RECYCLING OF COAL ASHES AS ENERGY-SAVING BUILDING MATERIAL

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ANNOTATION

This article provides some information on the energy efficiency of building structures made from a mixture of coal ash.

Keywords: Fly Ash, Utilization of Fly Ash, Geo-Polymer Concrete, Fly Ash bricks, Energy Savings.

Most developing countries are experiencing energy shortages, which means that it is still difficult to increase the energy efficiency of buildings in these countries. Specialists are tasked with designing and constructing low-energy buildings during operation. The use of industrial and other wastes is very important in solving this problem. One of them is coal ash.

The properties of coal ash depend on the source of coal, the degree of grinding, combustion conditions, processing and storage methods. Any of the above factors can lead to changes in the properties of coal ash. Any change will affect the potential for ash use.

Chemically, coal ash is considered to be a mixture of amorphous and ferro-alumino silicate minerals. However, the composition of coal ash depends largely on geographical factors associated with coal. The main constituents of coal ash are mainly oxides of Si, Al, Fe, Ca and Mg, which make up 95-99% of the total constituents.

Table 1.
Physical properties of coal ash

Density	2,17 g / sm^3
Dimensional weight (density)	1,26 g / sm^3
The amount of moisture	2%
The shape of the particle	Spherical / irregular
Rangi	Gray
pH value	6.0-10.0
Specific gravity	1.66-2.55
Porosity	45% -55%
Water holding capacity	45% -60%
Electrical conductivity	(dS / m) 0,15-0,45

The structure, made of low-moisture and sufficiently strong concrete mix, is sufficiently resistant to freezing and thawing. This means that if the water contact level is low, all the water can mix with the binder and other components, resulting in low permeability of the structure. This process prevents the mixture from saturating during the freezing phase. If the saturation of the mixture does not develop, the structure will not crack, even in the absence of any air-absorbing mixture. Coal ash reduces them, the water-cement ratio and the permeability of concrete decreases.

Due to the large-scale industrial use of coal, the environment is polluted with various types of industrial waste, including coal ash in the production of baked bricks.

As a result of brick production in our country, 100 million tons of coal ash are formed. Losing such a large amount of industrial waste is costly and time consuming.

In this case, the targeted use of this industrial waste can be considered as another effective solution to the problem. In other words, coal ash, which is considered a waste, can be used as an energy-saving additive in the development of energy-efficient construction structures.

Coal ash can be used as a main component for various building materials. Coal ash is a material that contains a sufficient amount of silicon. Coal ash has great potential for use as an alternative material in building construction. Coal ash can be used as an efficient and energy efficient material in building construction.
Depending on the needs of the local market, it is possible to produce a variety of wall blocks and bricks, tiles and cast materials.

Raw materials produced from a mixture of coal ash and other light wastes can have a global economic effect in increasing the energy efficiency of buildings. These materials are mixed and a bonding agent is added. The mixed raw material is poured into molds, after which the molds are sent to a special oven or the product is dried in the open field. The products can be used as a lightweight material in the construction industry.

Figure 1. Examples of energy-efficient building structures based on a mixture of coal ash.

This is also important so that the specific gravity of the building does not increase. In this case, the density of the material is from 500 kg / m3 to 1300 kg / m3, and it is possible to build low-rise buildings with such block wall structures. The material can also be used in multi-layer wall panels, as partitions in multi-storey buildings and in roof constructions.

As the structure is not aesthetically rich material, it can be surface treated or painted. Thermal insulation properties and ease of production are the most important cost-effective points of using coal ash.

Table 2

Comparison of energy savings in a building using constructions made of a mixture of coal ash [2].

Building materials	Composition	Energy saving (%)
Portland cement	75% plain portland cement and 25% coal ash	20
Lime mixture	25% acetylene gaseous lime and 75% coal ash	75
Calcium silicate brick	90% coal ash, 10% lime (source of waste)	40
Burnt brick	75% clay and 25% coal ash	15

A brick made of a mixture of coal ash	50% coal ash, 28% sand, 20% lime and 2% gypsum	>40

In this regard, a number of works are being carried out in our country.

It is no exaggeration to say that the Resolution of the President of the Republic of Uzbekistan dated May 26, 2017 "On the Program of Measures for Further Development of Renewable Energy, Energy Efficiency in Economic and Social Spheres for 2017-2021" was aimed at solving this problem.

According to the document, in 2017-2021, brick and cement enterprises will be gradually converted to coal as a fuel.

A number of measures have been taken to ensure the implementation of the decision.

The following information was provided by the Ministry of Energy of the Republic of Uzbekistan on the following:

First of all, working groups with the participation of entrepreneurs were established in all regions of the country to explain the benefits of using coal as a fuel.

Second, special analyzes were conducted to study the benefits of using coal. For this purpose, experiments were conducted at a number of brick factories. As a result, it was concluded that the use of coal instead of natural gas could save 45-55% of fuel.

As part of the implementation of the decision, the country began to organize the production of heating boilers for the use of coal. As a result, the production of coal boilers was launched in Chirchik.

In 2019, 33% of bricks produced in Uzbekistan were produced by enterprises that use coal as a fuel instead of natural gas.

In 2019, another 94 brick factories were adapted to use coal as fuel.

Statistics show that the transition of brick factories in Uzbekistan to full use of coal will save the country more than a billion cubic meters of natural gas annually. The reduction in fuel costs will also be of great benefit to manufacturers.

It is also known that if we used to spend 350,000 soums for the production of 1,000 bricks, the cost of 1,000 bricks as a result of using coal is 200,000 soums.

CONCLUSION

Coal ash becomes an important material for various industrial and construction applications.

Helps conserve land and natural soil.

Research on the use of coal ash shows that great progress has been made in the construction of energy-efficient buildings.

It is also beneficial in terms of cleaning the environment from harmful wastes.

LITERATURE

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