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RESEARCH OF ANTICORROSION PROTECTION OF BUILDING STRUCTURES BY HIGHLY FILLED POLYMERIC COMPOSITIONS

Aliakbar Islomov

Samarkand State Architectural and Civil Engineering Institute Uzbekistan, Samarkand

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Annotation

The article describes the use of composite materials in construction. This is due to their high anticorrosive properties. Measures of primary and secondary protection of building structures that increase the endurance of structures.

A large amount of electricity in the world is produced by thermal power plants. To remove waste heat from nuclear power plants, technical water supply systems are used, which are divided into direct-flow, circulating and mixed. A direct-flow water supply system uses a natural source. Most often it is a river or sea. To design a direct-flow system, it is necessary to take into account sanitary requirements and fish protection requirements. However, direct-flow technical water supply systems are prohibited. The circulating system of technical water supply is carried out with brigal pools, cooling towers and cooling ponds. The latter are widely used in the nuclear power industry. For example, the technical water supply of nuclear power plants is carried out according to the reverse scheme from the bulk reservoir of the cooler.

However, their use leads to the alienation of significant land plots. In addition, they cannot be used at thermal power plants, which are usually located near or within the city. The use of tower cooling towers in the circulating water supply systems of thermal power plants and nuclear power plants allows the most convenient arrangement of cooling devices, which are also more economical.

If compared with a direct-flow cooling system, the use of cooling towers saves natural water by 25-50 times and prevents thermal pollution of water bodies.

The operating environment has an aggressive effect on the building structures of cooling towers. Accelerated wear is facilitated by the mechanical action of air and water flows under specific operating conditions. These include: an air temperature of 50 °C, at which the humidity of the steam-air environment reaches 100%; the temperature of the irrigating water structure is up to 50 °C, but in some industries it reaches 60 °C or more. Due to the freezing of materials in a water-saturated state in winter and from alternating wetting and drying in summer, internal stresses increase impressively. Under the influence of solar radiation, as well as aggressive impurities in the recycled water, the physical and chemical properties of building materials change. Stresses also arise in structures from vibration during the operation of fans and high-speed wind pressure.

The cyclic nature of aggressive impacts, which depends on fluctuations in outdoor temperatures,

changes in wind speed and direction, solar radiation intensity, as well as on the technological operating conditions of cooling towers, exacerbates their impact on the building structure.

In order to ensure long-term operation of the cooling tower structure without destruction at a return water temperature of more than 50 °C, special materials are used that can operate in such an environment from 15 to 20 years, as well as special measures to protect structures from temperature effects or water pre-cooling. 289 Reliability and service life of cooling towers are largely determined by the type of material, strength and quality of enclosing structures (cladding). In winter, the temperature difference between the outside and inside the cooling towers can reach 60 °C or more, creating significant thermal stresses in them.

Building load-bearing structures of cooling towers can be made of monolithic or precast-monolithic reinforced concrete.

In areas where the temperature reaches -28 ° C and above, a hyperbolic exhaust tower made of monolithic reinforced concrete is used.

Due to the severe temperature and humidity conditions of operation of cooling towers, the materials used for their construction, in most cases, do not meet the requirements of durability without the use of additional protective equipment.

The most durable are reinforced concrete enclosing structures of cooling towers, the service life of which can reach 40 years. In most cases, the destruction of reinforced concrete bearing supports and shells in the area of air inlet windows occurs due to the lack of protective coatings and anti-icing devices. design imperfections.

When designing cooling towers, it is necessary to provide for measures of primary and secondary protection of building structures. The choice of protective coatings in the design of anti-corrosion protection is carried out taking into account the type, degree of aggressiveness of the operating environment and the actual state of structures during construction and operation.

Primary protection refers to a combination of certain requirements imposed directly on the materials and the structure itself, which are implemented in the design and manufacture process. Thanks to it, the further operational suitability of the entire product can be guaranteed as much as possible. The technological aspects of primary protection include the choice of materials that are resistant to certain types of aggressive influences, the choice and observance of certain specified methods used in the technological process of manufacturing structures, the choice of corrosion-resistant types of cements, the type of aggregate (coarse and fine), types of chemical additives and modifiers, selection of effective concrete compositions, selection of the type and class of reinforcing steels, methods of laying and compacting the concrete mixture, conditions for the maturation of concrete, etc. This part of the measures is determined at the design stage and is carried out during the manufacture of structures and erection of structures.

Secondary protection includes all measures to protect reinforced concrete and concrete surfaces from corrosion from direct exposure to aggressive media. This applies to structures already completed and in operation and is a means of extending the life support of previously protected structures. If primary protection is implemented through measures and techniques of a technological and constructive nature, is performed once for the entire period of operation and does not provide for renewal, then secondary measures can be resumed during the entire service life of the structure.

Technological measures of primary protection cannot maximize the resistance of concrete and its protective properties to reinforcement. The presence of cracks in concrete leaves the question of the reliability of protection open, since they are conductors of aggressive components to the reinforcement. To ensure the practical operation of reinforced concrete without cracks, structures with prestressing reinforcement or fiber structures should be used. And in this sense, if we do not consider the technical

and economic side of the issue, prestressed structures are preferable for working in an aggressive environment. On the other hand, high-strength steels are used in such structures, which have a lower corrosion resistance to stress cracking.

The use of fiber in concrete reinforcement can improve corrosion resistance due to the chaotic arrangement of its fibers, which protects the concrete body from cracking. When designing reinforced concrete structures that are likely to come into contact with aggressive agents, SP 28. 13330. 2012 "Protection of building structures against corrosion" is used to select the main measures of primary protection.

Currently, increasing priority is given to methods of primary protection. It is assumed that the development and creation of new materials and technologies will allow reinforced concrete of a new generation to withstand aggressive influences for a long time without resorting to secondary protection methods. In this regard, it can be assumed that scientific research in the future will be carried out in the following areas:

- expansion of types of concrete with high impermeability (W16 and above), frost resistance (F 500 and above), sulfate-resistant, bioacid- and alkali-resistant, etc.
- increasing the protective properties of concrete in relation to steel reinforcement by increasing its impermeability to gases and liquids by creating and introducing new chemical additives in concrete with an inhibitory effect;
- development and implementation of new, non-metallic reinforcing steels;
- development and application of dispersed reinforcement of concrete with chemically resistant fibers;
- development of new constructive forms of products and structures, technologies for laying and compacting concrete mixtures.

In highly critical structures, high-strength elements of complex structural schemes and solutions, it is advisable to use composite reinforcement. Such structures include cooling towers, various hydraulic structures at nuclear power plants, pumping and hydraulic structures on the water intake area. Due to the corrosion resistance and high specific strength of composites, the introduction of carbon fiber in the construction and reconstruction of cooling towers opens up wide opportunities for creating new highly efficient structures and individual elements. In order to eliminate design or execution errors, the consequences of damage to load-bearing structures that occurred during operation, to increase the bearing capacity of structures with an increase in design loads, external reinforcement systems with carbon tapes are used to repair and strengthen building structures.

About a third of all carbon fiber produced is consumed by the nuclear industry, incredible strength and lightness. because of him

It is planned to use composites in the construction of new generation nuclear power plants, namely in the production and installation of concrete structures, as well as the use of composite pipes in cooling towers, which will improve the quality of nuclear power plants under construction.

Composite reinforcement is not subject to corrosion and is superior to metal reinforcement in a number of other important characteristics, which makes it important to replace metal with composites.

The use of modern materials, as well as the continuous innovative development of the technologies used, is an important component of improving the quality of construction and guaranteeing the reliability and safety of nuclear power plants.

Modern production technologies make it possible to obtain composite products with more attractive characteristics than traditional materials. The main advantages of composite reinforcement: it is not

subject to corrosion, is a dielectric, radio-transparent, magneto-energetic, does not lose its properties at ultra-low temperatures. Due to these properties, after completion of testing and development of technical documentation, one can expect the use of composite materials in the construction of nuclear power plants.

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