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Павлодар

суына қойылатын талаптарды қанағаттандырады. Сарымсақ көліне ағынды сулардың орташа мөлшері сағатына 188 текше метрді құрайды. «ПМХЗ» ЖШС павлодарлық ЖЭО-3-нен екі сатылы натрий катализденгеннен кейінгі судың жұмсартылған суына тәулігіне 200 тоннаға дейін жылу қазандықтарын қазып алу үшін сатып алады.

The article shows the results of the research carried out to develop technological solutions for wastewater utilization of «Pavlodar Oil Chemistry Refinery» LLP. The analysis of possible technological solutions of wastewater utilization was carried out. Taking into account the quality of waste water of «POCR» LLP, discharged into Lake Sarymsak, its post-treatment can be performed using ion exchange or membrane technologies. Purified wastewater can be used for feeding boilers-utilizers instead of treated water purchased from Pavlodar CHP-3, as it will meet the requirements for make-up water boilers data. The average amount of wastewater discharged into Lake Sarymsak is 188 cubic meters per hour. «POCR» LLP buys an average of 200 tons per hour of demineralized water from Pavlodar CHP-3 for feeding HRSG after 2 sodium-cationization steps.

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PROTECTION OF MAIN OIL AND GAS PIPELINES FROM CORROSION WITH THE METHOD OF GAS PLASMA SPRAYING

Corrosion of pipelines is one of the main causes of accidents in the oil and gas industry. This industry traditionally deals with fairly aggressive environments transported through pipelines, so ensuring corrosion protection is one of the main measures to ensure industrial safety. In this paper, the problem of increasing the corrosion resistance of main oil and gas pipelines is considered. Because of this, the choice of the optimal method for controlling corrosion is particularly relevant. Effective introduction of modern developments in the field of corrosion protection will significantly reduce the number of accidents and financial losses that are caused by the effect of corrosion on pipelines. One of the methods to combat corrosion processes is gas flame spraying, which provides machined surfaces with increased wear resistance, including resistance to corrosion, temperatures, abrasive wear, and so on.

Key words: main pipeline, oil and gas pipeline, corrosion, gas-flame spraying.

INTRODUCTION

The constant development of the petrochemical industry determines the need for materials that have high performance properties, primarily such as corrosion and heat resistance. High-alloy steels can only accomplish this task in part because of their high cost and limited production, so low-cost, low-alloy or carbon steel is

now universally applied. They have low performance characteristics, due to which metal losses due to corrosion account for about 25 % of their annual production, and economic losses, even in industrialized countries, reach 4 % of the gross national product.

The characteristics and properties of steels and alloys are determined to a large extent by the state of their surface, as well as by the physicochemical interaction at the interfaces, this circumstance determines the growing popularity of methods and technologies for applying highly effective protective coatings, instead of using bulk doping. Since in many respects the coatings are superior to high-alloyed alloys and the cost of products with protective coatings is much lower than the cost of products made from high-alloyed alloys, their use is economically feasible. Coatings are increasingly used in surface modification of materials, allowing to obtain a set of operational properties, such as heat and heat resistance, corrosion resistance, wear resistance, hardness, etc.

Particularly acute is the problem of increasing the corrosion resistance of oil and gas pipelines, technological pipelines of enterprises and other equipment of the petrochemical cluster used in the extraction and transportation of hydrocarbons. Corrosion processes are the basis of their environmental safety (accidents at these sites cause significant damage to the environment, cause, large destruction, cause accidents). However, among a large number of corrosion protection technologies, there are none that fully meet the complex of parameters, since each technology has certain advantages and disadvantages. In this regard, the development of a comprehensive technology for corrosion protection of oil and gas equipment is relevant.

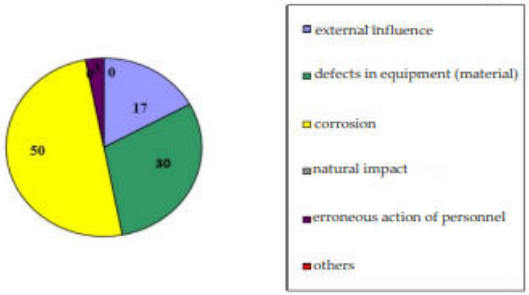
For convenience of analysis, all reasons contributing to the emergence of emergency situations are combined into 6 generalized groups of factors. They are: corrosion, equipment defects, external impact, natural effects, erroneous actions of personnel, others.

The distribution of accidents on the main oil and gas pipelines, depending on the causes of their occurrence, is shown in figure 1.

MAIN PART

When carrying out a statistical analysis of accident data in the oil and petrochemical industries, it is possible to identify general trends and factors that can be used in practice and when improving regulatory documents on risk assessment at gas and petrochemical cluster facilities. Corrosion and external influences are the underlying factors of premature wear and equipment failure in these industries. The development of technologies and methods for increasing corrosion resistance, improving the operational properties of petrochemical equipment parts is undoubtedly one of the priority tasks for ensuring their safe operation.

Diagram 1 – The main causes of accidents on main oil and gas pipelines



A promising method of protection against corrosion is gas flame spraying (GPN). This method involves heating the powder, rod (wire) or cord material (Fig. 1, 2) in the flame of the gas flare and delivering the smallest particles to the surface of the workpiece with a flue gas stream. As a source of thermal energy, a flame occurs as a result of combustion of an oxygen-combustible gas mixture (acetylene or propane). The gas-flame method is distinguished by the relative simplicity of the equipment used. At the same time, a continuous supply of oxygen and fuel is required to carry out the process. The temperature of the deposited material passing through the torch torch is close to the melting temperature. When in contact with the surface of the product, the heated particles «stick» with the substrate and with each other, forming a dense and uniform coating thickness.

Materials that can be applied in this way are diverse. It can be metals and metal alloys (chrome, nickel, aluminum, bronze, babbitt), oxides (titanium dioxide, aluminum oxide), carbides and even polymeric materials.

The described method has the following main advantages: high productivity, high localization of coatings, negligible impact on the deposited substrate, unlimited dimensions of the workpiece, a wide spectrum of combination of coating and substrate materials, low noise and emissions, simplicity and mobility of equipment, a wide range of possible thicknesses coatings, simplicity of technology.

Disadvantages of the method are: low coefficient of use of thermal energy of flue gases, restrictions on the use of some low-melting materials.

The method in question makes it possible to technologically obtain a strong coating with high adhesion properties, without mixing with the base material. The structural layer of the coating consists of a solid solution and excess phases of the deposition materials. The length of the fusion zone with the base material does not exceed 0.04 mm.

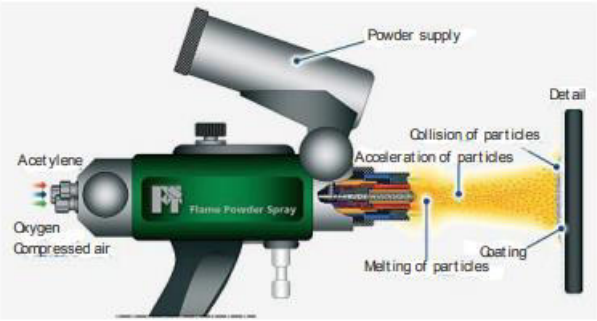


Figure 1 – Scheme of powdered gas-flame spraying

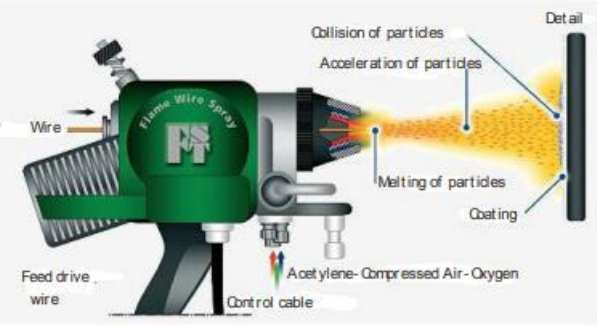


Figure 2 – Scheme of wire flame spraying

A variation of the gas-flame coating method, with supersonic exhaust velocity of the working gas-powder mixture (7–9 sound velocities). The key advantages of high-speed flame spraying are the high density of the resulting coating and the low content of oxides. The low content of oxides in the resulting layer is due to the fact that at a given high speed, the accelerated particles are extremely small in a high-temperature gaseous medium. An important factor is also not the high temperature (≈ 3000 °C) of the gas environment in comparison with alternative processes.

One of the important advantages of the method is the formation of compression stresses in applied coatings. This allows to obtain thicker coatings (up to 10 mm), with high adhesive strength and porosity of less than 1 %, which is impossible with subsonic gas-thermal spraying methods. The method is characterized by high productivity (with the use of industrial equipment, the consumption of powder

material reaches 30 kg / h), which can be successfully used to apply anticorrosive coatings on the main pipeline transport and large-scale components of oil and gas and petrochemical industries.

The structural scheme of the apparatus for applying HVOF coatings is shown in figure 3.

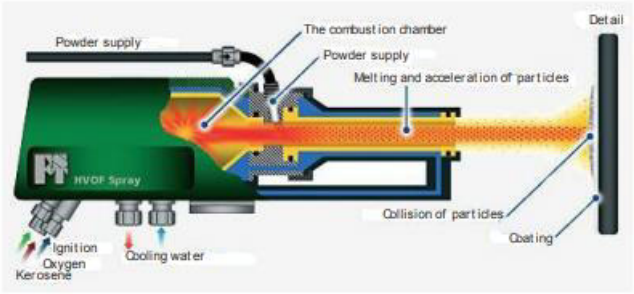


Figure 3 – High-speed gas-flame spraying scheme

The method in question makes it possible to technologically obtain a strong coating with high adhesion properties, without mixing with the base material. The structural layer of the coating consists of a solid solution and excess phases of the deposition materials. The length of the fusion zone with the base material does not exceed 0.04 mm.

CONCLUSIONS

The correct choice of a highly effective protective coating for a particular field of operation is not an easy task, which can be successfully solved by taking into account:

– properties of protective coatings;
– operating conditions of the product;
– economic validity of the application of the coating.

In the petrochemical industry, especially the transporting environments of high temperatures and pressures, the components and components of the equipment are subjected to highly corrosive and mechanical effects, therefore, it is most rational to use metallization methods of coating. The gas-flame method, as the most accessible coating technology, can be successfully used for surface treatment, both extended oil and gas pipelines, and small-sized parts, and equipment units of the petrochemical industry. This method ensures obtaining a uniform covering of the whole product area, which has a complex of required, easily variable, protective properties.

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Газ-плазмалық бүрку арқылы негізгі мұнай және газ құбырларын коррозиядан қорғау

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Защита магистральных нефтегазопроводов от коррозии методом газоплазменного напыления

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Құбырлардың коррозиясы мұнай-газ өнеркәсібіндегі апаттардың негізгі себептерінің бірі болып табылады. Бұл сала дәстүрлі түрде құбырлар арқылы тасымалданатын әділ агрессивті орталармен айналысады, сондықтан коррозиядан қорғау – бұл өнеркәсіптік қауіпсіздікті қамтамасыз етудің негізгі шараларының бірі. Осы мақалада негізгі мұнай және газ құбырларының коррозияға төзімділігін арттыру мәселесі қарастырылуда. Осының салдарынан коррозияны бақылаудың оңтайлы әдісі таңдау маңызды. Коррозиядан қорғау саласында заманауи әзірлемелерді тиімді енгізу құбыржолдардағы коррозия әсерінен болатын жазатайым оқиғалар мен қаржылық шығындардың санын айтарлықтай азайтады. Коррозия процестерімен күресудің бір тәсілі – тозуға төзімді, тот басуға, температурага, абразивті тозуга және тағы басқа тозуга төзімді өңделген беттерді қамтамасыз ететін газ-плазмалық бітеуі.

Коррозия трубопроводов является одной из основных причин возникновения аварий в нефтегазодобывающей промышленности. Данная отрасль традиционно имеет дело с достаточно агрессивными средами, транспортируемыми по трубопроводам, поэтому обеспечение защиты от коррозии является одной из основных мер по обеспечению промышленной безопасности. В настоящей статье рассматривается проблема повышения коррозионной стойкости магистральных нефтегазопроводов. Вследствие этого, выбор оптимального метода борьбы с коррозией является особенно актуальным. Эффективное внедрение современных разработок в области защиты от коррозии позволит во многом сократить число аварий и финансовых потерь, которые вызваны влиянием коррозии на трубопроводы. Одним из методов борьбы с коррозионными процессами является газопламенное напыление, которое обеспечивает обрабатываемым поверхностям повышенную износостойкость, включая устойчивость к коррозии, температурам, абразивному износу и т.д.