mechanical engineering, enamels are usually used, which are suspensions of pigments or their mixtures with fillers in varnishes. The industry produces a large range of elastic weather-resistant enamels: pentaphthalic PF-115 and PF-133; alkyd-acrylic AC-182 and AC-1247; alkyd-siloxanes I PF-188; melamine-alkyd ML-152; alkyd-epoxy PF-1234; alkyd-terephthalic ET-199, etc. They have good adhesion and do not tend to retain dirt, however, their corrosion protection properties need to be improved.

Recently, to enhance the waterproof properties of painting materials, composite coating compositions based on widely used base enamels have been used. For example, compositions based on PF-133 and AS-182 with polymer additives (curing time 15 minutes at a temperature of 80°C).

In order to prevent a decrease in the protective properties of paintwork, increased requirements are imposed on solvents for enamels. So, for PF-115, PF-133, PF-188 enamels, either pure solvent or its mixture with white spirit in a ratio of 1: 1 should be used as a solvent, and for AS-182 and ET-199 enamels - only pure solvent.

In accordance with environmental requirements, water-dilutable enamels are being actively developed (V-FL-1199; V-ML-28; V-MS-272, etc.). In Italy, a melamine-alkyd material is used, diluted by 30% with water (applied by dipping, drying temperature 150 C). In the USA, Caterpillar paints tractors with water-based enamel by spraying (drying temperature 80°C). The industry also produces special water-thinnable enamels for electroplating (for example, V-EP-2100).

To protect the components of machines when working in aggressive environments, a modified bitumen paint is used (BT-577 bituminous varnish + 5 ... 10% by weight epoxy powder paints), which is well applied

Spraying and dipping. The use of chemically resistant enamels XC-710 and XB-785 in 4 ... 6 layers over primers XC-068 and XC-010 is very effective. For such coatings, the impact strength and corrosion resistance are 1.5 and 10 times higher, respectively, compared to conventional coatings (enamel PF-133 + primer GF-0119).

For painting the internal surfaces of gas tanks, gearboxes, oil baths, etc., phenol compounds are used (for example, benzene resistant enamel FL-787); mufflers of cars are painted with heat-resistant organ silicon enamel KO-828; XC-527 and XC-1168 enamels have anti-icing properties.

Fluor plastic enamel FP-739 is chemical and benzene oil resistant, resistant to benzene and other solvents.

For electrical insulation work, enamels GF-92, EP-91, KO-936, KO-911 are used, in which the specific volumetric electrical resistance is 109 ... 1013 Ohm • m, the electrical strength is 30 ... 70 MV / m.

Good anti-corrosion coatings are polyurethane varnishes. The isocyanine contained in polyurethanes reacts with water (if it is present on the surface to be coated), which eliminates its effect on the development of corrosion and adhesion reduction. To protect steel structures, a polyurethane coating based on UR-930 varnish is used, which can be applied by spraying. In terms of its protective properties, it surpasses coatings based on bituminous materials.

A promising direction in the painting industry is the application powder paints, which allow to reduce the degree of environmental pollution, significantly reduce energy and economic costs. In fact, these paints are polymer coatings with all their inherent properties and application features. Therefore, they are not considered in this section.

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