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Eco-Cement Based on Glass Powder and Its Role in Reduc-Ing Electrical Energy, Thermal Energy in Cement Plants and Ecological, Environmental Protection.

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Eco-cement based on glass powder and its role in reducing electrical energy, thermal energy in cement plants and ecological, environmental protection.

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Abstract. The Cement is the most useful material in civil engineering, this material goes through several stages to be usable in bags, crushers and operational factory machines requiring a significant range of electrical energy. For the manufacture of clinker, it requires a very high temperature. Some countries use gas for the kilns, others use coal and some countries use electricity to heat the kilns. So, the factories produce a significant amount of heat (thermal energy). At the same time the emission of hot gases the majority of its gases is CO_2. The raw material of clinker is limestone so there are additional costs to transport it to the factories and at the same time a degradation of nature. researchers show that it is easy and possible to replace 30% of cements with glass powder (eco-cement based on glass powder), so we can invest in this powder to reduce the energy declared in this text. Who wants say 30% of total global energy and the necessary goal of this research. on the other hand, ecological and environmental protection.

Keywords: electrical energy, thermal energy, glass powder, CO_2, environmental protection.

1 Introduction

Cement is the most useful material in civil construction, engineering works, hydraulic works, maritime works or hydraulic works such as reservoirs and dams. And in some countries cement is used for the construction of infrastructure such as roads, highways and airstrips. Given that cement is very wide in its use, the order automatically increases and the production of cement will increase. But at the same time the production of cement causes several inconveniences in the field of energy, ecological system, pollution in the environment. First of all, it is better to see the impact of cement on human health. Nitrogen dioxide (NO2) released by cement factory gases seriously affects human and animal health and causes respiratory illnesses [1]. Another research shows that the different types of cancers affecting cement factory workers and masons came from the daily breathing of cement dust [2]. VESTBO states that in an experimental study, it found that the concentration of fine cement particles in the area is 5 mg/m^3 [3]. From an ecological and environmental point of view, there are several literatures which state that cement affects the natural life cycle of plants and animals. D'AUCLAIR studies

the influence of contaminating dust on the leaves of plants and trees which occupies the operation of spruce photosynthesis [4]. Auclair experimentally show that dust seriously eliminates photosynthesis by a factor of 5 compared to natural photosynthesis [5]. Scientific research shows that animals are affected by diseases such as dog allergies due to cement as launched on the dog mag website [6]. In second place we consider the electrical and thermal energies of cement factories as well as the emission of carbon dioxide CO_2. Jean-Pierre Pillard says in an energy diagnosis report for a cement plant that 25846 MJ of the thermal quantity released from the plant and 842 KWH for a ton of cement [7]. The cement info page gives important statistics on the emission of carbon dioxide CO2. First of all, we recall that the clinker contains (80% limestone and 20% clay), the decarbonation operation is noted as following: $CaCO_3$ (calcium carbonate) → CaO (calcium oxide) + CO_2.the same page gives an example from France that the manufacture of a tone of cement generates 600 kg of CO_2 [8]. Following this information, we logically deduce that there is a danger to the atmosphere and also to nature because the need for limestone and clay.

2 Eco-cement based on glass powder

Recently a broad forecast to replace cements with resistant substances because engineers are looking for the lowest cost and resistant structures among its tips the recycling of glass since the material richest in silicas. According to an experimental study by (Jichao Zhu and al) on a concrete based on glass powder, it is noted that the mechanical characteristics of the concrete will be greatly improved over the long term and there is the possibility of going up to a volume fraction of 30% [9]. The strengths and the modulus of elasticity of concrete are improved by the addition of glass powder but in this study the limitation stops at 25% of replacement of cement by glass powder [10]. In an aggressive environment, good concrete has a volume fraction of 10% of glass powder which replaces cement according to experiments established by (Ibrahim Almeshal et al) [11]. Zine el-Abidine Kameche is proven by experience in the construction materials laboratory that in the case of a mortar the replacement of cement is possible up to 20% [12]. Other studies show that we can go up to 40% or 50% of the glass powder with the presence of calcium carbonate to replace the cement provided that the crushing of the concrete is done after 360 days [13]. For a high-performance concrete, researchers conclude that the young dynamic module of B.H.P gives good results by the volume fraction of 30%, this working group uses experience in the laboratory by ultrasound then makes a digital assumption by ANSYS, the experimental and numerical results are almost identical [14]. Iraqi group work finds that the porosity and absorption of thermostat waste powder decrease with increasing percentage of glass, where porosity decreases from 63.38% to 28.74% and absorptions from 46.88% to 16.78%. Density, compression and hardness increased with increasing percentage of glass, where density increased from 1.351 to 1.712 g/cm^3[15].

3 Reduction of heat released by cement factories

From the previous title (N°2: Eco-cement based on glass powder), we conclude that we can go up to 30%, 40% even sometimes 50% of the glass powder. In this context we will estimate the conservation of electrical energy by a mean of 25%. the example studied is the cement factory cans in [7] the results in table 1.

Table 1. table present the reduction of heat released by cement factories.

Process	Maxmum capacity (ton/day) [7]	Heat Consumption (Mega-joule/ton) [7]	maximum Heat Consumption (Megajoule/ton) [Day]	New maximum Heat Consumption (Mega-joule/ton) /[Day]	The value of the thermal energy difference (Megajoule/ton) /[Day]	The value of the thermal energy difference (Megajoule) /[year]
Wet way	3000	6400	19200000	14400000	4800000	1732800000
Semi-dry route	2320	3900	9048000	6786000	2262000	816582000
Dry route	3270	4530	14813100	11109825	3703275	1336882275
preheater furnaces without pre-calciner	3800	3836	14576800	10932600	3644200	1315556200
Dry route AT (air through) preheater pre-calciner kilns	2740	3750	10275000	7706250	2568750	927318750
Dry route AS preheater pre-calciner kilns (separated air)	7600	3430	26068000	19551000	6517000	2352637000
The total value of the thermal energy difference (Mega-joule) / [year]						8481776225

Comment 1: replacing cement with glass powder gives a significant value which is equal to ***8481776225*** (Mega-joule)/ [year] of the total value of the thermal energy difference. So, this operation can reduce the heating of climates and minimize 30% of the gases released by cement factories. We note how we can invest the heat for other uses such as the transformation into electrical energy or the heating of water (like a heater) for towns or villages closer to cement factories. At the same time a 30% reduction in toxic gases and CO_2. in addition, we gain 30% of limestone and clay for future generations, and also a Tri protection (Atmospheric - Ecological - Environmental), on the other hand the absorption of glass waste and reusable in the field of cement

manufacturing. It is preferable to also look for other additions to minimize the destruction of the planet by looking for other additions that are effective and give good results.

4 Reduction of electrical energy

In this area, we will calculate the electrical energy before and after the use of glass powder by a fraction of 25%. View result in table 2.

Table 2. table present the reduction of electrical energy released by cement factories.

Process	Maximum capacity (ton/day) [7]	Electricity consumption (kWh/ton) [7]	Electricity consumption (kWh/ton) [Day]	New maximum Electricity consumption (KWH/ton) [Day]	The value of the electricity energy difference (KWH) /[Day]	The value of the electricity energy difference (KWH) /[year])
Wet way	3000	120	120	90	19199910	6931167510
Semi-dry route	2320	106	106	79.5	9047920.5	3266299301
Dry route	3270	135	135	101.25	14812998.8	5347492549
preheater furnaces without pre-calciner	3800	110	110	82.5	14576717.5	5262195018
Dry route AT (air through) preheater precalciner kilns	2740	110	110	82.5	10274917.5	3709245218
Dry route AS preheater precalciner kilns (separated air)	7600	110	110	82.5	26067917.5	9410518218
The total value of the electrical energy difference (KWH)/[year]						33926917812

Comment 1: the method of replacing glass powder with a large percentage of glass we gain more electrical energy. and we can invest this energy in sectors other than industry or the agricultural sector for pumps or for supplying towns and villages. Our proposal enriches the energy sector and the conservation of electrical energy. ***33926917812 (KWH)/[year]*** a very important figure and an energy and economic benefit at the same time. This benefit opens an important path for researchers to try to find other ways to gain electrical energy and benefit at the same time from additional electrical energy for water treatment machines or sewage treatment or desalination plants as the world is in a climate change crisis. the country's economy will be better because there is the export

of electricity to the country which no longer has the resources to produce electrical energy.

5 Conclusion

At the end of this work, we note that the replacement of cement with 25% of micro glass particles or glass powder has the aim of:

1) Enrich the cement manufacturing sector with a new technique.
2) gains a very significant quantity of electrical energy which will be transformed into other sectors.
3) Reduce global warming because a range of heat will be reduced which has a positive influence on the climate because we are experiencing very disrupted climate change
4) Keep a significant amount of limestone and clay deposits for future generations.
5) The disease rate will decrease because the emissions of particles into the area will be better than before.
6) Cover atmospheric pollution because the reduction in gases released especially CO_2.
7) Absorb a significant quantity of glass waste for reuse as cement replacement.
8) the literature shows that concrete based on eco-cements provides strength and durability performance.
9) Eco-cement can also be used as a coating or mortar in civil construction.
10) This research opens the way for other research in the field of eco-cement in order to conserve energy, protect the environment and the ecological system.
11) The use of waste in the manufacture of cement or in other areas of civil engineering minimizes waste and creates a clean environment with an economic benefit
12) eco-cements are an important necessity in today's times because of the danger that threatens human health, especially dermatological diseases and respiratory system diseases.
13) Electric energy plays a very important role for the legislation of factories and also for the sale also to non-productive paid electricity.
14) For factories located very far from the deposits, means of transport such as trucks or trains were needed to bring the necessary materials (limestone + clay). This glass powder process creates a very significant impact on the economy of factories and reduces the risk of truck accidents and road hazards for factories that use trucks as a means of transport.
15) The various sciences are linked, civil engineering, energy engineering, industrial engineering, mechanical engineering and electrical engineering so each science helps the other for a single reason (We only have one planet).

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