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Research Article

EXPANSION OIL WELL CEMENT BASED ON SUBSTANDARD RAW MATERIALS

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ABSTRACT

Grouting cement is a type of Portland cement designed to insulate pipes of oil and gas wells and protect them from groundwater pressure, shifts of ground layers, and the negative effects of aggressive media. When solidified, the cement mortar forms a monolithic jacket, impermeable to liquids and gases. The material adheres firmly to the metal pipe and to the walls of the trunk drilled in the rock. The use of grouting cement creates conditions for safe operation of wells and prolongs their working period. In traditional construction, this type of Portland cement is not used. The exception is the foundation of drilling piles in difficult geological conditions. That's whay, the article presents the investigation of grouting cement with the basis of substandard raw materials.

KEYWORDS

cement, grouting, raw materials, portland cement, element, production, substandard.

INTRODUCTION

Grouting Portland cement (TPC) is a special type of Portland cement designed for grouting oil and gas wells. It is made by joint grinding of a mixture consisting of Portland cement clinker and gypsum, taken in such quantity as is necessary to regulate the setting time and hardening of the cement dough during well plugging. Grouting cement is produced according to GOST 1581-96 of the following types: – type I – grouting Portland cement without additives; – type I-G – grouting Portland cement without additives with normalized requirements with a water–cement ratio equal to 0.44; - type I–H - grouting Portland cement without additives with normalized requirements with a water-cement ratio equal to 0.38;

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– type II – grouting portland cement with mineral additives; – type III – grouting Portland cement with special additives regulating the density of cement dough [5; 2-22].

One of the elements involved in the production process of all Processing Industries is raw materials, since it is impossible to produce products without raw materials. Raw materials are said to be an item of labor in which a certain amount of Labor was spent on mining or production, and which, as a result of this Labor, changed unevenly [2; 84-92]. During the production process, the raw material forms a finished product or semi-fabricate. As a result, the full value of raw materials goes to the gross product, which takes the form of a commodity.

Mineral raw materials are various minerals extracted from mines. The subsoil of Uzbekistan is very rich in types of minerals. The so-called kokhna deposits and their remains are evidence of the fact that mining on the territory of Uzbekistan has developed since time immemorial. To date, more than 3,000 mineral deposits have been identified in the country, 1,100 of which are ready for mining, in particular, 50 of them are original, 41 are colored, rare radioactive and ferrous metals, 187 are fuel and energy, 19 are mining, 45 are mining raw materials, as well as building materials, groundwater and other mineral deposits. The prospect of Uzbekistan's underground wealth is enormous. Only 20-25% of the territory of the Republic was subject to geological exploration. About 90 oil fields of industrial importance have been opened on the territory of Uzbekistan, of which 36 are in the category of oil, 24 are in the category of oil-gas and gas-oil, 26 are in the category of oil-gas condensate fields. Oil and gas from mamalakat have been found in Fergana, Surkhandarya, Hisor, Bukhara, Khiva and Islet-Ustyurt regions.

The chemical suitability of waste as raw materials is an important factor: they must provide the required chemical and phase composition of the clinker produced. The primary necessary chemical compounds are 107 materials containing lime, silicon, aluminum and iron, as well as sulfur, alkalis and other elements, which should be classified into groups according to their chemical composition. When using waste, the oxides contained in them are bound during the firing process into a clinker, as in the case of firing raw materials. They contain, like raw materials, oxides of calcium (CaO), silicon (SiO_2), aluminum ($A_{12}O_3$) and iron (Fe_2O_3). The ash of power plants (fly ash), blast furnace and other slags, belite sludge and other materials can partially replace natural raw materials [3; 54-60]. Fly ash can be used as a raw material in the production of clinker (mainly as a component containing aluminum oxide) and as an additive during grinding in the production of cement. It can replace up to 50% of Portland cement clinker. Moreover, modern by-products of gypsum production are suitable by themselves for use as a sulfate component. Table 2.6 shows the waste used as a raw material, distributed into different groups according to their chemical composition.

Table 2.6 — List of wastes classified by their chemical composition that can be used as raw materials in cement kilns (according to [41])

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Raw Materials Group	Waste used as raw materials
Ca — group	Industrial lime (limestone waste) Lime sludge Calcium carbide sludge Drinking water purification sludge
Si — group	Molding Casting sand Sand
Fe — group	Blast furnace and converter slag Pyrite cinders Synthetic hematite Red sludge
AI — group	Industrial sludge
Si-AI-Ca — group	Ash-entrainment Slags Small crushing screenings, earth (soil)
Raw Materials Group	Waste used as raw materials
S — group	Industrial gypsum waste
F — group	CaF2, sludge after fi

Up to 15% caustic magnesite is injected into the expanding grouting cement for gas wells, during hydration of which the volume of cement stone increases by 0.1 – 0.2%. When grouting high–temperature wells, sandy and weighted grouting cement is used - a product of joint grinding of clinker with 25-45% quartz sand, 40-60% of high-density materials (hematite, magnetite, etc.) are then added to this composition. The density of such a solution is 2-2.5g/cm3 [4].

panding grouting cement based on substandard raw materials is a material that is used to fill and seal wells in the oil and gas industry. It contains expanders that allow it to expand upon contact with water or other liquids, which provides good tightness and protection against the penetration of liquids and gases.

The main raw materials for the production of expanding grouting cement are powders of limestone, clay, slag, ash and other industrial waste. These materials may be substandard, that is, they do not meet quality standards for use in other industries.

The production of expanding grouting cement based on substandard raw materials has a number of advantages. Firstly, it is economically advantageous, since raw materials can be obtained at a lower price. Secondly, it helps to reduce the amount of industrial

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waste and reduce the negative impact on the environment.

However, the use of substandard raw materials can affect the quality and properties of cement. Therefore, before using such cement, it is necessary to conduct thorough testing and quality control.

CONCLUSION

To sum up, a special kind of Portland cement called grouting cement is used to shield oil and gas well tubing from hostile media, groundwater pressure, and shifting ground layers. The cement mortar hardens into a monolithic jacket that is impervious to liquids and gases. There are several benefits to making expanding grouting cement from inferior source materials. First and foremost, it is helpful economically because raw materials may be acquired for less money. Second, it aids in lowering the volume of industrial waste and the harm it causes to the environment. However, cement's quality and qualities might be impacted by the use of inferior raw materials. Therefore, careful testing and quality control must be done prior to employing this cement.

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