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THE QUESTION OF THE APPLICATION OF SLUDGE OF WATER TREATMENT

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The problem of negative impact of waste of a sludge collectors on the environment is considered. Sludge of water treatment use options as secondary raw materials, for production of construction materials are offered.

One of important tasks of the industry of construction materials is ensuring a construction with effective, environmentally friendly materials which are made with the maximum use of raw materials from local production and waste of this production.

Waste of sludge of systems of water treatment of the entities of power is of considerable scientific and practical interest. The analysis of chemical and mineralogical composition of similar waste has shown a possibility of active use as a source of raw materials for receiving construction materials.

The enterprises of metallurgy, the mining and overworking complexes, large heat electro power station and others operate with large volumes of firm, liquid and gaseous components (including waste) create waste heaps of dead rock, a red mud disposal field and sludge collectors. Direct impact on the environment from sludge collectors is made by filtrational losses to the soil and ground waters, secondary dusting and evaporation of gaseous substances from their surface, losses of suspensions when transporting slimes, leading to pollution considerable on land area and transformation of a natural landscape. Sludge collectors are a serious source of hydrodynamic impact on the environment, causing change of level of underground waters that exerts negative impact on a residential zone. Subdump waters pollute superficial reservoirs, ground waters and soils toxic elements. Secondary dusting and gas emission from the surface of the sludge collector cause pollution by toxic connections not only the atmospheres around placement of the sludge collector, but also the soil around them. The working platforms including system of slurry pipelines for transportation of slimes to sludge collectors also demand withdrawal of certain land plots and, in turn pollute the soil and ground waters at damage of pipes and pumps [1].

Important stage is development of measures for the prevention, reduction, compensation and elimination of potential damage to the surrounding environment from the sludge collector.

It is most fully possible to solve this problem due to use of sludges as raw materials of the most material-intensive branch of the national economy of the construction industry. A variety of products of this industry allows to find the rational direction of utilization practically of each type of waste of this group [2].

In work [3] authors suggest to use high-iron sludge of water treatment of the Tomsk water intake for receiving a pigment for the painted composite construction materials. In the chemical composition of sludge of water treatment iron oxide (42 and 44%) on average prevails, shares of oxides of silicon (5,4 and 2,4%), calcium (4,2 and 2,8%) and magnesium (2,0 and 4,9%) are significantly lower.

In attempt of receiving a pigment from sludge of water treatment of the Tomsk water intake, it has been shown that heating of the dried-up sample in a crucible to 400 °C leads to uncontrollable increase in temperature in powder above 600 °C and to his agglomeration in the dense weight having black color. For an exception of agglomeration of powder the technique of receiving a pigment with use of the rotating furnace and with application of an automatic feeder has been offered. By this technique the pigment of coffee color has been received. Also easier way of receiving a pigment from high-iron sludge has been developed and experimentally checked: initial raw materials were dried up, crushed, burned in the muffle furnace at a temperature above 600°C. After cooling the deposit has gained saturated red color.

Authors studied a possibility of use of the received pigment in production of the painted construction composite materials.

Inorganic waste of heat electro power station can used as thinning agent additives in production of a ceramic brick on the basis of clay breeds. Inorganic waste as thinning agent additive, reduces plasticity of clay, connects water. As a result of a product are easier formed, product quality, in particular, frost resistance increases.

It is offered to use sludge of water treatment for production of a ceramic brick. In work [4] the composition of raw materials is developed for production of a brick ceramic by method of moist pressing with use of waste of heat electro power station according to requirements GOST 1160-99 «A brick and stones ceramic» and STB 1286-2001 «A ceramic brick». Clay raw materials of the Zapolye field are applied to production of a ceramic brick of moist pressing on JSC «Obolsky Ceramic Plant».

Inorganic waste of heat electro power stations on the chemical composition and technical characteristics is close to clay raw materials, their application in production of construction materials is one of the main directions on decrease in a material capacity of this large-tonnage production.

The brick made with additive of sludge of water treatment of a boiler room «Southern» JSC «Vityaz» of Vitebsk possesses high strength characteristics, high frost resistance, acid resistance. Due to use as a part of raw materials of waste the cost of such ceramic brick falls by 10–15%.

The analysis of modern experience has shown that use of sludges of chemical water treatment of heat electro power station is limited to their application as minor components at addition in mix of construction appointment. Considerably the smaller attention is paid to activization of these products and obtaining on their basis of the systems which independently have the binding properties. For these reasons as a result of these researches the technology of utilization of sludges of chemical water treatment of the heat electro power station with the maximum energy use stocked at a stage of their education in case of the minimum anthropogenous impact on the environment is developed [2].

Development of effective additives for cement mortars with use of secondary raw materials is an urgent task of construction materials science as allows to prove scientifically application of the construction materials received on the basis of industry by-products.

Technogenic sludges can be used as curing activators. Optimum amount of sludge in cement and sand solutions are 5–10% of weight binder. In this case stable increase in durability for 10–15% is provided. At introduction of carbonate sludge together with gypsiferous as well as for structures with carbonate sludge sharp increase in plastic durability of cement and sand solutions with the increased content of additives is noted.

Researches in work [5] have shown a possibility of use the gypsiferous and carbonate sludges for the purpose of regulation of process of initial structurization of cement and sand compositions. Increase in durability of samples of cement and sand solutions with additive of sludge makes, on average 20–25% and also increase with increase in his quantity in mix.

Some researches showing a possibility of use of sludge of water treatment as a part of gypseous binders as filler, and also efficiency of joint use of sludges with chemical additives modifiers of the properties knitting were conducted.

For the purpose of modification of physics and technology properties of the received gypseous binder during recovery sludge of water treatment additional studying of a possibility of use of sludge of water treatment as filler of the «KMK-OK» modifier representing the starch air exerting impact on a consistence the mortar of mixes, a thixotropy, resistance to a water separation, stickiness binder in the presence of chemical additive is carried out. «KMK-OK» supersoftener-modifier of production of CJSC «Politsel» in Vladimir on TU 6 – 55 – 221 – 1396 – 95 is used as a part of plasters, fillings, glues, as the technological additive reducing stickiness of solution mixes to the tool usually in a combination with cellulose air; let's combine with the majority of other additives for dry construction mixes.

In structure of the composition containing optimum amount of the prepared precleaning sludge in number of 14,7% at a subtlety of a grinding of 14,5% on the rest on a sieve No. 008, entered «KMK-OK» additive in a solid-phase state in number of 0,1–1%. The analysis of the obtained data [6] has shown that introduction of «KMK-OK» softener to structure of gypseous composition increases water requirement gypseous binder from 58% to 67% at introduction to 1% of additive. Acceleration of terms of a prehension of the gypseous test at introduction of additive in quantity to 0,5% is at the same time observed and delay of a prehension at further increase in number of the «KMK-OK» modifier.

In many cases chemical water treatment at heat electro power station is made with use of the cheapest components: coagulant (iron vitriol) and precipitator (slaked lime). Lime as the neutralized agent is applied quite widely, however still there are no corresponding standards regulating its structure and properties as a precipitator what brings in a case of use of usual construction lime to her big overexpenditure and affects phase composition of sludge.

The phase composition of sludge of Novogoryevsky heat electro power station is presented generally by a calcium carbonate, as impurity – compounds of magnesium and iron, plaster, silicon dioxide, organic chemistry.

As a result of researches [7] it is established that on functional purpose sludge of chemical water treatment of heat electro power station can be recommended as raw materials in case of production of the binding substances as contains in a large number of connection on the basis of calcium. For increase in reactionary ability of sludge before chemical neutralization it is recommended to carry out mechanical activation of a deposit by his grinding in a spherical mill. At mechanical activation there is a process of averaging of particles of slugde on grain structure. It allows to exclude a stage of separation of particles of sludge by the sizes as the kinetics and efficiency of reactions of neutralization depends on degree of dispersion.

The main rheological modifiers of cement mixes are chemical additives of surface-active action now. Entering of such additives promotes increase in their mobility, cuts a water consumption, saves binder and has a number of positive side effects depending on their composition, a type and amount of cement, the set parameters of concrete mix.

Special group of the mineral fillers which are functionally intended for regulation of sorption processes in the water binding suspensions and through them forming of a contact zone and superficial processes in composi-

tion «cement – filler», constitute sludges of water purification, water treatment and water softening of industrial enterprises.

Numerous technological experiments have shown that sludges as a part of cement compositions exert positive impact on rheological properties and sedimentation of firm particles on stages of processing of raw mixes at production of heavy, light and especially light concrete, masonry and plaster solutions.

Owing to high dispersion sludges increase number and the areas of phase contacts that increases superficial activity and interphase interactions between cement and filler, promotes decrease in fragility of a cement stone, increases the module of elasticity and durability at stretching and compression.

Effect of sludges on processes of structurization of cement compositions at various stages differs in complexity, however, it is possible to assume with confidence that the adsorptive and connected water – a positive factor for formation of mineral and sludge glue and increase in adhesive durability between binder and filler [8].

As a result it is possible to draw the following **conclusions:**

1) drawing into economic circulation of production wastes and consumption as secondary raw materials provides an effective solution of tasks of resource conservation and environmental protection;

2) because of a negative impact of waste of the sludge collector on the surrounding environment, the problem of their utilization is urgent at this stage of development of the industry of construction materials;

3) as show results of researches, sludge of water treatment perhaps actively to use as a source of raw materials for receiving construction materials.

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