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THE ROLE AND SIGNIFICANCE OF THE USE OF SECONDARY INDUSTRIAL WASTE IN THE PRODUCTION OF LOW ENERGY CEMENT CLINKER

Bakhriyev Nuritdin Fakhritdinovich[1], Ibragimov Navruzbek Shaydullayevich[2], Aliyeva Shoxsanam Olimovna[3]

[1)] Candidate of Technical Sciences, PhD of Samarkand State Architectural-building University ;
[2)]basic PhD student of Samarkand State Architectural-building University.
[3)]basic PhD student of Samarkand State Architectural-building University.

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Abstract:

This article describes scientific research on the creation of highly efficient mineralizers based on iron scale of a rolling mill during the firing of cement clinker in order to reduce the sintering temperature. So, in modern conditions, there are acute problems of energy saving and the production of high-quality, high-strength cements, the authors propose an innovative method and scientific justification for the solution problems in the workplace. New ideas and results of experimental developments, technological regulations and practical experiments in this direction are proposed. The authors made an attempt to implement the idea by using the local iron scale of the Tashkent Metallurgical Plant as a ferrite additive during clinker firing. The joint venture Tashkent Metallurgical Plant is a super modern enterprise of New Uzbekistan, with an annual capacity of 500 thousand tons of cold-rolled steel with galvanized and polymer coating.

Keywords: Metallurgical Plant, cement

An analysis of the global construction market, in particular the production of binders and cement, its implementation conclusion shows that the use of resources and energy-saving, innovative technologies is a requirement of today and the future.

"In view of the implementation of the decisions contained in the Development Strategy of Uzbekistan for 2017-2021 [1], a concept has been developed for creating new capacities through the development and modernization of the cement industry and the construction of new plants in a number of regions: the Republic of Karakalpakstan, Jizzakh and Surkhandarya regions. The strategic task is to bring the level of cement production per capita to the world level (433 kg per person per year) [2].

The most important research priority in this area is the scientific topic of cement clinker firing using energy-saving technologies enriched with iron compounds.

The relevance of the study lies in the fact that according to the proposed method, the idea of using ferrite-containing additives in the firing of traditional cement clinker is that when the ferrite-enriched additives are introduced into the cement firing of slags, clinkering of the product occurs. at relatively low temperatures +1200...1250 °C is predicted. The proposed scientific and practical idea helps to solve economic problems, since it involves the use of a steel ball (dross), a minor element of steel sheet rolled products of the Tashkent Metallurgical Plant, the leading industrial enterprise of the republic [3,4].

According to the information publication "Uzex News" of the Commodity Exchange of the Republic of Uzbekistan, 13.9 million tons of cement will be sold on the exchange in 2021 [6].

JSC "Qizilqumcement" is the leader in the cement trade market of Uzbekistan with a share of 36.8%. The second place is occupied by "Olmaliq TKMK" and "Ohangarancement" JSC, their share is 22.6 and 21.9 percent, respectively.

The next places were taken by "Quvasaytcement"JSC with a share of 6.2% and "Bekobodcement" JSC with a 4.8% share. The share of other sellers is about 7.6%. The volume of products put up for auction by these enterprises is 92.4% of the total volume of cement sold through the exchange.

In the analyzed year, the cement price was formed only according to the laws of market supply and demand. In the period under review, the average prices offered by manufacturers ranged from 509.5 thousand to 623.9 thousand soums per ton of cement.

In the analyzed year, the greatest need for cement consumption was recorded in Tashkent city and Tashkent region, their total share was 25%. The share of Surkhandarya region is 12%, Samarkand - 11%. Kashkadarya and Bukhara regions occupied 10% of the market. The share of other regions is relatively lower.

Today, the fact that our country has become a huge construction area requires a fundamental improvement in production, including the production of cost-effective, energy-saving types of cement. The decision of May 25, 2019 PQ 4335 "On additional measures for the rapid development of the building materials industry" provides for a doubling of cement production volumes [2]. In addition, in accordance with the Decree of the President of the Republic of Uzbekistan on measures to implement the investment project "Construction of the Tashkent Metallurgical Plant" dated April 7, 2017, high-quality galvanized steel sheet with a polymer coating will be rolled. at the Tashkent Metallurgical Plant, which was put into operation in 2020.

The entire production process is carried out according to a 4-stage technological process. At the initial stage, the sheet is rolled under pressure from finished steel ingots in the annealed state, during which a layer of soot is formed on the surface of the annealed steel sheet due to the action of atmospheric oxygen, which is formed by steel. storm (dross) is called, and this layer is chemically treated to clean the surface of the metal.

In the second stage of metal processing, metal scale is separated in the cold rolling process. This secondary product accumulates during the production process, and when studying its composition, it was found that it contains up to 48 ... 50% of ferrite inclusions (Table 1). This situation became the basis for us to put forward the idea of using an iron ball (dross) as a ferrite additive in the firing of cement clinker.

It is known that limestone and clay are used as raw materials for firing cement clinker. Iron oxide III (Fe_2O_3), silicon oxide II (SiO2) and alumina (Al_2O_3) are important oxides in the production of clinker minerals.

The iron ball (dross) studied by us contains iron oxide III (Fe2O3) - 48.38%, silicon oxide II (SiO_2) - 6.02%, which is necessary for firing cement clinker. Silicon oxide II (SiO_2), contained in the scale, takes an active part in the formation of tricalcium silicate (alite)-$3CaO*SiO_2$ and dicalcium silicate (belite)-$2CaO*SiO_2$, the main clinker minerals. Iron oxide III (Fe_2O_3) is an important oxide in the formation of tetracalcium aluminoferrite (selite) - $4CaO*Al_2O_3*Fe_2O_3$. In addition, iron oxide III (Fe_2O_3) acts as an alloying agent during alite crystallization during clinker firing, which makes it possible to increase the activity of cements. It can be seen that the introduction of an iron ball (scale) rich in iron oxide III (Fe_2O_3) into the composition of the clinker increases the activity of cement, resistance to mineralized salts, and reduces the temperature of Portland cement. clinker.

The studies were carried out in the analytical control laboratory of the "Testing Laboratory and Technical Control Department" of JSC " "QIZILQUMSEMENT". Based on the results of the analysis, the following results were obtained.

Iron ball (dross) of the Tashkent Metallurgical Plant
chemical composition

Table 1

T/r	Name	Oxides included in the composition, weight including%					
		SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	ппп
1	TMZ the iron ash	6,02	there is an invisible trace	48.4	2.36	there is an invisible trace	0.92

Picture-1. External view of the iron ash (dross) of the Tashkent Metallurgical Plant

Chemical composition of dry powder flour prepared for cement clinker kilning at the plant

Table-2

t/p	Name	Chemical composition of dry powder flour prepared for cement clinker kilning at the plant							
		SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	KH	N	ппп
1	1-line	13.53	3.19	2.67	2.36	2.22	0.92	2.30	1.19
2	2-line	13.71	3.00	2.60	41.67	2.29	0.93	2.44	1.15
3	3-line	14.31	3.82	2.44	43.15	1.94	0.90	2.28	1.56

Rolled powder, often referred to as ordinary slag, is a sooty residue formed on the surface of burning rolled steel, and particles of various thicknesses, consisting of iron oxides of II and III valence - wustite, hematite and magnetite. In terms of chemical composition, the steel ball is close to pure magnetite (65-72% Fe), and in terms of granulometric composition, it is mainly represented by a fraction of less than 0.2 mm. The amount of iron ball (dross) obtained by rolling steel sheets is on average 1-3% of the mass of steel.

In the process of rolling steel plates, sheets and profiles from annealed ingots under pressure, sooty scale is formed on the outer surface. The iron ball is composed of iron oxides and has a blue-black, brown powder structure, scale particle size is less than 1 mm, initially firmly adheres to the steel surface and protects it from atmospheric corrosion.

While the sensor shell is intact, it is an anti-corrosion coating, but when the metal is deformed during subsequent processing, transportation or storage, the scale layer cracks and partially collapses. Since the oxide always has a positive electrode potential relative to the parent metal, they are a galvanic couple, and when moisture enters the crack, contact corrosion begins at a rate several times higher than normal atmospheric corrosion.[1]

CONCLUSION

The most important direction in the development of the cement industry is the introduction of resource- and energy-saving technologies. One of the most common ways to reduce the temperature and increase the firing of cement clinker is to activate the process of formation of clinker minerals due to mineralizers. As such a mineralizer, many suggest using oxides of ferrite and emery. The use of mineralizers in the clinker firing process makes it possible to increase the reactivity of the cement-raw mixture, which improves the formation of minerals that make up the clinker, primarily dicalcium and tricalcium silicates.

Mineralizers - regardless of the phase state of the raw material, included in the amount of 1-3% by weight of the aggregate, not included in the final composition of the synthesized substance, but only by their presence in the composition, physically or chemically affect and activate the cooking process," said pants. The reasons for the activation of the clinker firing process with mineralizers are as follows: the formation of a solution at a lower temperature than at the traditional clinker firing temperature; support the formation of intermediates; deformation of the crystal lattices of the constituent components.

Reducing the energy intensity of cement production is one of the problems that attracts the constant attention of researchers and practitioners. The most energy-intensive process in the production of Portland cement is the firing of clinker. The optimization of energy consumption by improving this process is the basis for various studies exploring the possibility of firing clinker at temperatures well below 1400 °C.

Based on our research, it was proposed to use an iron ball (scale), which is a waste of the Tashkent Metallurgical Plant, as a mineralizer, as an idea to reduce the firing temperature of cement clinker. For this purpose, the use of an iron ball (viburnum) as a mineralizer widely used in our country changes the mineralogical composition of the clinker and leads to an increase in the content of tricalcium silicate. Such additives increase the activity of Portland cement clinker and reduce the temperature of clinker formation by 100-150°C. Of great scientific and practical importance is the fact that research can significantly reduce the temperature of clinker firing at the present time.

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