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Measure And Compare The Chemical And Physical Properties For Cement In The Laboratory Of Najaf And Kufa

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ABSTRACT

The cement industry depend on the availability of raw materials - limestone and clay .It contain different ratios of CaO, Fe_2O_3, Al_2O_3, SiO_2 and impurities like P_2O_5, MgO, SO_3 ,chlorides, alkalis etc. Present study deals with the measurement of physical and chemical properties of the cement produced in the Kufa and Najaf cement factories. We determined the measurement of elements and compounds ratios in cement before and after the manufacturing, % Water , Res180, Res90, LSF, L.O.I, etc., in our quality control laboratories.

Keywords: Cement Industry, Measurement of physico- chemical properties, comparison.

INTRODUCTION

Cement industry is classified among the heavy industries and hazardous, worried many international environmental systems of health and environmental risks resulting from air pollution, especially when their presence near residential areas [1]. The following abbreviations means: L C = CaO, L A = Al_2O_3, LG S = SiO_2 and El F = Fe_2O_3.

MATERIALS AND METHODS

Equipment and materials: Limestone (calcium and magnesium carbonate), clay (Alcaalin), Windmill, Almkasr, dizziness burning oven, X-ray machine, computer automation.

The mode of action: Brought raw materials (limestone and clay) from the quarries to the mills for grinding and mixing to form a paste which is analyzed putty abroad at intervals equal (every hour) and based on the results of the analysis is adjusted ratios of raw materials entering the mills every hour so that the putty overseas mills to Almkasr (Mixers) homogeneous in accordance with the required chemical specifications and included important factors account for this mixture , namely: Hydraulic laboratories, Hydraulic Modulus***1-*** (H.M) CaO/SiO2 + Al2O3 + Fe2O3 = 1.7-2.3. The laboratory hydraulic cement is good if H.M is almost = 2 .When it is less than 1.7, the power of cement is least and if increased from 2.3 to high has least stability. Volumetric Cement output has to increase, use the good proportion of lime free CaO, which enhances its interaction with water to a substantial increase in volume and high temperature.

Lime Saturation Factor (L.S.F) =100(CaO - 0.7SO_3)/2.8SiO2 +1.2Al_2O_3 +0.65Fe_2O_3 = (85-95)% .

SilicaModulus-*(*S.M) =SiO_2/ Al_2O3+ Fe_2O_3= 2.2-2.6**.**

Alumina Modulus-*(A.M*) = Al_2O_3 / Fe_2O_3 = 1.5- 2.5.

Overseas mills to Almkasr be paid to the rotary furnaces for burning as the Putty survival time in the oven and temperature have a significant impact on the composition and properties of clinker output based upon the properties of cement required to produce it. After burning the raw materials in the rotary kiln and clinker formation within the specifications laboratory cooled at a temperature of 120-1100 C and add a suitable amount of gypsum , milled and packed in cement bags weighing 50 kg.

Physical properties of raw materials and manufactured half (Clinker) and cement: Tests were conducted in the quality control laboratory. Means the percentage of the amount of water added to the soil in the bang and to stone in putty mills in addition to soil moisture and the stone itself. The aim of the examination putty moisture to ensure the production of toothpaste conformity with the specifications required in the two cement plants of Kufa, Najaf and acceptance criteria are less than 38%[2].

Smoothness cement (Blain*2*): To ensure quality control on cement producer in terms of smoothness and within the approved standard specifications of the pilot manual issued by the Central Agency for Standardization and Quality Control apply these instructions in a production laboratory to ensure smoothness examination of the product and cement per hour. It must be baleen or softness of cement between 4500 and 2800 cm 2 g-1 [3].

Measure Feed Fineness (sieve 90 - 180-): To ensure the production of toothpaste identical to the required specifications and within the specifications issued by the standard Cement laboratory, Kufa and Najaf, applied the instructions of production, which includes examined smoothness putty product per hour and include. The selections must be remaining on the sieve 90 not more than 10% and 180 sieve not more than 5% and less acceptance criteria less than 11% on the sieve 90 and less than 5% on 180 sieve [4,5].

Examine the strength to cement cubes: Admission intended to calibrate the strength of cement to the age of (3 days) and not less compressive force carrying about(150 kg cm 2 -1) for the molds and the age of (7 days) and not less compressive force carrying about(230 kg cm 2 -1) templates.

Persistence or examine the longitudinal extensibility (Auto Clave): The aim of the work templates safety check (consistency longitudinal) is to examine the safety autoclaving Cement product or packaged [3] and applies these instructions on the cement product and packaged to reach the best quality. And acceptance criteria for the ratios examination are upto 0.8 upto a maximum 3. Intended to firmly cement resistance to the volumetric increase that occurs faithful after intransigence and which result in increased damage to the mortar or concrete. For this reason, determines the amount of gypsum standard specifications to be added to the clinker [6].

Measuring the standard strength of cement paste (FS, IS): Determine the amount of water needed to get a record on the strength of cement paste used in the tests to determine the time required for the cohesion of the primary and final examination of safety (stability) is used for this purpose device (RMU) Italian origin to calculate the time of the final primary and cohesion. And there is mold, which consists of a cylindrical portion inner diameter (80.0 +_ 0.1) mm, outer diameter (89.0_ + 0.1) mm height (40.0_+ 0.5) mm based on a non- force board enamels with a light layer of oil. And be accepted standards primary sclerosis time not less than 60 minutes and the final solidification time no more than 10 hours. And

absorbs moisture cement Almtmiih the dough from the periphery because of possession of the property to the presence of water absorption without microscopic pores. Based real water content in the dough on the ocean moisture [6].

The study of the chemical properties of raw materials and manufactured half (Clinker) and cement.

% Net Carbonate: Intended to calcium and magnesium carbonate in the raw materials and product putty and putty nutritious furnaces where these instructions applied in the laboratory of production , which includes the total set carbonates paste product per hour , given the results to the Department of putty mills and basic conditions and requirements are:

a- calibration of the acid and the base if necessary.

b- timer to 3 minutes of the examination and to be cautious when dealing with chemicals and selections work by Altarki (Target) required .

And within the accepted standards must be ratios Less than Altarki (Target) required b 0.3 and higher of Altarki required 0.3. The chemical composition of the paste outside of the mills and applied in the laboratory of Najaf and Kufa represented by Alcarbonat the (% $CaCO_3$) between (72.0-72.5%).

Coefficient of saturation limestone or the so-called saturation coefficient limestone(L.S.F): A proportion of lime or oxides of calcium to oxides of silicon , aluminum and iron in order to find out the amount of lime used in cement production because the greater the amount of lime for the allowable limits caused the formation of clinker early and reduced the temperature during the burning which affects the completion of the process of interaction and the European Union for the silica and aluminum , which need for high temperature melting and serious interaction [6] . The proportion of saturated limestone and applied in the laboratory of Najaf and Kufa in the range 95-85 %.

Coefficient of silica (Silica factor): The proportion of silica (% SiO_2) and applied in the laboratory of Najaf and Kufa Cement normal resistor between (2.2 to 7.2 %) as the increase in the proportion of silica lead to difficulty milling has been found to increase by 1 % reduces the production of the mill , equivalent to 30%.

Alumina plants (Alumina factor): The proportion of alumina (Al_2O_3%)) and applied in the laboratory of Najaf and Kufa Cement familiarity (2-0.9%) In cement resistor (0.7-0.85%).

Sulphate factor (Proportion of sulfates): The proportion of sulfates (% SO_3) and applied in the laboratory of Najaf and Kufa, up to a maximum of (6%) dry method and wet method (1%).

Percentage R2O3%: Increase the proportion of R_2O_3 (Al_2O_3+ Fe_2O_3) lead to ease in milling has been found to increase by 1% in the clinker mill production increases by 10%.

Proportion of magnesia MgO%: Should be the proportion of magnesia in limestone up to a maximum of 2% increase in the dirt for not more than 6%.

Examination burning loss (Loss on ignition L.O.I.): Refers to the percentage of the amount of materials that lose their burning temperature 500-900^{0}C which include moisture (water), CO_2 and part of sulfates. Chemical reactions that occur for raw materials (calcium and magnesium carbonate, clay and water) into the rotary kiln are:

1. Evaporation of free water (Evaporation of free water at 100^{0}C)
2. Loss of water of crystallization of Article clay (kaolin) at 500-600^{0}C

$$Al_2O_3.\,2SiO_2.\,2H_2O \xrightarrow{500\text{-}600C^0} Al_2O_3.\,2SiO_2 + 2H_2O$$

3. Biodegradable magnesium carbonate at 600-700 0 C.

MgCO3 in the cement clinker and must not exceed 5%.

$$MgCO_3 \xrightarrow{600\text{-}700C^o} MgO + CO_2$$

4. Decomposition of calcium carbonate at 800-9000 C.

$$CaCO_3 \xrightarrow{800\text{-}900C^o} CaO + CO_2$$

5. reacts lime free (CaO) resulting from the decomposition of calcium carbonate with clay and silica free component of a compound (C12A7) at 900 0 C then turns at 110^0 0 C to (C3A) and higher than 1100-1200 ^{0}C complete configuration (C2S & C4AF & C2A) and then begins the liquid composition at approximately 1260^0C and then begins compound (C3S) configuration until 1450^0C have been completed to configure. The aim of the use of this test to find Cement identical to the required specifications [7] in terms of loss examination burning. These regulations apply in the chemical laboratory for examination molecule cement and clinker and raw materials where the LOI should not exceed 4%.

Inspection of material insoluble: Insoluble residue is that part of the model cement is soluble in hydrochloric acid HCl and arise from the silica is reactive to form compounds cement dissolved in the acid so the residue is dissolved express how complete the chemical reactions inside the oven [8]. Proportion of waste material non-dissolved in cement must that not more than 1.5%.

RESULTS AND DISCUSSION

The physical properties of the cement is more important than the chemical properties [9]. By studying the percentage of moisture for both laboratory putty Cement Kufa and Najaf, which is illustrated in figure 1, shows the variation confused between Almuammliyn of the ratios where the plant uses Kufa more ratios from Najaf Laboratory and which have an effect on the properties of cement product.

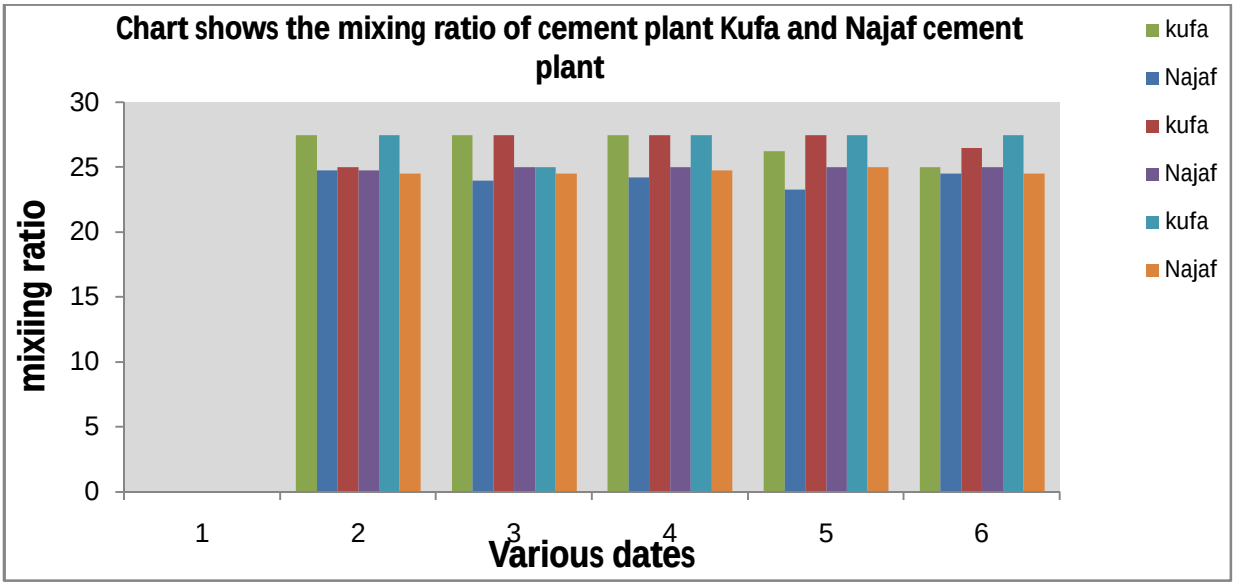

Figure 1. Shows the mixing ratio both Almuammliyn of Kufa and Najaf

Smoothness cement (Blain): Smoothness of cement studied for both Almuammliyn which is illustrated in figure 2, rising significantly for cement plant Kufa, which have an impact on the level of performance of the cement in concrete terms affect the rate of hydration. Higher the softness greater the surface area

available for hydration which leads to getting on the strength of an early the largest and fastest generation of heat [6,10].

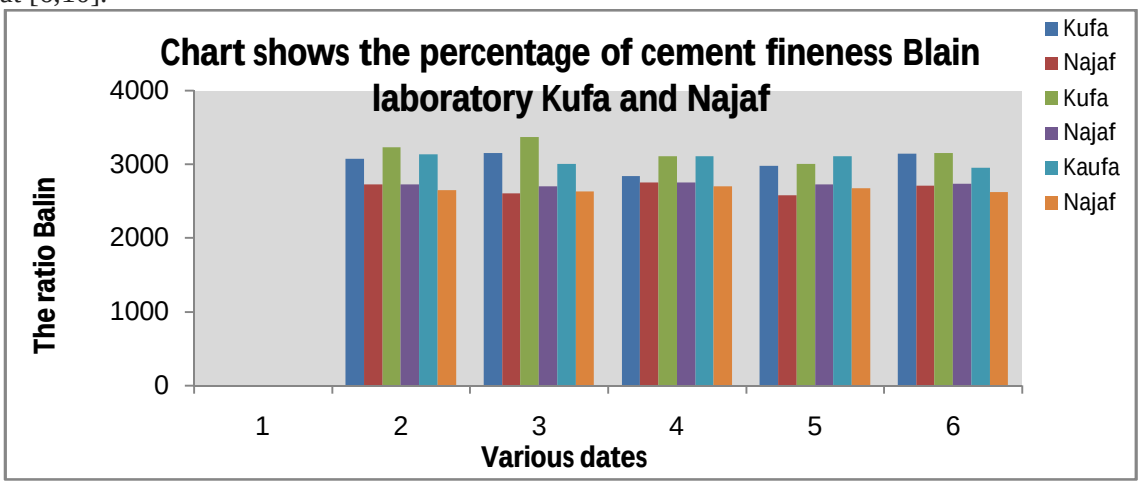

Figure 2. Shows the percentage of softer cement Blain to two cement plants of Kufa and Najaf

Putty smoothness measurement Feed Fineness (sieve 90 - 180): The study included measure smoothness putty sieve 90 - 180 and illustrated by figure 3 for two cement plants in Najaf and Kufa, as shown in figure high clear to Najaf Laboratory for Kufa.

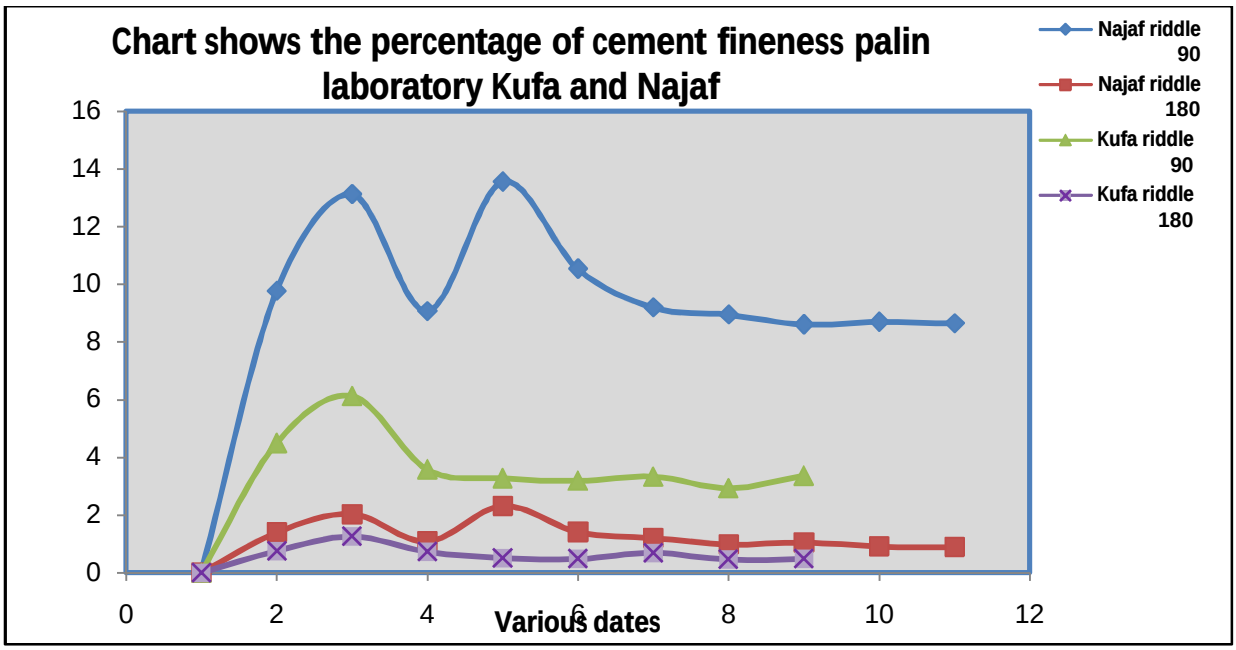

Figure 3. Shows own physical properties (sieve 90- 180) for laboratory Najaf and Kufa

Where it plays all of sleekness and installation of cement a major role in controlling the properties of concrete. Venauma cement is affecting every possibility or potential casting and interoperability as well as the water content Balkhaltp concrete as happens for the amount of cement used in the concrete. In this regard, we say that cement coarse tends to produce slurries Porosity be higher than those which are produced by most cement smoothness [2,11]. Examine the strength to cement cubes (Compressive

Strength) were screened power blocks of cement within 3 days and 7 days to Muammliyn as shown in figure 4, which shows that the ratios measured in the lab Kufa higher than the lab Najaf, which must not be less than the average compressive strength of three cubes of Mortar cement after 3 days (72 h) (183 kg cm2 -1) at least. The resistant to pressure after 7 days (168 - two hours) (275 kg cm2 -1) at least, must be greater than the compressive strength after 3 days [7].

Longitudinal stability or checking expansion(Auto Clave%): The measured examination stretch Cement for both Almuammliyn and illustrated by figure 5, which shows results of high cement plant Kufa, the results of the cement plant Najaf., Where shows this test method set constant volume of cement to measure the expansion and differences in the results because the templates used in your device for screening cases of different in terms of timeliness and that increase or decrease the distance between your template slot brat to measure the longitudinal stability.

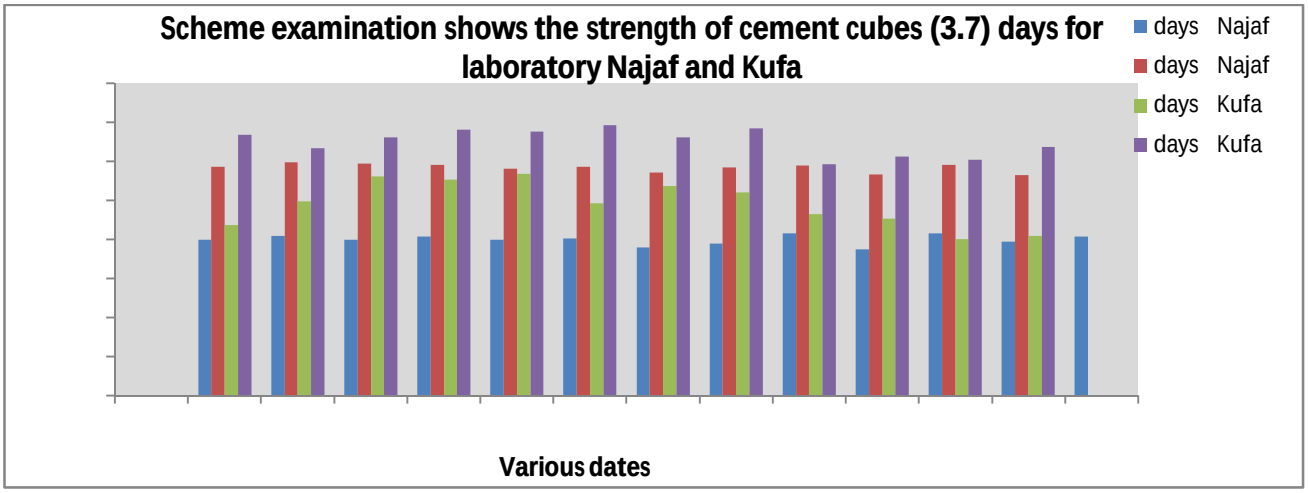

Figure 4. Shows the durability examination within (3 and 7) days for lab Najaf and Kufa Cement

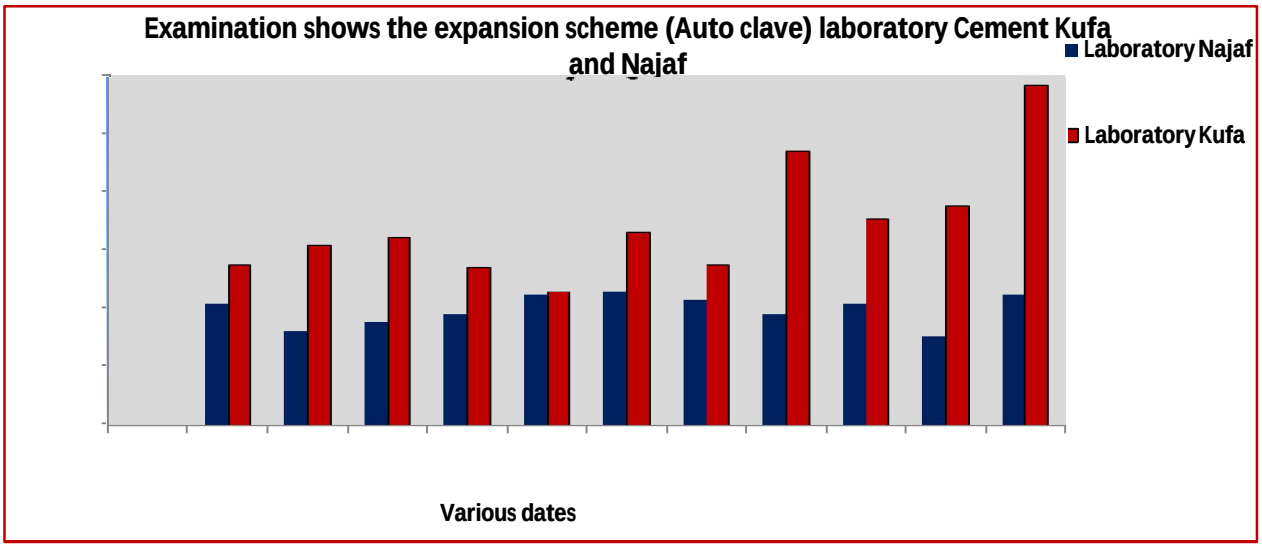

Figure 5. An examination of the expansion of both the laboratory

Standard for measuring the strength of cement paste (FS, IS): Textures were measured standard cement paste (FS, IS) for the laboratory which illustrated by figure 6, where the high notes of the

examination sclerosis primitive cement plant Najaf, while lower values sclerosis final and on the contrary, for the cement plant Kufa.

Chemical laboratory tests and X-ray lab in laboratory Cement Kufa and Najaf: It has been calculated the percentages of the elements included in the initial installation of cement and calculates (SiO_2, R_2O_3, MgO, SO_3) in the laboratory of cement, which is illustrated in figures 7 and 8. It was found that there is variation in the proportions of the elements, but relatively little variation.

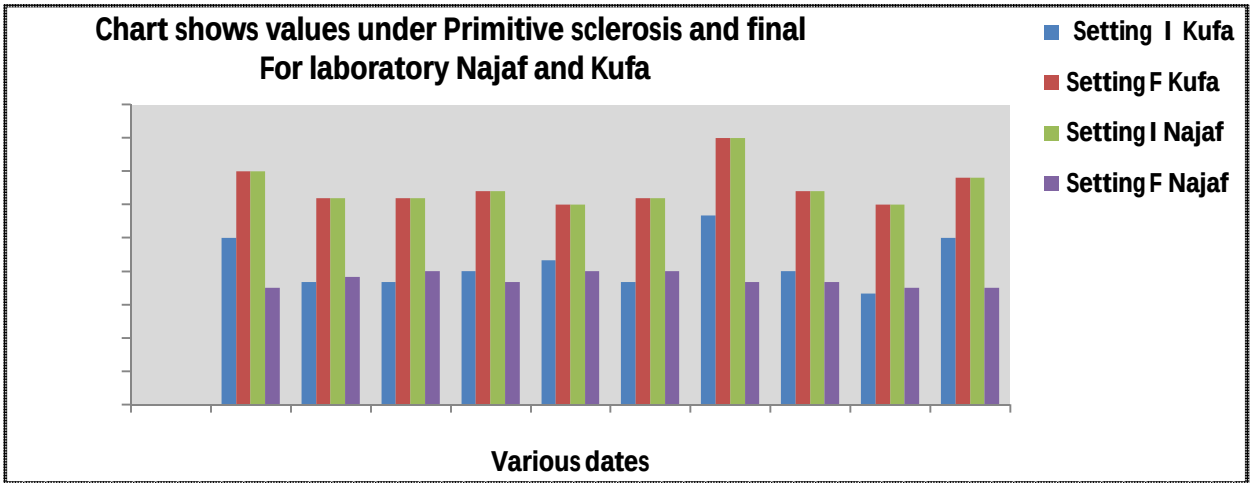

Figure 6. Shows the assay values sclerosis primitive and final (FS, IS) for laboratory cement

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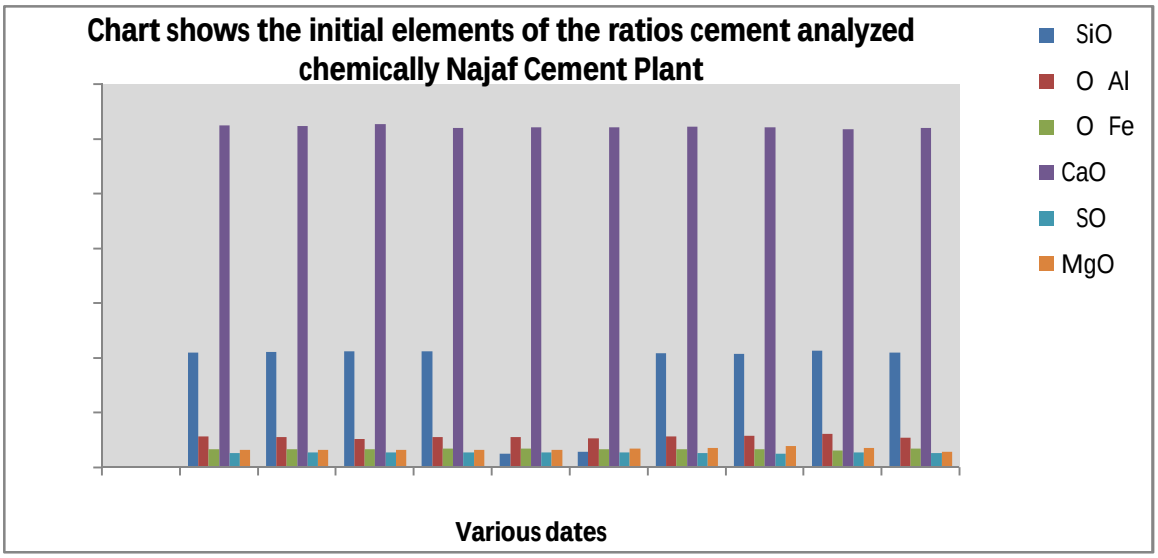

Figure 7. Ratios initial elements analyzed chemically to the cement plant Najaf

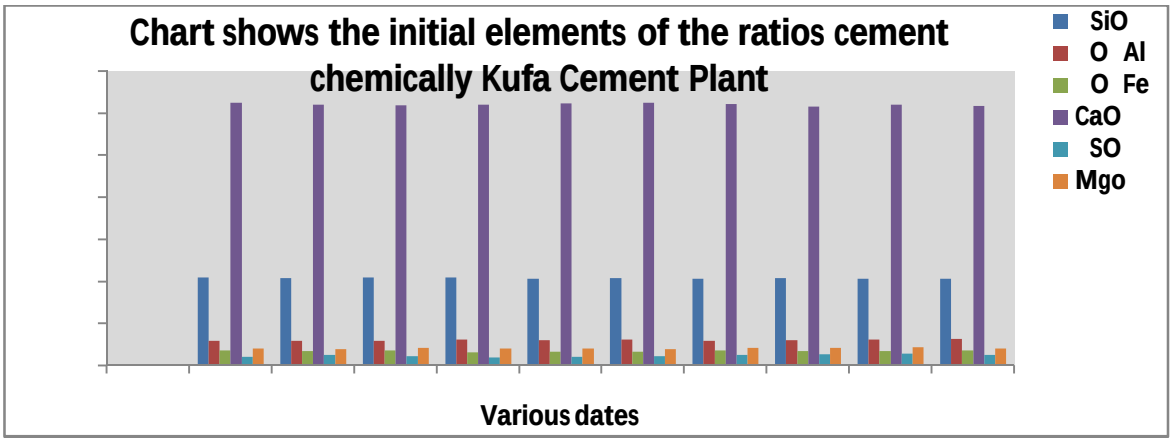

Figure 8. Attributed the initial elements analyzed chemically to Kufa Cement Plant

The study was the analysis of the initial elements embedded in the cement of the For laboratory and shown in figures (9 and 10) using X-ray .The cement plant Kufa uses elemental analysis preliminary using X-ray and manual analysis (laboratory) on an ongoing basis, and the comparison between the two analyzes. While at the cement plant Najaf depends manual analysis (laboratory) because the unit of analysis using Atomic Absorption in the lab there are holidays in the device.

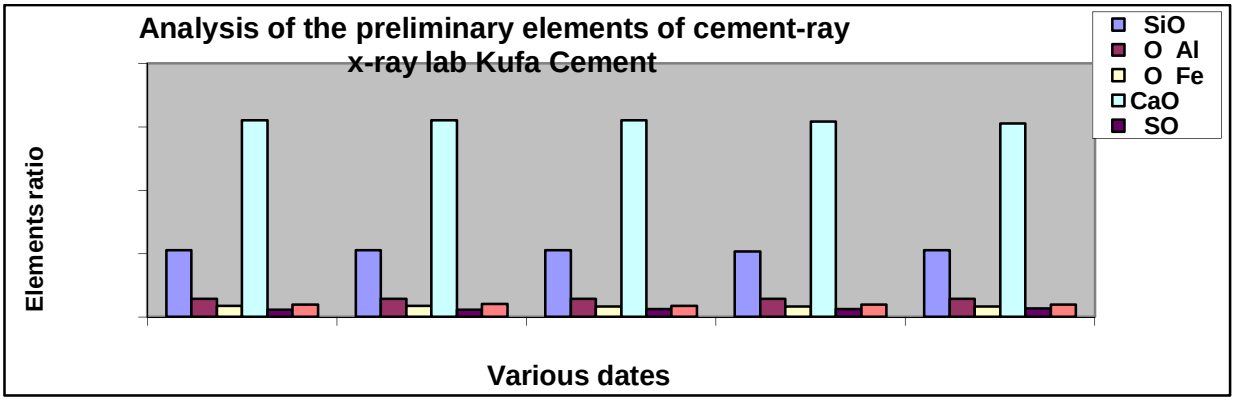

Figure 9. X- ray analysis of the primary elements of Kufa Cement Plant

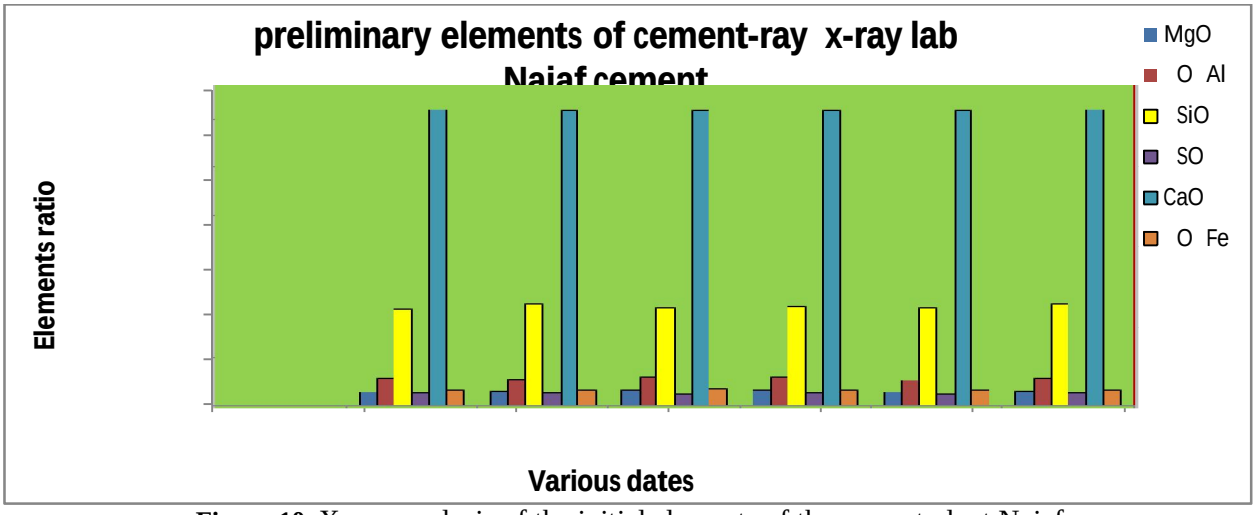

Figure 10. X- ray analysis of the initial elements of the cement plant Najaf

The study of burning loss coefficient (L.O.I) in laboratory illustrated in figure 11. It was observed in different laboratory, the percentage of irregular cement plant in Kufa and there is variation in the values which differ because of the different proportions of items lost by burning.

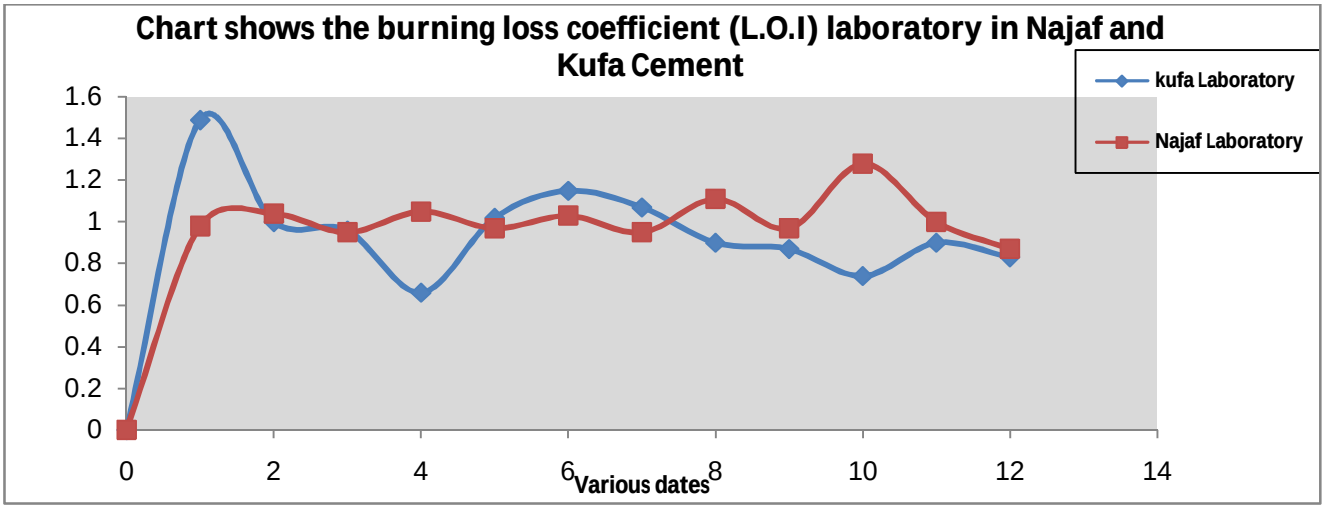

Figure 11. Shows the burning loss coefficient (LOI) to the laboratory

We were also studied and compared rates of limestone saturation coefficient for both laboratory and illustrated by figure 12, which explains the disparity between the measurements in the laboratory where the high note proportions of cement plant Najaf, Kufa plant ratios. All the measurements that are made for the labs is to study the efficiency of the cement producer in the province of Najaf, which identifies the results that were obtained during the current study, which vary according to the proportions of the elements and methods and the efficiency analysis in the laboratory as well as the mixing ratio, humidity and other factors during the stages of production of cement.

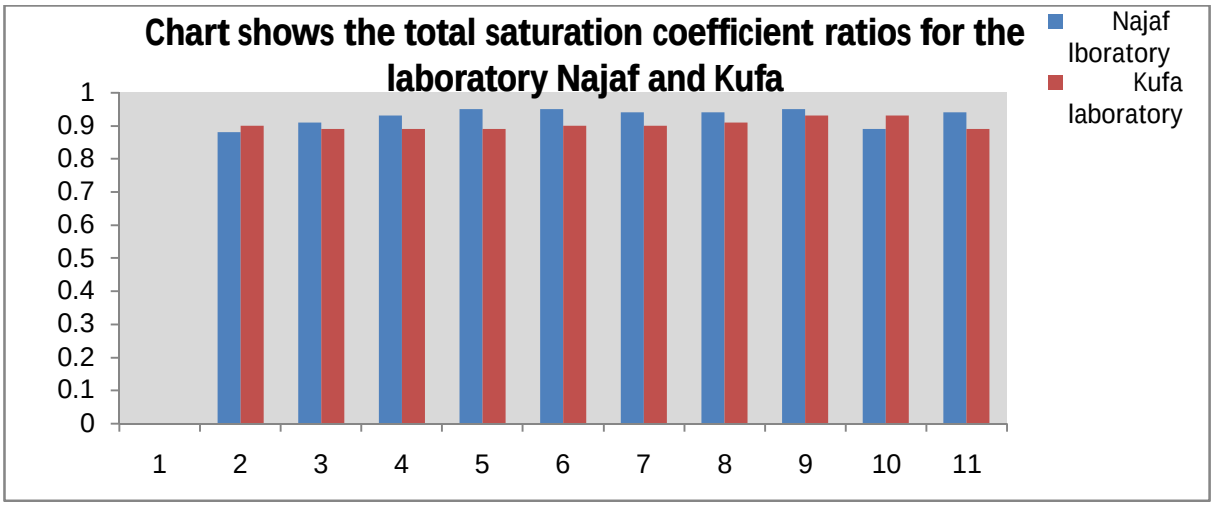

Figure 12. Shows the values of coefficient of saturation limestone for cement plant Kufa and Najaf cement plant.

The following table shows the illustrative each foregoing results of the comparison between the laboratory Cement Najaf and Kufa, and compared with the standard:

Standards	Cement Factory Kufa	Cement Factory Najaf	Type examination	s
%38	%26	%25	The moisture content of the paste	-1
(2800-4500)cm2/gm	2750 cm2/gm	3400 cm2/gm.	Smoothness cement)Blain(	-2
%10 sieve 90the the sieve %1 180	%6sieve 90the the sieve %1.5 180	%14 sieve 90the the sieve%2.5 180	Smoothness Putty (Feed Fineness)	-3
150Kg/cm2-3day, 230Kg/cm2-7day	>183Kg/cm2-3day,> 275Kg/cm2-7day	<183Kg/cm2-3day,<275Kg/cm 2-7day	Cement Strength	-4
0.8	0.75	0.3	Expansion)Auto clave(	-5
At Least IS 60 min FS No more than 10 h	IS Low FS High	IS High FS Low	FS,IS	-6
% (19-24)	% (2.2-2.7)	% (2.2-2.7)	SiO_2	-7
% (4-8)	% (0.9-2)	% (0.9-2)	Al_2O_3	-8
% (1.5-3.5)	%0.25	%0.25	Fe_2O_3	-9
% (55-65)	%63	%63	CaO	-10
Max %3	%0.15	%0.2	SO_3	-11
Max % 5	%0.3	%0.27	MgO	-12
Max %4	%1.5	%1.3	L.O.I	-13
% (85-95)	%90	%95	L.S.F	-14
Min %85	% (72-72.5)	% (72-72.5)	The proportion of the total al carbonate	-15
Max %1.5	----	----	Ins. Res	-16

APPLICATIONS

The current study has been applied in the province of Najaf in laboratory Cement Najaf and Kufa for the purpose of reaching a preferential production quality and quantity of cement for use in consumer projects for this article.

CONCLUSIONS

We concluded from the current study that the cement plant is the best of Kufa Cement plant Najaf study of some physical and chemical properties-ray analysis and x-ray of the learned ones for the purpose of expansion of production processes the best in Applied Life.

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