

Improvement of Metalwork Anticorrosive Protection

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The integrated system of diagnostics of condition and recoating of shop metalwork at iron & steel plants is presented in the paper.

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Introduction

Mineral carbon plays a special role in transformational growth of the planet. Along with other gaseous and liquid carbonaceous resources, mineral carbon is a long-time carrier material of biosphere evolution regularities. It is known that free oxygen that accumulated in the planet atmosphere because a part of organic matter originated at photosynthesis deposited and was isolated from interaction with oxygen. The huge natural deposits of coal, liquid and gaseous carbohydrates collected in sedimentary rock during more than 2 billion years are also those recovered elements which were “torn off” from the oxygen by photosynthesis of plants. Ozone has been synthesized in the uppermost levels of the atmosphere under effect of sun ultra-violet radiation, and protective ozone layer of the planet was formed, since the Earth atmosphere is not regenerative and free oxygen occurred in it. Ozone holes which occurred under anthropogenic effect are one of the most severe environmental problems of the present [1].

Results and Discussion

The annual coal production in the world is increasing and will exceed 300 million tons by 2015 only for metallurgy. Iron and other ores, lime, natural gas, pulverized coal and other not restored resources are extracted from entrails along with coking coals for iron & steel making. However, up to 20 % of annual metal production is consumed for its recovery due to corrosion. Metal

losses reach 70 % for mankind history and are many billions tons.

Approximately 36 million tons of constructional steelwork is operated in Ukraine, first of all, in plants of iron & steel metallurgy, machine industry, power engineering, coal, oil - and gas industries. More than third (> 12.2 million tons) is steelwork of industrial companies. The state of metal fund anticorrosive protection level is unsatisfactory, which is a threat in economic and ecological spheres according to article 7 of the law “About Fundamentals of National Safety of Ukraine”.

Monitoring of metalwork anticorrosive protection, selection of rational technologies and materials for overhaul-period renewal are extremely important.

The integrated system of diagnostics of condition and recoating of intrashop metalwork at iron & steel plants was worked out. This system includes: diagnostic study and estimation of corrosive power in the areas of intrashop metalwork; testing and diagnostics of condition and protective ability of coverings on metalwork; selection of materials, recoating techniques according to characteristics of industrial environment and real service conditions, extent of wear and determined level of protection [2].

Corrosion activity is estimated by corrosion rate of steel samples according to specially developed map of their arrangement in various technological zones of the plant (shop, department, etc.).

Extent of atmosphere aggressivity is evaluated by method established by the

international standard BS EN ISO 12944-2:1998.

Diagnostics of coating condition includes estimation of its integrity, extent of adhesion to metal in points (according to State Standard 15140-78), widths, hardness. It allows determining the rational sequence and scope of works related to formation of metalwork anticorrosive protection.

Home and foreign producers offer various materials for anticorrosive protection - organic paintwork material, including with various metal fillers, waterborne and others. Scientific-testing centre "Kachestvo" has picked up a databank about properties of tens of advanced materials, their price, consumption indices and other technical and economic characteristics. These data allow recommending rational system of materials, surface preparation technology and metalwork coating during repairing anticorrosive work [3].

Preparation of metal surfaces, removal of detached layers and rust are required prior to applying new coverings and when restoring the damaged ones. Surface bead blasting is often used. This treatment is labor-consuming and pollutes environmental. Frequent application of bead blasting decreases cross-section of metalwork surface and carrying capacity. Therefore in some cases, application of bead blasting together with other types of surface treatment is impossible. To apply coating on rusty surface it is necessary to use special base coat which creates a polymeric film. In Ukraine, these base coats are fabricated with addition of target anticorrosive components - powdery rust solvents.

Compositions of powdery rust solvents were worked out on the basis of such fruit processing waste as peach, grape, walnut-shell and other natural raw material. Their application technology allows utilizing heavy stone fruits wastes [4].

To obtain high-quality coating it is necessary to add different amount of powdery solvent in coating composition as rust film thickness on metal surface can be various. When amount of powdery rust penetrating solvents is not enough, extractive elements are not able to break corrosion processes under lacquer coating. Application of base coat containing active agents in excess can lead to deterioration of protective effect due to etch undercutting of metal surface and decreased adhesion of coating to adherend. Negative effect of powdery rust solvents grows at the presence of acid substances in them that underetch metal.

Protective properties of base coat when applied on the metal with corrosion products 70-80 mkm thick are optimal at content of powdery

rust solvents to 7 %. High protective properties are provided when applying base coat over the layer of corrosion products (30-40 mkm) at powdery rust solvent content 3.5 %. Addition of powdery rust solvents in large amount (to 7 %) can have a negative effect because of excess of active acid components at specified thickness of corrosion products.

Conclusions

It is necessary to provide a reasonable correlation between amount of corrosion products on metal surface and amount of powdery rust solvents added into base coat.

References

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Повышение качества противокоррозионной защиты металлоконструкций

Пинчук С.И.

Разработана комплексная система диагностики состояния и восстановления защитных покрытий на внутрицеховых металлоконструкциях металлургических предприятий.