Volume 2, Issue 4, April - 2024 **ISSN (E):** 2938-379X

ECOLOGICAL ASPECTS OF CHEMICAL AND PHYSICO-CHEMICAL FORTIFICATION OF SOILS

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Abstract
This article covers the ecological aspects of chemical and physico-chemical reinforcement of grunts and the methods of chemical and physico-chemical reinforcement of grunts.

Keywords: grunt, gruntgrunt waters, environment, toxic (toxic) substances, alkali, resins, Sandy and lyose grunts, cement.

Introduction

In our country and in foreign countries (USA, UK, Germany, Japan, Korea, etc.q.) in the construction of the foundation, various methods of chemical and physico-chemical strengthening of grunt are widely developed. The experience of their application has shown that these styles are considered reliable enough, can be performed for short periods without interrupting the use of structures, do not require complex technologies, etc.k. [1].

However, in their use, negative conditions associated with the possibility of negative chemical changes in the thick layer of natural grunt and the consequences of its negative impact on Man, The Biotic world and the full natural environment have been noted.

Therefore, in accordance with the existing building standards and regulations, it is necessary to strictly adhere to special measures aimed at protecting soils, grunts, atmospheric air, grunt waters and complete construction sites from contamination and other environmental disturbances when reinforcing grunts with the application of various toxic (toxic) substances or the release of toxic waste. The service employee is obliged to strictly comply with the relevant technical safety rules, until recently there was almost complete environmental assessment of the application of methods of strengthening the grunts in the literature in the field of technology. In connection with the exacerbation of common environmental problems in recent years [2].

In the study of chemical reagents reinforcing and environmental suitability for the natural environment, many scientists and experts (Charles J. Kibert, Jan Sendzimir, G. Bradley Guy, David C. Coleman, Martin Kranert, Klaus Cord-Landwehr, Michael Begon, Colin R. Townsend, John L. Harper, Neil S. Grigg, Roland Clift, Angela Druckman Editors, A.Ergashev, D.YOrmatova, V.E.Sokolović, F.E.Voronkevich, L.V.Goncharova, M.N.Ibragimov) made important contributions.

In the process of research, it was determined that all existing methods of chemical and physico-chemical reinforcement of grunts in one case or another contaminate the natural environment. The greatest danger, strengthening the grunts associated with toxic substances, has the following styles:

- rub in the glass;
- some types of resin and silicate curing techniques;
- thermal cooking in small quantities (reinforcement) [3].

Alkaline reinforcement of grunts. The essence of this method is that in the grunt alkali (corrosive alkaline (caustic) solution) there is an injection and concentration. A solution of at least 100 kg of corrosive alkali is spent on 1 m3 of reinforced grunt. The alkali solution sent to the grunt enters through irreversible chemical interaction with soil minerals, cements the grunt, loses its place of deposition, does not show its corrosive property in relation to its attitude to building structures. The radius of reinforcement is 0.5 meters, the capacity of the reinforcing area is 2-2.5 meters. Natural observations show that alkaline fields differ in time from their stable physical and chemical indicators, even below the level of grunt water.

Experts have noted the not fully accepted method of grounding, the occurrence of an undesirable strong Chemical Whirlpool of chalk grills, a violation of the concrete structure, an exacerbation of the appearance of a dangerous toxicant-dioxin in the elephants of alkaline mixtures. The technique also has a negative effect on people who are doing work on strengthening (in the form of alkaline casting). However, alkalizing methods can be used in construction practice when you have a careful relationship with alkali and strictly follow all the rules of Technical Safety [4].

The resinous technique is achieved by applying stiffeners (hydrochloric and shovel (or oxalate – colorless crystalline acids used in the chemical industry) to the grunt with pressure through carbamide and other resins.

The use of urea resins makes it possible to achieve a good strengthening of grunts. For example, temporary resistance 7-10 MPa is achieved when compressing Sandy grunts reinforced with resin. In particular, the resinous method was successfully applied in test work on the formation of an anti-ivory barrier at the rogue hydro power plant (GES).

However, resins of varying appearance (carbamide-containing, epoxy-containing, furan-containing, phenol-formal'degid-containing, and b.q.) as a result of the polymerization of the initial components during the solidification process, i.e. the formation or formation of high-molecule organic compounds from low-molecule organic compounds), grunts include polyethylenpoliamide, formal'degide, phenol, and other toxic substances. The thickening of these substances can exceed the permissible level several times and be several times in the series of events [5].

In addition, the reinforcement of the grunts with furan resin creates a well – acting condition for the formation of a dioxin-like Bond-tetrachlorobenzofuran.

The release of Free formal'degide into the environment from hardened resins to the reinforced grunt requires the application of strong open-flow ventilation. This ultimately led to a sharp reduction in recent use of resins. Even so, the ecological work of this style continues.

Advances in local chemistry and the need to develop non-toxic-looking resins to strengthen the grunts led to the creation of speciated (modified) non-toxic resins.

According to scientists, “K” - and “S” - branded pickled carbomide resins are less secreted from a reinforced grunt than ordinary resins are reinforced, 12-19 times more toxic formal'degide. In a fortified grunt, the weakly bound formal'degid remains less than 0.1%, which does not significantly affect the state of natural ecosystems [6].

The silicate method is considered one of the most common and is used in the technical reclamation of grunts.

One-solution and two-solution silicate (calcium chloride and silicate sodium solutions sent with pressure to reinforcing rocks) are distinguished from each other, in which chemical reagents or only silicate sodium (lyos, i.e. to yellow soil) are injected into the rocks by pressure with the addition of silicate sodium solution to it.

The research of scientists shows that in the style of single-solution silicate of Sandy and loamy grunts, their significant alkalization occurs, which in the first place has a detrimental effect on the waters in the grunt. Only in the reinforcement of 1 M3 grunt indicates that it contains from 16 to 32 kg of sodium hydrooxide, which is then almost completely alkaline with water and spread to the grunt area, causing its pollution and other negative environmental consequences [7].

From an ecological point of view, the method of single-solution silicate is absolutely not correct, the composition of which is accompanied by aromatic compounds of oil refineries (organic compounds with one or more benzene nuclei in their molecule) and a large additive of alkaline waste with an amino complex composition. Scientists believe that in this case, in the alkaline environment of a silicate solution, conditions are created for the appearance of dioxin-like tetrachlordiazobenzene, which is much more toxic in the interaction of these reagents.

The interaction of the addition of two components to the grunt in a two-solution silicate style results in low-solution calcium hydrooxide and non-toxic solution sodium chloride. However, in this style of reinforced grunt, strong alkali can be stored for a long time, which does not cause environmental negative alkalization of grunt waters [8].

Types of resinous and silicate styles, similar to grunt strengthening techniques, which have a significant amount or little poison in their strictly observed need for Environmental Protection, also include thermal cooking (reinforcement). In this style, atmospheric air can be contaminated with toxic gases.

The environmental safety requirements of chemical and physico-chemical reinforcement of grunts are constantly increasing.

However, it should be admitted that today there are no completely “clean” methods of strengthening the grunts from an ecological point of view, all of which, in one case or another, provoke a violation of the harmony of the functioning of natural systems. Let's take a look at the following new styles that pollute the environment to the least and are environmentally friendly.

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Cementing. Experience gained in the creation of various structures suggests that the use of portlandcement as a binder in grunt reinforcement does not cause any dangerous environmental consequences.

In 9th construction practice, several types of this style are used [9].

Cement grunt-reinforced cement grunt is made up of 85-95% earthen grunt and 5-15% cement. It is widely used in most countries of the world for foundation construction, anti-ivory curtains and fences, foundation of roads, etc. The application of soil-based cement grunt allows to significantly improve the environmental situation of residential buildings (Yu.A.Sokolov and a., 1998).

High environmental friendliness the style of cement suspension (a solution in which a substance floats in a small particle or droplet in another liquid substance) is distinguished, which is obtained on the basis of a resilient Cement, which is sent to the hard-pressed LySs grunt. In particular, in the work performed by scientists, cement of the “microdure” type of the German firm “Dukerhoff " was used, on the basis of which the suspension prepared allowed most of the lyoss grunts to be absorbed into their pores (O.E. Prikhodchenko, N.V.Volyanik and a.,1997).

The shape change (deformation) module of the grunt reinforced by this technique reached 80-90 MPa after 28 days, the density of the dry grunt increased by 0.1 g/cm3, the strength of the grunt was 3-6 MPa. Cementing style has the following advantages in comparison with silicate style [10]:

- high environmental friendliness of the style;
- a significant increase in the volume of reinforcement of the nozzle; an increase in the strength of the area to be strengthened and water resistance.

In the context of the development of modern technologies, the use of cementing techniques has been improved by the melioration of the grunt mass when its walk-through soils approach unsettled groundhogs, in a relatively ecologically stable area, allowing the displacement of a non-stagnant part of the areas where their soils have sunk.

One of the leading French firms in the field of strengthening the grout according to the cementing method has developed a new composition of the cement mixture “Soletash”, namely actizol for sand and other Unbound grunts. The composition of actizole includes cement, bentonite, silicate additive. The main advantage of this mixture, which is used to strengthen Sandy grunts, is the following: [1,7]:

- construction of anti-icing curtains, fences and drill-filled piles;
- the absence of environmental pollution;
- the presence of the possibility of using any type of cement.

In our country, when reconstructing buildings, the method of strengthening the foundation with the help of drilling filling or a pile in the “root form” is most common at the moment. As a strengthening agent, a cement mixture is served, which is sent to the hole under pressure.

In the mid-1980s, an advanced environmentally friendly style of grout base reinforcement was developed with whipped cement grout compositions.

In the 1990s, a style of environmentally friendly drilling mixing was developed in strengthening clay and Cork grills. This technique is based on softening and mixing without

releasing grunts that are reinforced with the introduction of cement suspension. As a reinforcer of components, environmentally safe has appeared anew – cementing is used in the combination of sand soil and clay soil with water [8].

Gas silicate. In this style, a significant part of the free alkali is neutralized with carbon dioxide gas. As a result, sodium hydrooxide is transferred to low-risk sodium carbonate, and in practical terms sodium bicarbonate is considered harmless.

Based on the sending of various impurities from important species, a technique of silicate grunts occurs. For example, a type of silicate crust has been developed based on ammonium hydroxide separation to enhance the ecology and effectiveness of lyoss grunt reinforcement (S.D.Voronkevich and b.q., 2000). The authors of this method believe that products obtained by the reaction of silicate and ammonium mixtures are close in nature to natural bonding and should not contaminate the natural environment [2].

Electrochemical style. In this style, grunt reinforcement is based on the transfer of a current source through steel electrodes that are in an upright position. A solid column is formed around it from a cemented grunt with a diameter of 100-400 mm, while the electrodes disintegrate. This environmentally friendly technique allows the creation of effective and inexpensive electrochemical anchors and piles, and also increases the stability of grunt areas.

The based selection methods of chemical and physico-chemical reinforcement of grunts are considered a rather difficult issue, in addition to the expense of various technical and economic requirements, it is necessary to comply with the rules of the basic environmental order in construction.

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