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STUDY THE POSITION OF TEST POINTS IN CEMENT PRODUCTION

RAID TARIK AL-KHATEEB

Department of Chemical Engineering, College of Engineering, University of Al-Muthanna,

Al-Muthanna, Iraqi

ABSTRACT

This search including the studying of location and important points of testing and inspection in AL Muthanna cement plant through chemical test for chemical oxides (SiO_2, Fe_2O_3, Al_2O_3, SO_3, MgO, CaO) that have been taken from these points during the process of cement production depending on the technical route of the plant. After comparing between the results of chemical testing for this point we find there ismis coincidence between the test result of stone quarry (S_1) with stone crusher(S_3) and raw materials mill (S_4) with storage and homogenization materials silo (S_5). So the furnace (S_7) with clinker storage (S_8) that technical route has been developed contain afew testing points for decreasing the time and materials testing necessary.

KEYWORDS: Chemical Oxides, Technical Route, Test Points

INTRODUCTION

Cement is the first building material and image of construction progress in the modern age and a symbol of the evolution of science be harnessed in the service human uses [1]. Cement is a constructional binder material hardens in the presence of water, characterized by high mechanical strength and great potential force, and had features of high consolidation and rigidity force. Cement used in the construction of bridges and dams and the manufacture of pipes and concrete columns [2].

In Iraq cement industry started and expanded on the basis of calcareous deposits Know the geology of the Euphrates lime, and its deposits in most cases flux generated located to the west of the Euphrates river and along the river, These sediments extend in depth to the north of the country and Less deeper towards the south where the shallow and non flux generated in Al Samawah and site by Al Muthanna cement plant. There are two methods for making cement the first is Dry method, the other is Wet method, and they are different in the ratio of water to the other substances the used [3]. The dry process avoid the use of slurry material and as a result is far less energy intensive [4]

RAW MATERIALS

The raw material basis in cement industry and ease provided consistently ensures the continuity of the flow of the production without faltering. Essential raw materials in cement industry are available in Iraq widely available than needed in the long-term, these materials are:

- **Limestone**

Limestone is the primary raw material in cement industry for all types (Ordinary, White and Resistant) and enter in the industry by up to 70% of the total raw material, So raw materials must be provided in very large quantities without neglecting avoid any deviation in quality in terms of the components of this material must be located within the limits laid

down by the Iraqi standards specification [5]. Limestone that used in Al Muthanna cement plant is Al Samawa limestone and is one of Lime Euphrates, which is characterized as containing few impurities and the percentage of clay materials give putty product of high viscosity, So use a high proportion of water to reduce the viscosity and this in turn leads to an increase in the spent fuel burn this paste into the rotary kiln.

- **Soil and Clays**

This raw material comes second place in terms of quantity in the cement industry, with percentage ranging from (1/3 – 1/4) from the total raw materials, Because of the relative homogeneity of material in nature and the absence of large variation in the contents that affect in the cement industry, the process of exploration and investigation of Mud's sites are not characterized by hardship and efforts such as those in the large limestone quarries. Clay consists of due to erosion alkali and alkali dust container ammonium silicate, according to chemical analyzes, the mud is composed of specific percentages of the following chemical compounds (SiO_2, Fe_2O_3, Al_2O_3, SO_3, MgO, CaO).

- **Admixtures for Correction**

Difficult to identify the chemical compounds required in a mixture of raw materials once mixing stone and mud so it is necessary to add relatively small amounts of materials are denominated in the correct, these ingredients should not contain harmful compounds such as magnesium and potassium oxides of added goal is to modify the chemical compounds to a mixture of raw materials and improve energy flocculation, example; quartz sand is added to increase the proportion of silica (SiO_2), In addition ore iron pyrite to increase the ferric oxide and bauxite to alumina increase[5].

CEMENT PRODUCTION

Attend the raw mix of various types of cement mixing four key raw materials and the mix ratios vary for different types of cement, in the ordinary cement production, for example, the proportion of limestone in the mix (68%) and Percentage of clay (32%), In the production of cement, stainless salts percentage of limestone (72%) and Percentage of clay (19%), and be added to mix percentage of (6%) of the sand and (3%) of Iron oxide.

Raw mix is prepared and it broke down limestone in rotary crusher then milled in the hammer mill, as well as washing clay material to separate impurities and storing them in the form of soup. After that blends Van proportions define installing each and control laboratory, then grinding the mixture into Mills pipe and that the fall of the steel balls when turnover mill continuous transforms the mixture into positions fall into powder increased accuracy with continuing precipitation and circulation. End milling to being soup to basin nutrition or to the storage silos, after that constantly sends soup to feed tub rotary kiln, which is shaken by air from time to time to prevent a recession or conglomerate soup. Inside the oven is burning soup with varying thermal approaching of (1400^oC) where there are physical and chemical changes it, the oven is a steel cylinder line by thermal brick To prevent leakage of heat to the outside in order to prevent the erosion of the cylinder and the damage quickly. Bricks that line the cylinder when the flow of material eroded and burning their transformations in a row to take off at certain intervals brick oven and re-apply new brick.

Diameter of rotary kiln ranges between (8-16) feet and be tilted slightly up (4%) and revolves around rpm and then burning material which slowly while output and increases melting surfaces minutes materials and then fit together and cohere in the form of balls that are what is known as clinker which cools quickly certain to prevent the occurrence of crystallization in article. Consumed in the burning one ton of dry cement in the way nearly 160 kg of oil.

The Test Points

The identification of examination and inspection points through the stages of production of cement, one of the most important factors that help to get the Cement production match with Iraqi specifications and has the ability to meet the practical requirements, Therefore it was necessary to determine these points in a scientific manner and give a special code for each point distinguishes it from other points.

In Al Muthannacement plant there are many test points of examination and inspection distributed in different places during the stages of production, as shown in the table (1).

Table 1: Location and Code of Main Testing Points

Location of Activity	Code Testing and Inspection Points
Stone quarry	S_1
Soil quarry	S_2
Stone crusher	S_3
Raw material mill	S_4
Storage and homogenization materials	S_5
Iron	S_6
Furnace	S_7
Clincker arena	S_8
Grinding arena	S_9
Packing arena	S_{10}

CHEMICAL TESTS

Using chemical analysis methods include classic Gravimetric and volumetric to obtain set of the following chemical compounds [5], [6].

- **Silicon Dioxide (SiO_2)**

Appointed by weight by adding ammonium chloride to form and mix well, then add all of hydrochloric acid and nitric acid. Vaporizes the solution to the pre-drought and after fully degradable cement block nominate silica and washed several times then filtered and the filtrate aside saves, Taken the filter paper with sediment and placed in a platinum weighted vine and burn in a thermal oven temperature (1100-1200 ° C) For an hour then vine graduated from the oven and weighed after being cooled.

- **Aluminum Oxide (Al_2O_3)**

Ammonium hydroxide is added to the filtrate silica precipitates aluminum in the form of hydroxide, which is filtering sediment and burned and then weighed in the form of oxide.

- **Iron Oxide (Fe_2O_3)**

Appointed separately down sample Iron to ferrous using stannous chloride then titrated with a standard solution of potassium dichromate Dai using (Redox) Guide or barium Dai-methyl Amine. Had ratios of iron oxide and then put the rate from the previous step to set the ratio of aluminum oxide (Al_2O_3).

- **Calcium Oxide (CaO)**

Appoints adding ammonium oxalates to the filtrate in step aluminum oxide where calcium is deposited and

nominates shape oxalates then re-melted again titrated with potassium permanganate and burette reading taken with the coefficient of oxalates.

- **Magnesium Oxide (MgO)**

Taken filtrate backward from deposition of calcium and has added ammonium phosphate (dibasic) [$(NH_4)_2$ HPO] and ammonium hydroxide. Magnesium in the form of precipitates magnesium phosphate, nominates sludge and burn and then weighed in the form of ($Mg_2P_2O_7$) and then calculates the equivalent of magnesium oxide.

- **Sulfur Trioxide (SO_3)**

Sulfates precipitate by adding barium chloride after melting of the acid solution cement. Filtered and burn in the form of barium Sulfates ($BaSO_4$) and percentage of (SO_3) calculated equivalent him. Figure 1 illustrate the point locations of testing and inspection engineering helps to quickly identified have been included within the technological route of AL Muthanna cement plant which designed by (KHD Humboldt wedag company)

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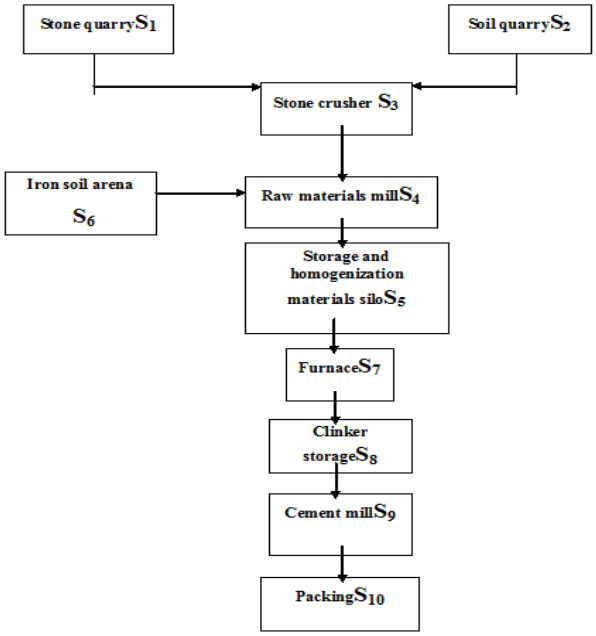

Figure 1: Test Point in Technical Route of Al Muthanna Cement Plant

RESULTS AND DISCUSSIONS

A general idea of chemical composition of cement types can be obtained from different figures, which give the oxide composition limits of Portland cements. Figure 2 is a summarized form of various test results. Iraqi standard specify [6] and American standard specification [7] amounts of Silicon Dioxide in Portland cement within the range 18-24%. It is apparent that the all cement types are within specified limit. It was found that the concentration of SiO_2 in all test points was with Iraqi standards specifications and American standard specification limits. It has been observed that all amount of this oxides in test points (S_1, S_4 andS_7) is compatible with (S_3, S_5 andS_8) respectively.

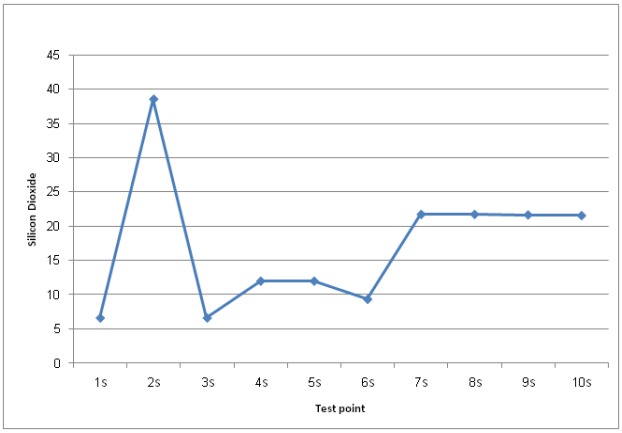

Figure 2: Concentration of Silicon Dioxide in Different Test Point

As well as the Aluminum Oxide concentration values for all types of cement Iraqi within specification limits of Iraqi standards, It was found that the concentration of Al_2O_3 in test point (S_1) is the same in test point (S_3). Also the concentrations in test points (S_4, S_7) is compatible with (S_5, S_8) respectively as shown in Figure 4.

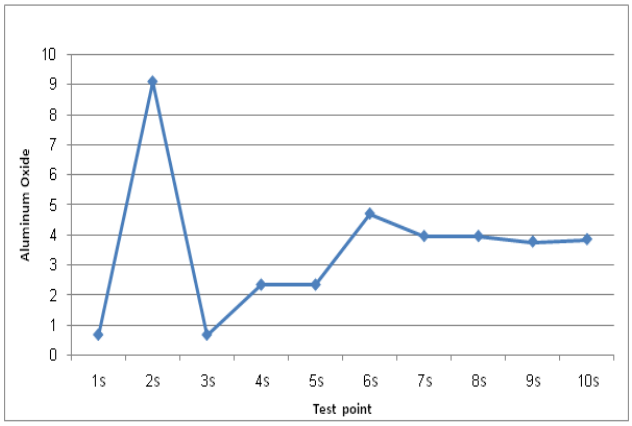

Figure 3: Concentration of Aluminum Oxide in Different Test point

The content Iron Oxide, Calcium Oxide and Magnesium Oxide were found within the specified range of Iraqi standards specify and American standard specification. It has been observed that all amount of these oxides in test points (S_1, S_4 andS_7) is compatible with (S_3, S_5 andS_8) respectively as shown in Figures (4, 5 & 6)

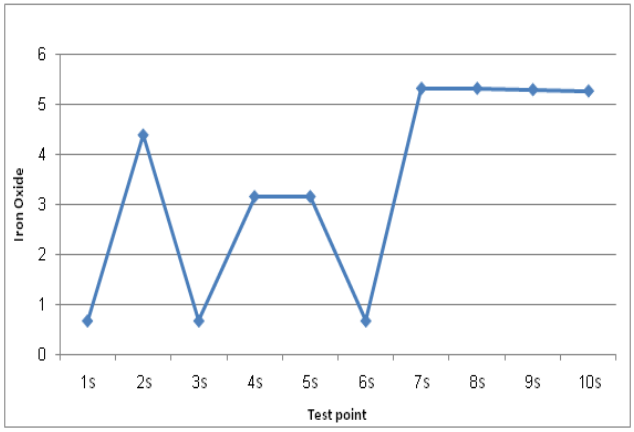

Figure 4: Concentration of Iron Oxide in Different Test Point

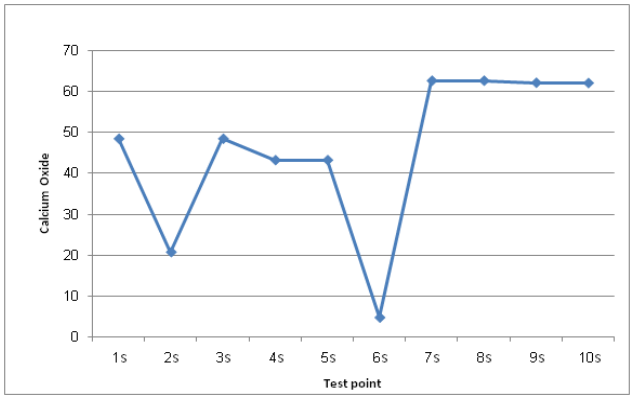

Figure 5: Concentration of Calcium Oxide in Different Test Point

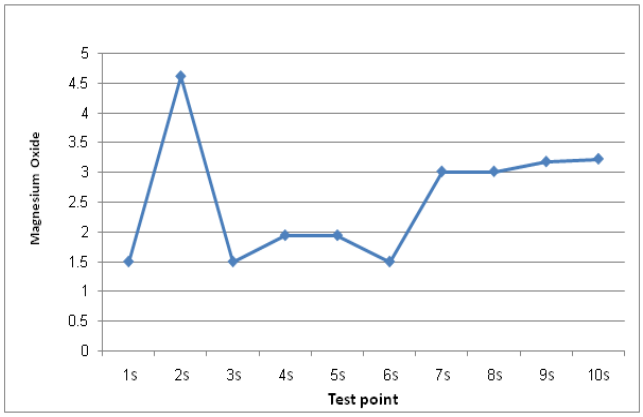

Figure 6: Concentration of Magnesium Oxide in Different Test Point

Figure 7 shows the amount of Sulfur Trioxidein different test points. It was noted that the concentration of SO_3 in all these points are within specified limits of the Iraqi and American standard specification. It was found that the concentration of SO_3 in test point (S_1) is the same in test point (S_3). This concentrations in test points (S_4, S_7) is compatible with (S_5, S_8) respectively.

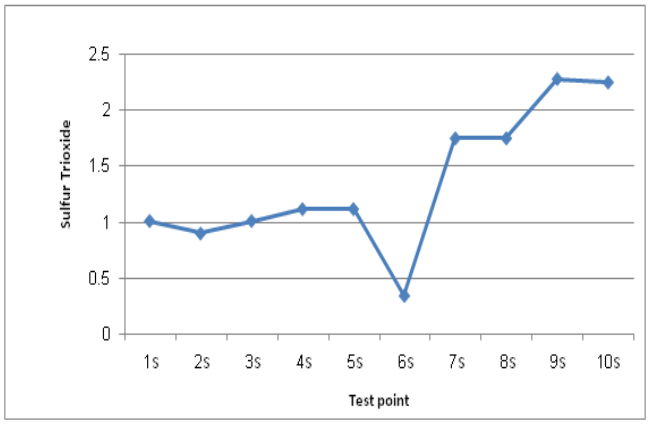

Figure 7: Concentration of Sulfur Trioxidein Different Test Point

The chemical tests shows that the concentration of all chemical oxides in test points (S_1, S_3&S_7) are compatibility with (S_3, S5 andS_8) respectively. Accordingly, it is suggested that number of test point to be reduced to about seven testes. In other words, testes number (S1, S5, S7) can be neglected.

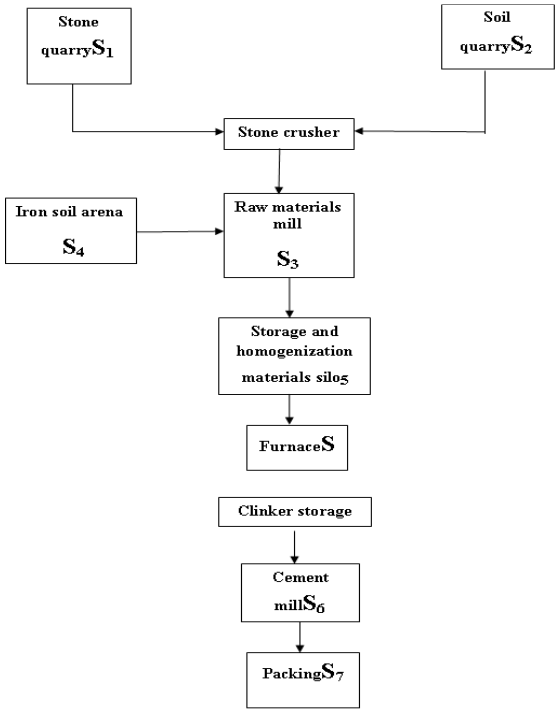

Figure 8: The Suggest Test Point in Technical Route of Al Muthanna Cement Plant

CONCLUSIONS

The chemical test has shown that the chemical oxides (SiO_2, Fe_2O_3, Al_2O_3, SO_3, MgO, CaO) in all test point compatibility for Iraqi standards specifications limits. New technical was suggest which has few test point to decreasing time and the chemical tests needed in cement production.

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