THE USE OF SLAG MIXTURES FOR THE MANUFACTURE OF BUILDING MATERIALS

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Abstract. The article deals with the use of ash-slag mixtures in the production of building materials, presents the results of studies to determine the physical and mechanical characteristics of solutions prepared from various compositions.

Key words: ash-slag mixtures, production, building materials, physical, solutions.

Among industrial waste, one of the first places in terms of volume is occupied by ash and slag from the combustion of solid fuels (coal of various types, oil shale, peat) at thermal power plants. Ash and slag wastes (ASW) have a negative impact on the environment, their accumulation leads to pollution of groundwater and earth resources. It should be noted that ASW are not removed from the territory of the TPP, they form hydropulps when combined with recycled waters. Territories allocated for ASW become unsuitable for use in agriculture or for other purposes, they become exclusion zones. To create waste zones (ash dumps) for ash and slag impurities (ASHP) in TPPs, working on coal reduced costs, payments for the environment, investment costs amount to 5-7% of the cost of electricity generated. In particular, for the creation of new ash dumps, the costs may amount to 2-4 billion rubles, for the construction of protecting dams more than 1 billion rubles, and these costs are paid by consumers of energy and heat.

In this regard, ensuring the environmental safety of thermal power plants is the utilization of.In most developed countries, much attention is paid to the use of WGW for the production of building materials: in Germany and Denmark about 100%, in the USA, Great Britain, Poland and China about 50-70%. However, in the CIS countries, only 8-10% of WGW is recycled and used in the production of building materials. In the goods market, the main consumers of ASW are the construction industry and the building materials industry. The use of ZSHP reduces the cost of building materials by (cement, dry mortars, concrete, mortars, etc) at least 15-30%.

The technologies of using ash and slag waste in the following industries are of the greatest interest.

• in the production of Portland cement (as active silica additives) in the amount of 10 15 percent, in the production of pozzolanic Portland cement grades 300 400 - up to 30 40 percent (ash Portland cement);

• in the manufacture of mortars - as an active additive in the amount of 10-30 percent by weight of cement, when high-grade Portland cement (400-500) is used in mortars,

the use of pulverized ash can reduce its consumption by up to 30 percent;
• as an active micro-filler in heavy concretes, which allows reducing cement consumption from 6-10% in normal hardening concretes to 12-25% in steamed ones;
• in the production of silicate bricks;
• in heat-resistant concretes - as a filler instead of fireclay powder, which significantly reduces the cost of such concretes;
• in the manufacture of ash and aggloporite gravel;
• in the production of fine-grained aerated ash concrete and products based on it, as a fine fraction of lightweight concrete on porous aggregates of dense and porous structure;
• as raw materials for the road industry;
• the use of ash and slag wastes with a high content of unburned fuel particles in the production of clay bricks, which not only improves its quality, but also reduces the consumption of process fuel for firing;
• the use of ash and slag wastes with a high content of unburned fuel particles in the production of clay bricks, which not only improves its quality, but also reduces the consumption of process fuel for firing. The most effective use of fly ash is in concrete of low classes (up to B20), in particular in concrete used for the construction of dams, foundations, foundations. The amount of ash introduced varies from 30 to 90 kg per 1 m^3 of concrete mix.

The quality of fly ash used in concrete and building mortars must comply with the requirements of GOST 25818–91, ash and slag material - GOST 25592–91. GOST 25818–91 applies to fly ash, which is used as a component for the manufacture of heavy, light, cellular concrete and mortar, as well as a finely ground additive for heat-resistant concrete and mineral binders for the preparation of mixtures and soils in road construction.

For the manufacture of heavy and light concretes, mortars, fly ash is used to reduce the consumption of cement and aggregates, improve the technological properties of concrete and mortar mixtures, improve the quality of concrete and mortars.

Insufficient volume of use of WGW is explained by the following disadvantages - increased content of ash (up to 53%), porosity (up to 1600 m2/kg), increased water demand, leading to a decrease in the strength of building materials and products based on them.

It should be noted that the joint grinding of cement clinker and ASW leads not only to a decrease in the cement fraction, but also to an increase in their specific surface area, which increases the interaction of cement particles with water. However, the grinding of mixtures reduces the efficiency of production, and the use of ASW in concrete mixtures leads to an increase in water demand, which leads to a decrease in

the strength of concrete.

At the Department of Building Materials and Products of the Namangan Civil Engineering Institute, research work is being carried out to obtain building materials based on ash and slag impurities For these purposes, samples of 70x70x70 mm in size were prepared from various components. The superplasticizer Dzhalilov-SJ-3 was used as additives [4]. The water-cement ratio is assumed to be 0.5. Portland cement grade 400 (without additives) was used as a reference. After 28 days of hardening under normal conditions, the samples were tested in the laboratory to determine the physical and mechanical characteristics. The research uses the results of scientific works by V.S. Prokopets.

Table 2 shows the results of studies to determine the physical and mechanical characteristics of solutions prepared from various compositions.

Table - 2. Physical and mechanical characteristics of the samples

№ composition	The content of the components in the binder %				Density, g/sm^3	Setting time, start-end, minutes. - hour.	Tensile strength after 28-day hardening, MPa	
	Cement (M400)	Ash	Slag	Additives			When compressed	Stretching in bending
1	100	-	-		3,1	45 - 10	40,2	6,2
2	70	30	-		3,2	50 - 11	34,8	3,2
3	27	40	30	3	3,04	52 - 11	39,5	6,4
4	36	40	20	4	3,05	53 - 13	40,7	6,5
5	47	29	19	5	3,07	55 - 14	41,5	6,6

The table shows that when only ash (composition 2) is added to the composition of the mortar mixture, its strength decreases

When adding ash, slag and additives to the composition of the mortar mixture (5-composition) - the superplasticizer Dzhalilova-SJ-3, the performance of the samples is higher (compared to composition 1). Promising directions for reducing the water demand of mixtures are the use of plasticizing additives and nanomodifiers (carbon astralens, fullerons and nanotubes, metal oxides, lime, nanoparticles, etc.).

The introduction of plasticizing additives and nanomodifiers into the composition of concrete improves their physical and mechanical characteristics, increases the strength and value of the modulus of elasticity, water resistance, and frost resistance, reduces the values of ultimate shrinkage strai.The use of nanomodifiers to improve the properties of concrete based on ash and slag mixtures opens up wide opportunities for targeted control of the economic, technological, and physical and

mechanical properties of concrete.

Conclusion. The use of ash-slag impurities (ASHI) in the production of building materials is currently very relevant both from an economic and environmental point of view. Cement mortars based on ash and slag waste have sufficient strength and can be used for the preparation of concrete. An integrated approach to the processing of ash and slag waste can give a great economic effect. To do this, it is necessary to develop industrial technologies for the use of ash and slag waste, as well as develop a set of marketing activities to promote products based on ASW. It is necessary to comprehensively study the market of building materials (manufacturers, their capabilities and desire to use ash and slag waste in their production), as well as to search for and establish contacts with potential consumers of a new product.

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