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Geographical Characteristics Affecting the Kufa and Najaf Cement Factory and Their Impact on Air and Soil Pollution

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ABSTRACT

The cement industry is one of the most important and widespread industries among other industries due to its industrial and developmental importance in the country in general, and in Najaf province in particular. These industries have recently taken with them many toxic environmental pollutants affecting all natural components of the environment, including air, water, and the soil. The study showed that the Kufa and Najaf cement factories use black oil, which is considered the worst type of fuel because of its high sulfur content because it is cheap, and a by-product produced from fuel refineries, and because it contains high calories, and the raw materials used are limestone and soil.It is clear from the study that the stages of cement production are the preparation of raw materials, and it requires the removal of limestone rocks, bringing clay soils, preparing the required proportions of two materials, lime rocks and clay soils between (60-65%) and (20-25%) of clay soils, preparing the mixture of raw materials, burning the raw mixture and cooling it Then the clinker is ground and the cement is packed. The study showed that the Kufa and Najaf cement factories throw to the environment solid particles that are precipitated dust and the damaged mixtures that are thrown behind the Kufa cement factory and it is considered the main pollutant of the soil. Raw material, kiln operation, clinker cooling, grinding, circulation and packaging of products and in various cement formations, especially the stage of grinding materials in the dry method and in the clinker forming kiln. As for the liquid wastes, the two factories do not throw these wastes. As for the industrial water, it is reused in the cooling operations.

Introduction

The cement industry is one of the important industries in Iraq due to its direct relationship to the development process and the fact that its material (cement) is one of the basics on which industrial, agricultural, service and urban development projects are based. The General Company for Southern Cement includes Kufa, Karbala, Sedat Al-Hindiya, Umm Qasr, Al-Muthanna, Al-Janoub, and the General Company for Iraqi Cement, which includes Fallujah, Al-Qaim, Kubaisa, Al-Tamim cement factories. (clinker) resulting from kilns in addition to combustion gases, so it became necessary to use methods and techniques to sediment and capture these particles and ensure that they do not leak into the atmosphere. As for the materials that are used in the production of the cement industry, they are limestone, a source of calcium oxide, and sand is a source of silica or dioxide Silicon, dirt or clay is a source of silica, aluminum, gypsum and iron dust. The pollutants resulting from the rotary kiln are considered the most quantitative pollutants compared to other production processes. As for the gaseous pollutants resulting from the combustion of the fuel itself, it has a bad effect, especially since most cement factories in Iraq use black oil as fuel. Which is the worst type of fuel due to its high sulfur content, and the water used in the workshops for washing trucks used for loading, cleaning mud tanks and washing raw materials is another source of pollution, but it has little effect. As for pollution in this water, it is

the degree of acidity, a high concentration of suspended and dissolved solids, Potassium, sulfates, and environmental pollution resulting from industrial processes is considered one of the most dangerous types of pollution and has the most impact on humans, animals and plants, as various factories in the world emit millions of tons annually of human-produced pollutants.

Material and method

The research problem:

1-Are the wastes resulting from the Kufa and Najaf cement factories harmful to the environment?

2-Do the gaseous pollutants of the Kufa and Najaf cement plants affect the environment?

The research hypothesis:

1-There are wastes resulting from the Kufa and Najaf cement factories, represented by (liquid, solid and gaseous wastes)

2-There are environmental effects resulting from air pollution resulting from the Kufa and Najaf cement factories in the study area.

Third, the research objective:

The study aims to reveal the reality of the Kufa and Najaf cement factories, and to show the wastes from them, with an indication of the most important environmental impacts resulting from them, and the proposed solutions to reduce the effects of the two factories.

Fourth, the boundaries of the study area:

The boundaries of the study area are represented by the administrative borders of Najaf Governorate, its districts and districts, as the governorate occupies the southwestern part of the Republic of Iraq and extends between longitudes (42.50 - 45.44) to the east and between two latitudes (29.50 -21), 32 ° (North) forming a shape as close as possible to a rectangle.

The province is bounded from the north by the provinces of Babil and Karbala, from the south and southwest by the borders of Iraq with the Kingdom of Saudi Arabia, and from the east by the provinces of Al-Qadisiyah and Al-Muthanna, while from the west by the province of Anbar. The actual field of study is determined in the region with industrial activity in the province of Najaf/Kufa district

As for the temporal field, it is determined by a study of the Kufa and Najaf cement factories for the year 20 . As for the subject area, it is determined by studying the wastes from the two factories, and studying the environmental impacts resulting from the wastes from the two factories.

Fifth, the structure of the study.

The research was divided into five topics:

First - the normal situation of the study area.

Second - the current reality of the Kufa and Najaf cement factories.

Third - the wastes thrown out by the two laboratories.

1-Solid waste.

2-Gaseous waste.

3-Liquid waste.

The research concluded with a summary and a list of sources.

First, the normal situation of the study area:

1-Surface:

Al-Najaf Governorate is one of the governorates of the Middle Euphrates - located in the southwest of Iraq. Its area reaches (28824) km 2 and constitutes 6.6% of the area of Iraq amounting to (438317) km 2. The governorate consists of three districts (Najaf, Kufa, Munathira) and (10) sub-districts. of two parts. (1)

1- The eastern section (the sedimentary plain / its area reaches 1300 km and is equal to 5% of the governorate's area and about 1.4% of the sedimentary plain's area of 39,000 km. It consists of areas of shoulders, basins, marshes and swamps, and it descends from north to south from 20 to 15 m. Agriculture is concentrated in the areas of shoulders, basins and marshes surrounding in the past.

2- The western section / the western plateau / reaches an area of (27524) km and constitutes 95% of the governorate's area, gradually descending from the southeast (50 m) towards the northeast (450 m) and is divided into the lower valleys and the stone area. It helps to transport waste from the two factories from one place to another, and this affects the pollution of the environment.

Results

Table (1): Monthly averages of climate elements in Najaf Governorate for the period (1988_2018)

Duststorms / storm	***Precipitation mm***	***wind speed ((m / s***	***Average temperature***	***Month***
0.3	14,4	1.3	10.7	***January***
0.2	15,1	1.8	13.3	***February***
0.8	13,3	2.1	17.7	***March***
1.1	14,1	2.3	24.3	***April***
0.6	4,8	2.6	30.1	***Mays***
0.4	0	3	34.1	***June***
0.03	0	3.1	36.9	***July***
0.01	0	2.5	35.1	***dad***
0.02	0	1.8	32.3	***September***
0.02	4,8	1.5	26.1	***October 1***
0.02	16,1	1.3	17.9	***October 2***
0.02	19,4	1.2	12.6	***Canon 1***
–	-	2.5	24.2	***annual rate***
4,3	106,4	-	-	**the total**

Source: The Ministry of Transport and Communications and the General Authority for Meteorology and Seismic Monitoring in Iraq, Department of Water Resources, unpublished data, 2020

Table (2) Components of dust discarded from the Kufa cement plant.

Elements Concentration Percentage µg/m2	Elements
12.48	SiO_2
4.60	Al_2O_3
5.40	Fe_2O_3
3.13	MgO
37.57	CaO
8.31	SO3
28.51	***Loss by heat (l-o-i) 1***
100%	***Dust Density***
3.8g/L	**The weight of the flying dust is**

Source: The analyzes were conducted in the chemical laboratory of the new Kufa Cement Factory 9/29/2022

Discussion

The climate has a direct effect on the environment of Najaf governorate and has an impact on the movement or transmission of wastes thrown out from the Kufa and Najaf cement factories. The most prominent climatic characteristics of the study area and their impact on the Kufa and Najaf cement factories will be presented.

A- Temperatures: Table (1) shows that the general average temperature in the study area is (2, 24) C, the highest in July, reaching an average of (9, 36) C, and the lowest in January, where it reaches (10.7) C5, as the high temperature during the summer affects the workers in the two factories, especially within the ovens area, where the high temperature resulting from combustion is added to the air temperature during the summer, which affects the workers in the two factories on the one hand, and the high temperature also affects the solid waste thrown behind the two factories As it works to increase its evaporation, which makes it easy to transport by wind.

B- Winds: Table (1) shows that the average annual wind speed in the governorate reached (5, 2) m/s. We also find that the wind speed is active during the hot months (June, July) at rates (3_3.1) m/s. And the speed is less than these rates in the cold months, reaching the lowest in November and December to (3, 1-2, 1) m / s. Low pressure over the Arabian Gulf and southern Iraq. The winds in the study area have a significant influence, as the winds in the province of Najaf are characterized by the dominance of the northwest winds. These types of winds are characterized by their dryness during the hot season, their increase in speed, and their high temperature, especially at noon during the months (June-July-August), and they raise dust, but during the winter season These winds are cold, dry, and dusty. These northwestern winds, during the months (June, July, August), transport the solid waste of the workers from their collection places to other areas. The wind also contributes to the transportation of damaged waste represented by damaged bags of cement to other places.

Secondly, the wastes disposed by the two laboratories:

The waste thrown out of the Kufa and Najaf cement factories is limited to gaseous waste and solid waste, and there is no liquid waste. As for the gaseous waste, it is limited to cement dust, which is of the type of dust.

1-Solid Waste:

They are solid particles and particles resulting from the various stages of production processes (explosive-transportation-cracking-grinding-burning-cooling-packing), as all these processes are carried out through softening and transporting materials, which leads to the emission of gas, in

addition to the amount of dust that It is released from the chimneys of cement factories, especially when the percentage of carbon monoxide gas in the furnace is high, as the electric filters separate as a result, which leads to the release of dust and gases into the surrounding atmosphere. There are also quantities of dust that are disposed of in many cement factories in what is known as (by-pass secondary dust) the cause of the composition of the raw materials used or the quality of the fuel and it has bad environmental effects for these dusts, and these dusts are fortunately not present in our factories due to the lack of alkaline materials in the composition of the materials Natural Primary(1)

Solid waste is a result of the activities and activities carried out by the person during his daily life. As for the solid waste of the workers, which is the settling dust and damaged scraps, it is thrown behind the Kufa Cement Factory, at a distance of 2 km via Najaf-Manathira, with an area of (4) km. The sedimentary dust is the main pollutant of the soil, and therefore the soils close to the factories suffer from the risk of pollution, and the percentage of pollution varies in these lands, see picture (1)

Pictures (1) Solid waste from the Kufa Cement Factory

Source: The photo was taken on 2/12/2022

2-Gaseous waste: 2222 O2

Gases are produced from blasting operations in quarries, most of them from fuel combustion in kilns. In the cement industry, liquid fuel (fuel oil or fuel) and natural gas are used. In some European companies, solid fuel (coal) is used.

Among the most important gases resulting from the combustion of these types of fuel:

CO_2 carbon dioxide gas

SO_2 sulfur dioxide gas

Nitrogen oxides

carbon monoxide co.(1)

Cement dust:

The escalation of cement dust from chimneys is considered the biggest factor polluting the air, which causes a lot of chest diseases for the residents of these areas and for the workers present in and around the factory. Cement plants, which have diameters from 20 to 100 microns, also include particles with diameters smaller than 10 microns, denoted by the symbol (pm10). Dry and in the kiln forming clinker. (2) See picture (2)

Photo (2) The gaseous waste from the Kufa Cement Factory

Source: Photo taken on 12/2/2022.

(0.3 gm) of dust is produced during the production stages of (1) ton of cement according to European standards. The amount of particles carried with the gases emitted from cement factory secretions is within (10-20%) of the amount of kiln cash and the permissible concentrations are (50-150 mg/m^3).) of the particles emitted from the chimneys, but the light quantities emitted from dust are greater than the theoretical concentrations, and this follows from poor production process, poor storage, wasted quantities of cement, and low efficiency of precipitators (1)

It appears from Table (2) that the components of the dust discarded from the two factories are of different oxides. These oxides are calculated on the basis of the concentration ratio of micrograms / m^2. It appears from the table that the percentage of silicon dioxide is 12.48 micrograms / m^2, the percentage of aluminum trioxide is 4.60 micrograms / m^2, and the percentage of trioxide is 4.60 micrograms / m^2. Iron 5.40 µg/m^2, magnesium oxide 3.13 µg/m^2, calcium oxide 37.57 µg/m^2, and sulfur trioxide 8.31 µg/m^2. That the total dust density is 100%, and the weight of flying dust is 3.8 m / liter. These small particles of dust rising from chimneys are considered the largest factor polluting the air, which causes many diseases to the residents of these areas and to the workers in and around the factory, and these particles of dust The volatile quickly settles on the soil and interacts with other elements present in the soil, causing pollution.

It is clear from the study that what comes out of the chimneys of the Kufa and Najaf cement factories is dust and grit. Dust: It is solid spherical particles ranging in diameter between (1-100) micron. It may be spherical, lamellar, flakes, or fibrous (fibers) spongy containing gases. As for grit: they are bodies of irregular shape and size. From (100-1000) microns and may be in the form of spongy or fibrous or lamellar, so the appropriate method of isolation of particles from the air depends on the characteristics of these particles such as their distribution.

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