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Effects of Crude Oil on Workability and Compressive Strength of Concrete

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Abstract

The research aims to study the effect of adding crude oil on the workability and compressive strength of concrete, where it was noted that there are significant changes in the properties of concrete that were provided when varying percentages of crude oil were added.

In this study, different percentages of crude oil were used, constituting (0%, 1%, 2%, 2.5%, 3%, 4%, 5%, 6%, 10%, 15%, 20%, 25%) of The weight of the fine aggregate used in the concrete mixtures, where the results of the laboratory examination of the amount of slump as a measure of the workability of the concrete showed that there was a collapse of the concrete after fixing it in the test cone when adding percentages of crude oil more than 6%, which indicates that the addition of crude oil causes a delay in the cement reactions And water, and this indicates that its presence hinders the bonding between the components of concrete, and thus leads to the separation of these components from each other.

As for the results of the compressive strength test, the concrete cubes that were tested at the age of (7) days proved that the compressive strength decreases when adding percentages ranging from (1%) to (5%), then it starts to increase from (5%) to (10%) and then back. to decreasing again, which indicates an improvement in the compressive strength of concrete when adding a ratio of (10%) and a higher percentage of the compressive strength in the event that crude oil is not added to its components. The study also showed that there is an improvement in the compressive strength when adding percentages of crude oil ranging Between (6%) and (15%).

Keywords: Crude Oil, Workability, Compressive Strength.

تأثير النفط الخام على قابلية تشغيل ومقاومة الانضغاط للخرسانة

الخلاصة:

يهدف هذا البحث الى دراسة تأثير اضافة النفط الخام على قابلية تشغيل ومقاومة الانضغاط للخرسانة، حيث تم ملاحظة وجود تغييرات كبيرة في خصائص الخرسانة عند اضافة نسب متفاوتة من النفط الخام.

تم استخدام نسب متفاوتة للنفط الخام تشكل (0%، 1%، 2%، 2,5%، 3%، 4%، 5%، 6%، 10%، 15%، 20%، و 25%) من وزن الركام الناعم المستخدم في الخلطات الخرسانية، حيث أظهرت نتائج الفحص المختبري لمقدار الهبوط كمقياس لقابلية تشغيل الخرسانة ان هناك انهيار للخرسانة بعد تثبيتها في مخروط الفحص عند اضافة نسب من النفط الخام أكثر من

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6%، بحيث تشير الى ان اضافة النفط الخام يسبب تأخير في تفاعلات السمنت والماء، وهذا يدل على ان وجوده يعيق الربط بين مكونات الخرسانة، وبالتالي يؤدي الى فصل هذه المكونات عن بعضها البعض.
اما نتائج فحص مقاومة الانضغاط فقد أثبتت المكعبات الخرسانية التي تم فحصها بعمر(7) أيام ان مقاومة الانضغاط تتناقص عند اضافة نسب تتراوح من (1%) الى (5%) ثم تبدأ بالزيادة من (5%) الى (10%) ثم العودة الى التناقص مرة اخرى، وهو ما يشير الى تحسن في مقاومة انضغاط الخرسانة عند اضافة نسبة (10%) وبنسبة أعلى من مقاومة الانضغاط في حالة عدم اضافة النفط الخام لمكوناتها. وكذلك أظهرت الدراسة ان هناك تحسنا في مقاومة الانضغاط عند اضافة نسب من النفط الخام تتراوح بين (6%) و (15%).

Introduction:

Concrete is a combination of cement, (coarse and fine aggregates), and water that is unquestionably the most frequent material utilized in the building of civil engineering projects. The slurry (cement and water) binds the aggregates together to form a solid mass; the paste hardens due to hydration (for example, the chemical reaction of water and cement). It was a versatile building material that may be used for a variety of purposes. Several different elements, such as admixture and additives, may be used to vary the characteristics of the concrete so as to get the desired outcome, depending on the engineer's specifications [1] [2].

Crude oil is among the most essential sources of energy, and it has a significant impact on any country's economy. Oil leaks throughout oil extraction and production, though, are becoming a serious environmental issue globally. Throughout oil production, for instance, large volumes of oily effluent are produced, contaminating the neighboring sand [3]. Furthermore, crude oil pollution has a direct impact on sand erosion and water penetration, as well as the potential for ground fire [4]. Sand's physio-chemical qualities are also affected by crude oil pollution [5]. Sharma and Reddy [6] found that as the density of the fluid filling the gaps rises and the viscosity of the fluid decreases, the intrinsic permeability (k) of contaminated sand increases. Because the sand's permeability expanded as the crude oil's viscosity reduced, the crude oil spread quicker, affecting a broader area. Moreover, there was a greater risk of crude oil pollution reaching subsurface water. Ground water contamination by crude oil and other petroleum-based liquids has become a common concern, according to many investigations [7].

Several cleanup approaches were established to reduce the negative environmental consequences of crude oil pollution. However, the majority of existing remedial methods are ineffective [8]. Clean-up necessitates an understanding of the mechanical qualities of the polluted sand as well as the quantity of crude oil pollution in order to select the most cost-effective and efficient remediation approach. According to Eagle, et al. [9], soil washing is the lowest cleanup procedure in terms of capital cost, but it takes up to 23 months to complete. Cement encapsulation, soil

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stabilization, chemical oxidation, biological oxidation, and Vitrification are some of the other ways. These techniques are also time demanding and expensive. Once encapsulating with cement following lime stabilization, hazardous encapsulation seems not to be permanent, and after a period of time, leaching was detected. The use of alkali binders to encapsulate hazardous waste in the form of geopolymers concrete, mortar, and blocks is well reported and has a proven track record.

For the purpose of problem statement has led Increased production of oil like a form of energy and a main raw resource for industries has led in increased production, transport, and refining, resulting in significant environmental damage. Contamination happens once crude oil is released into the environment, either directly or indirectly, as a consequence of human activity, causing an unfavorable alteration that jeopardizes the safety and welfare of any living entity. Poor ship and terminal designs, mechanical failure, operating methods, human mistake, oil well blowouts, and transportation are the main sources of oil pollution across the globe [10].

The environment's sand becomes tainted with crude oil as a result of the incident. This polluted sand(added crude oil) is utilized to make concrete and create structures in the area, or it may be borrowed and utilized in other locations. The level of pollution (crude oil ratio) impacts the strength of sand-based concrete; the extent of these change could only be determined by testing. The fire resistant, surface resistivity, linear shrinkage, compacting factor, slump, durability, compressive strength, and flexural strength of concrete can all be influenced by crude oil pollution [11].

A number of academics are looking at using sand mixed with crude oil in cement and concrete manufacturing as an alternative and cost-effective solution. After that, the final product may be employed in a variety of technical applications [12]. The impact of crude oil on concrete compressive strength, 2.5% to 25% adding crude oil resulted in a loss of 18 % to 90 % compressive strength [13]. Oil solidification utilizing the direct immobilization approach [14] was used in another investigation to make cement mortar from oil-contaminated sand. Some research has been done to see whether using sand with crude oil in building is useful. Moreover, multiple studies [15–17] have looked at the impacts of various percentages of light crude oil pollution (0.5, 1, 2, 4, 6, 8, 10, and 20% by weight) on the mechanical characteristics and microstructure of produced concrete. These investigations found that at a contamination level of up to 6%, concrete with minor crude oil contamination may preserve the majority of its compressive and splitting

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tensile strength. Up to this amount of oil pollution, a satisfactory connection between the steel reinforcement and concrete may be formed.

The impacts of utilized motor oil on concrete characteristics and behavior are investigated by Hamad et al [18]. The impact of used motor oil on the characteristics of both hardened and fresh concretes have been studied. The results showed that used motor oil improved the fluidity and slump of the concretes mixture, as well as the air content of new concrete, acting as an air-entraining agent. The strength qualities of hardened concrete have not been affected as much by the addition of oil as they had been once a chemical based air-entraining additive was applied. They discovered that adding UEO to concrete mixture materials had no influence on the structural behaviour of reinforced elements, as the ultimate loading or loading displacement diagrams were not changed. Ayininuola [19] investigated the impact of bitumen and gas oil on the compressive strength of concrete in which sand was polluted with both gas oil and bitumen at various weight ratios. Oil-exposed concrete exhibits a decrease in compressive strength over time, according to Jassim and Jawad [20], with the maximum reduction in the strength magnitudes of high and normal concrete samples subjected to crude oil, gas oil, and white oil for 120 days being about 25.19 % and 12.86 %, respectively.

Authors in [13] evaluated the concrete's compressive strength utilizing fine aggregates polluted with crude oil at various percentages of the sand utilized in the combination. As the proportion of contaminant increased, the findings revealed a modest rise in concrete strength and an increased rate of loss. Abousnina et al. [17] discovered that when fine sand concrete has been polluted with light crude oil, the cohesiveness rose dramatically up to 1percent oil pollution and subsequently declined as the percentage of crude oil grew, but the frictional angle fell somewhat. The mortar with 1percent oil pollution had the maximum compressive strength, whereas mortar with 10percent oil pollution had just a 18percent drop in strength when compared to unpolluted specimens. According to [21], the existence of crude oil in concretes prevents the creation of bonds between component minerals, resulting in segregation. As a consequence, the existence of crude oil in concretes caused differences in the concrete's workability. The greater the crude oil content in the fine aggregates, the more workable it is. In addition, as compared to controlling cubes, polluted concrete cubes had lower compressive strengths. This clearly shown that crude oil seems to be a compressive strength inhibitor in concrete manufacturing. The lower the compressive strength attained, the greater the percentage of crude oil in the fine aggregates. The

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ideal crude oil pollution for achieving normal compressive strengths has been estimated to be as low as 0.3 percent.

In comparison to the controlling concrete's slump, Shafiq et al. [22] discovered that adding used motor oil raised concrete slump by 18% to 38%t and air amount by 26% to 58%. The oxygen permeability and porosity of concretes having utilized motor oil were decreased as well, and the compressive strength achieved was similar to that of the control sample. Shahrabadi1 and Vafaei [23] investigated the compressive strengths of typical normal weight concrete using kerosene-contaminated sands. In all exposure settings investigated, they discovered that 2percent kerosene polluted specimens had a loss in concrete compressive strength of up to 27%. Karkush MO, Kareem. ZA. [24] indicated that the effects of lubrication affect the soil particles and they slide against each other, thus causing weakness in the soil. Karkush MO ,AL-Taher T.A.A. & Zaboon A.T. [25] [26] indicated that the compressive coefficient and cohesion coefficient of contaminated soil samples increase with increasing concentration of petroleum hydrocarbons and There are significant impacts on the geotechnical and chemical properties of the soil. Karkush MO,Jihad AG [27] indicated that a kerosene concentration of less than 10% has a slight effect on the properties of soil samples. Karkush MO,Resol DA [28] .indicated The internal friction angle of contaminated soil samples decreased by 18% to 26% with the increase in the percentage of pollutant from 10% to 100%, and a decrease in the cohesion of soil samples by 7% to 33% with the increase in the percentage of pollutant.

The major goal of this work seems to be to investigate the changes in concrete properties caused by the addition of petroleum products to a concrete mix with predetermined ratios. Oil spills and leaks happen all the time, especially in facilities that deal with the storage, transportation, or processing of oil products. Contamination may arise in a number of ways, but the most important consideration when dealing with concrete in which crude oil or its products have been added to the fine aggregate used (apart from environmental concerns) is whether the building is still structurally sound. What happens to the concrete underneath these leaks or spills?

2. Experimental Works

2.1 Materials

2.1.1 Cement

Ordinary Portland Cement [29] has been employed in the study because it has the qualities to operate as a binder material in the occurrence of water.

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Table (1) Composition and Compounds of Cement

Chemical Composition	Percentage by Weight	Limit of (EN 197-1:2011)
Lime (CaO)	62.79	---
Silica (SiO_2)	20.58	---
Alumina (Al_2O_3)	5.6	---
Iron Oxide (Fe_2O_3)	3.28	---
Magnesia (MgO)	2.79	5% max
Sulfate (SO_3)	2.35	2.5 if C3A ≤5 2.8 if C3A >5
Chloride content	0.02	≤ 0.10 %
Loss on Ignition (L.O.I.)	1.94	5% max
Insoluble Residue (I.R.)	1.00	---
Lime Saturation Factor (L.S.F.)	0.9	---
Main Compounds (Bogue's Equation)		
Tricalcium Silicate (C_3S)	50.12	---
Dicalcium Silicate (C_2S)	21.26	---
Tricalcium Aluminate (C_3A)	9.29	---
Tetracalcium Aluminoferrite (C_4AF)	9.98	---

Table (2) Physical Krasta cement features

Physical Properties	Test Result	Limit of (EN 197-1:2011)
Specific Surface Area (Blaine Method) m^2/kg	314	
Initial Setting, (hr : min)	122	≥ 45 min
Final setting, (hr : min)	3:13	≤ 10 hrs
Soundness Using Autoclave Method	0.61	≤ 10 mm
Compressive Strength at:		
2 Days (N/mm2)	21.0	> 20
28 Days (N/mm2)	45.8	≤ 42.5

2.1.2 Water

For concreting, fresh drinkable water has been utilized; the water facilitated the cement hydration, resulting in the concrete setting and hardening.

2.1.3 Aggregates

The coarse material utilized was (5-19) mm [30]. Natural sand from al-ukhaidir, Iraq, has been used to be the fine aggregate. The fine and coarse aggregates were both air dried to achieve a

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saturated surface dry state in order to maintain the water/cement ratio. The standard for fine and coarse aggregates is BS 882 [31]. In this work, sieve analysis has been used to determine the particles sieve analysis of fine aggregates and the proportion of fine aggregates that passed the 600 ml sieve for concrete mixture, Figure (1) show the fine aggregate Distribution, and Figure (2) show the coarse aggregate distribution with grading limitations of zone 2. The aggregates sieve analyses have been carried out in line with Iraqi specification [32].

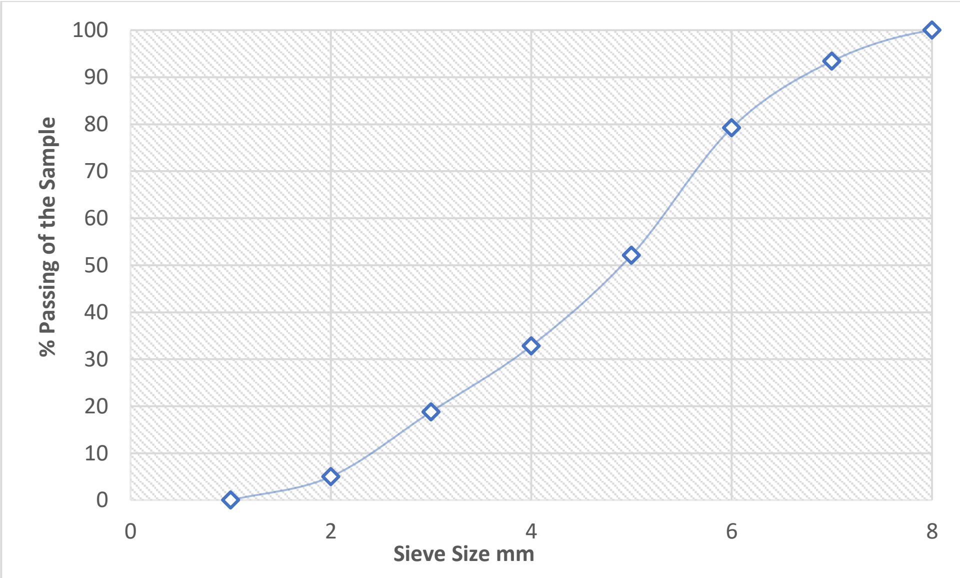

Fig. (1): Fine Aggregate Distribution.

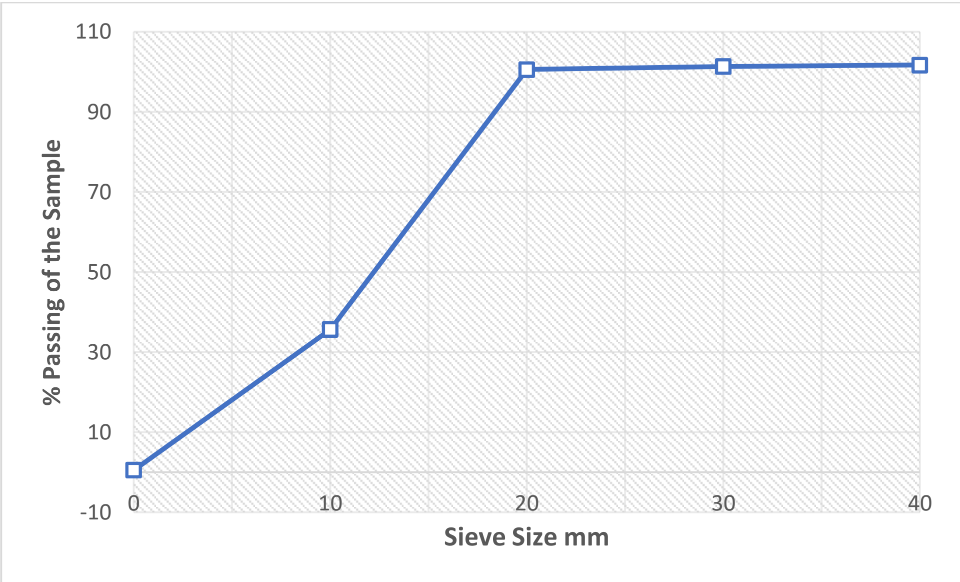

Fig. (2): Coarse Aggregate Distribution with grading limitations of zone 2

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2.1.4 Crude oil

Crude oil was utilized in the current study have been selected from Al-Dora Refinery and kept in air tight plastic containers to prevent losses and pollution. Table (3) demonstrated the feature of crude oil utilized.

Table (3) Feature of Al-Dora Crude oil

S/No	Parameters	Magnitude
1	Gravity Degree (API)	<35.00
2	Specific Gravity (15°C)	0.812
3	Sulphur Content (% by weight)	0.30
4	Nitrogin(ppm)	0.40
5	Wax Content (% by weight)	7.0
6	Carbon Residue (% by weight)	2.10
7	Melting point (°C)	57
8	Viscosity (21°C)	6.81
9	Acidity (Mg/KOH/g)	0.05

2.2 Preparation of Concrete Mixture

In compliance with British Standards, a concrete mix design with a water/ cement ratio of 0.5 has been selected. The mixed design includes forms of 0% polluted cubes cured in portable water as a control, 0 percent polluted cubes cured in Al-Dura crude oil polluted water as a control, and various levels of artificially contaminated cubes cured in fresh water (1%, 2 %, 2.5 %, 3%, 4%, 5 %, 6 %, 10%, 15 %, 20%, and 25%). In terms of newly mixed concrete and compressed strength in hardened concrete, these 3 specimens have been compared. In a clean, dry manual tilting concrete mixture drum, the concrete elements seem to have been fully mixed, yielding 144 cubes. Table 4 shows the material mix proportions.

Table (4) Concrete mix design for 1 m^3 concrete

Mix Proportion		Cement (kg/m^3)	Sand (kg/m^3)	Gravel (m^3)	Water (kg/m^3)	Crude oil (kg/m^3)
M1	0%	400	720	1080	200	0
M2	1%	400	720	1080	200	7.2
M3	2%	400	720	1080	200	14.4
M4	2.5%	400	720	1080	200	18
M5	3%	400	720	1080	200	21.6
M6	4%	400	720	1080	200	28.8
M7	5%	400	720	1080	200	36

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M8	6%	400	720	1080	200	43.2
M9	10%	400	720	1080	200	72
M10	15%	400	720	1080	200	108
M11	20%	400	720	1080	200	144
M12	25%	400	720	1080	200	180

2.3 Testing Method

2.3.1 Slump Test

A special cone was used to measure slump, and determine the workability of concrete. Its height is 30.5 cm, its bottom base diameter is 20.3 cm, and its upper base is 10.2 cm. There is also a flow disk. The cone mold and the disc were cleaned well, then the cone was placed in the middle of the disc, then the cone was filled with concrete in two layers after each layer was compacted 25 times using a special steel rod with a diameter of 1.6 cm and the final surface was leveled. The cone was then gently turned over. It was dropped on a flat plate, and then the slump was measured, which is the decrease in the height of the center of the sagging concrete, which was analyzed to the nearest 0.5 cm.

2.3.2 Compressive Strength Test

Concrete's great compressibility seems to be one of its most distinguishing features. The compressibility of a concrete cube with dimensions of 150 x 150 x 150mm to produce specific compressive strengths following 28 days has traditionally been referred to as the concrete performance test. There are a variety of procedures that may be used to determine the compressive strength of concrete, including direct and indirect methods, destructive and nondestructive tests, and so on. The destructive technique used in this study has been the cube compressive test that had a size of 15x15x15 cm and had been tested at the ages of 7, 14, 28, and 56 days.

3. Results and Discussion

3.1 Slump Results

The results showed that the amount of slump (workability test) of the concrete that was worked in the measuring cone without adding any percentage of crude oil is 45 mm, and when adding 1% of crude oil, the amount of slump is 60 mm, and when adding 2% of oil Crude, the amount of drop is 75 mm, when adding 2.5%, the amount of drop is 80 mm, when adding 3% of it, the amount of drop is 100 mm, when adding 4% of it, the amount of drop is 140 mm, and when adding 5% of it, it is The amount of slump is 165 mm, and when adding 6%, the amount of

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slump is 165 mm, and collapse occurs after it, and when adding 10% of it, the amount of slump is 170 mm, and when adding 15%, the amount of slump is 175 mm, and when adding 20%, the amount of slump is The slump is 190 mm, and when 25% is added, the slump is 210 mm. Where the collapse occurs when a percentage of crude oil is added to more than 6%, and this indicates that crude oil causes a high slump because of its interference with cement and water interactions and leads to a delay in cohesion Concrete particles.

Table (5) Results of examining the amount of slump

Seq.	Crude oil ratio	Slump (mm)	Notes
1	0%	45	No collaps
2	1%	60	No collaps
3	2%	75	No collaps
4	2.5%	80	No collaps
5	3%	100	No collaps
6	4%	140	Collaps
7	5%	165	Collaps
8	6%	165	Collaps
9	10%	170	Collaps
10	15%	175	Collaps
11	20%	190	Collaps
12	25%	210	Collaps

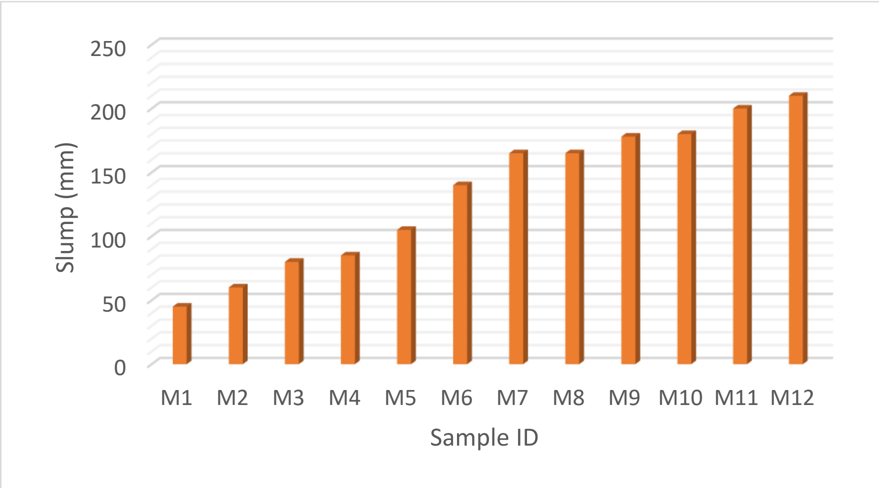

Fig. (4): Slump Test Results

3.2 Compressive Strength Results

A total of 144 cubes have been cast and then flooded to cure them. They contain concrete mixes with no crude oil ratio (the control) and crude oil ratio of 1%, 2 %, 2.5 %, 3 %, 4 %, 5%, 6 %, 10%, 15%, 20%, and 25%. At the ages of 7, 14, 28, and 56 days, three cubes from each combination were evaluated on a daily basis. Before the test, nevertheless, the surface water, grit, and any protruding surface have been removed by washing off. The crushing test has been

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conducted in line with British Standard 1881-102. (1983). The cubes have been positioned beneath the crushing process with the cast sides in contact with the machine's platens using this approach.

At 7 curing days using of 10% of crude oil gives the highest compressive strength as demonstrated in Table (6) and Figure (5), which is better than the control sample. While other ratios present decreasing in compressive strength comparison with control sample (with 0% crude oil).

Table (6) Compressive strength for age (7) days

Seq.	Crude oil ratio	Compressive strength (N/mm2)	Notes
1	0%	14	bad
2	1%	11.4	bad
3	2%	10	bad
4	2.5%	9.4	bad
5	3%	8.4	bad
6	4%	7.6	bad
7	5%	6.8	bad
8	6%	10.3	good
9	10%	15	good
10	15%	13	good
11	20%	11	bad
12	25%	9	bad

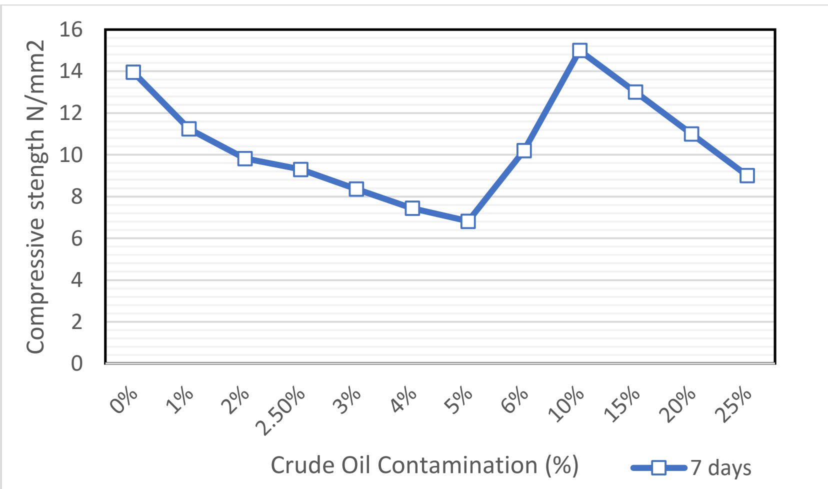

Fig. (5): The change in Compressive strength with various crude oil ratios at 7 curing days

At 14 curing days using of 10 % and 15% of crude oil give the optimum compressive strength as demonstrated in Table (7) and Figure (6), which are better or same as the control sample. While

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other ratios present decreasing in compressive strength comparison with control sample with 0% crude oil.

Table (7) Compressive strength for age (14) days

Seq.	Crude oil ratio	Compressive strength N/mm^2	Notes
1	0%	18	bad
2	1%	16	bad
3	2%	14	bad
4	2.5%	12.5	bad
5	3%	11.5	bad
6	4%	9	bad
7	5%	7	bad
8	6%	16.5	good
9	10%	18	good
10	15%	20	good
11	20%	15	bad
12	25%	11	bad

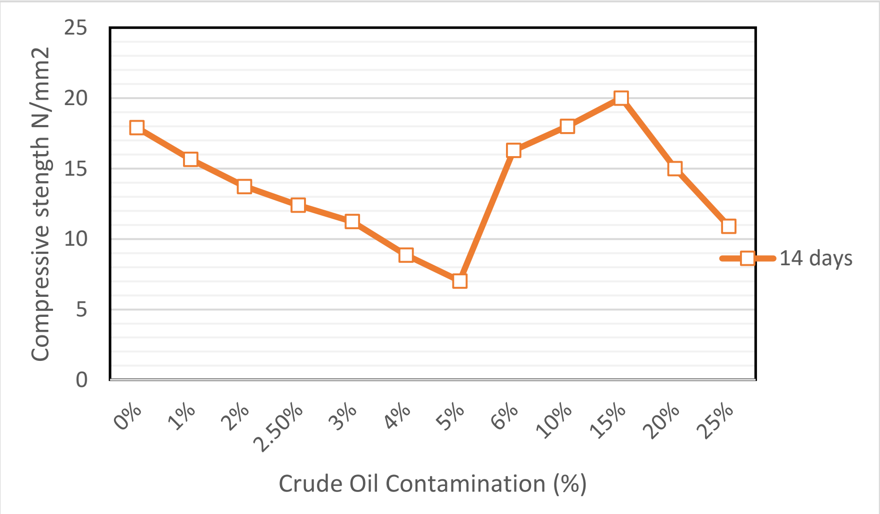

Fig. (6): The change in Compressive strength with various crude oil ratios at 14 curing days

At 28 curing days using of 6 %, 10 % and 15% of crude oil give the optimum compressive strength as demonstrated in Table (8) and Figure (7), which are higher than the control sample. While other ratios present decreasing in compressive strength comparison with control sample with 0% crude oil.

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Table (8) Compressive strength for age (28) days

Seq.	Crude oil ratio	Compressive strength (N/mm^2)	Notes
1	0%	22	bad
2	1%	17.5	bad
3	2%	16	bad
4	2.5%	13.5	bad
5	3%	12	bad
6	4%	10.5	bad
7	5%	8	bad
8	6%	24	good
9	10%	23	good
10	15%	25	good
11	20%	17	bad
12	25%	12	bad

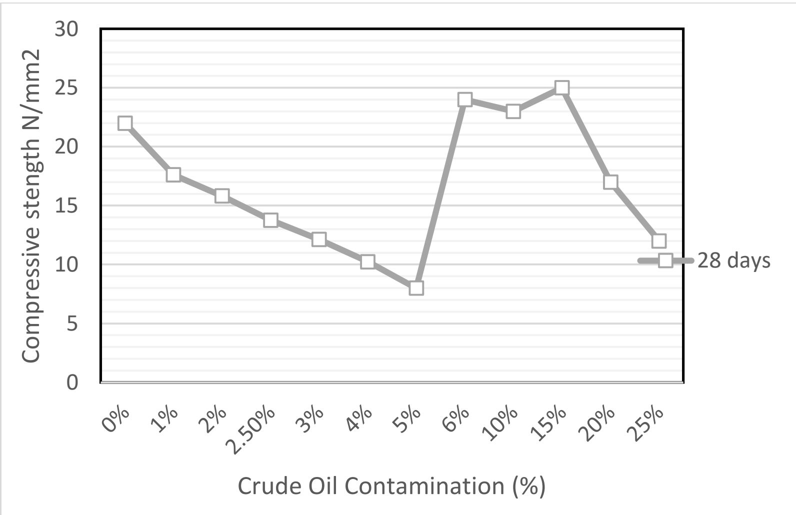

Fig. (7): The change in Compressive strength with various crude oil ratios at 28 curing days

At 56 curing days using of 6 %, 10 % and 15% of crude oil give the optimum compressive strength as demonstrated in Table (9) and Figure (8), which are better or same as the control sample. While other ratios present decreasing in compressive strength comparison with control sample with 0% crude oil.

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Table (9) Compressive strength for age (56) days

Seq.	Crude oil ratio	Compressive strength (N/mm^2)	Notes
1	0%	23.5	bad
2	1%	18.5	bad
3	2%	16.5	bad
4	2.5%	15	bad
5	3%	13.5	bad
6	4%	11.5	bad
7	5%	10.5	bad
8	6%	25.5	good
9	10%	25	good
10	15%	27	good
11	20%	18	bad
12	25%	10	bad

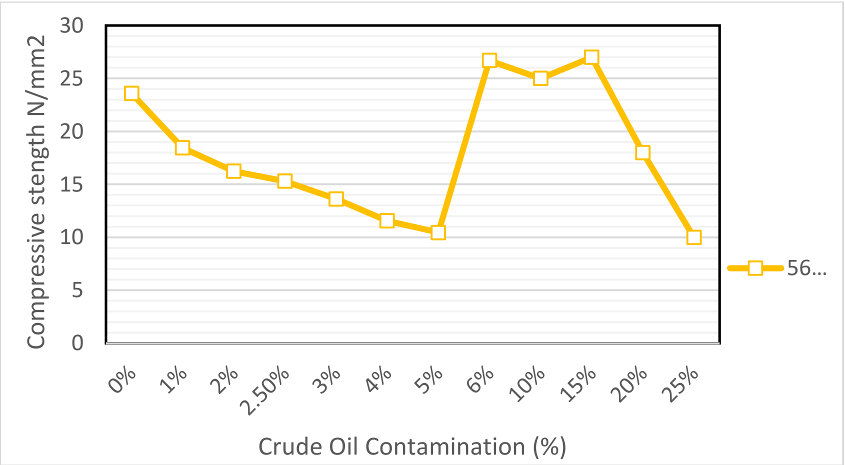

Fig. (8): The change in Compressive strength with various crude oil ratios at 56 curing days

Figure (9) demonstrated the compressive strength results for different crude oil ratios at 7, 14, 28 and 56 curing days. Sample M10 with 15% crude oil present best compressive strength for all selected ages, while sample M7 with 5% present the worst compressive strength due to prevent the bonds between the cement hydration gel.

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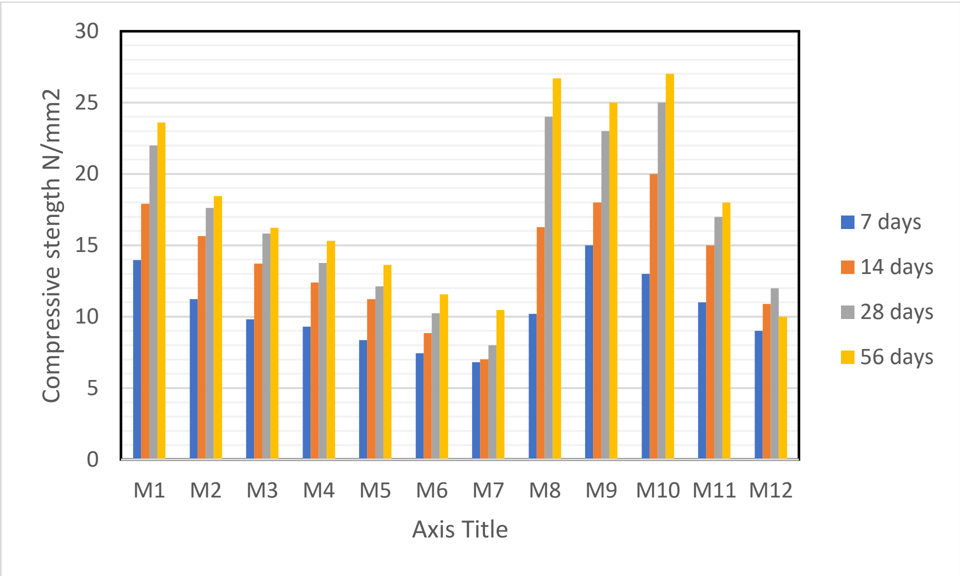

Fig. (9): Compressive Strengths of Concrete with or without Crude Oil Contamination

4. Conclusions

This study was conducted to find out the effect of using crude oil in different proportions on the properties of concrete, as these properties included the workability of concrete by measuring the amount of concrete slump, in addition to the compressive strength of the concrete. and by breaking concrete cubes with an age of (7, 14, 28, 56). One day, the results indicated that the increase in crude oil affects the workability of the concrete, and the higher the percentage of crude oil, the greater the amount of slump in the concrete, and thus the workability of it decreases, and where the collapse of the concrete was observed when it was examined with the conical mold in the event that there was a percentage of 6% of oil Crude.

Also, the compressive strength properties of concrete were improved by using an addition ratio of crude oil from 6% to 15%, where it was noted that the addition of 10% of crude oil to fine aggregate improves concrete by 7% for a 7-day age (The compressive strength without addition is 14 N/mm^2, and adding 10% is 15N/mm^2) and then this resistance slows down.

Either at the age of 14 days or note that adding 10% of crude oil to fine aggregate improves the compressive strength of concrete by 14% (compressive strength without addition It is 17.5 N/mm^2, and the addition of 15% will be 20%.

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As for the age of (28) days, note that the addition of 6%, 10%, and 15% contributes significantly to improving the compressive strength of concrete by 13.6% (strength The compression without addition would be 22 N/mm^2 and with the addition of 15% it would be 25 N/mm^2.

Either at the age of (56) days or note the addition of 6%, 10% and 15% contribute significantly to improving the compressive strength of concrete by 15% (compressive strength Without addition, it is 23.5 N/mm^2, and with a 15% addition, it is 27 N/mm^2 This study was conducted to find out the effect of using crude oil in different proportions on the properties of concrete, as these properties included the workability of concrete by measuring the amount of concrete slump, in addition to the compressive strength of the concrete. and by breaking concrete cubes with an age of (7, 14, 28, 56). One day, the results indicated that the increase in crude oil affects the workability of the concrete, and the higher the percentage of crude oil, the greater the amount of slump in the concrete, and thus the workability of it decreases, and where the collapse of the concrete was observed when it was examined with the conical mold in the event that there was a percentage of 6% of Crude oil.

Also, the compressive strength properties of concrete were improved by using an addition ratio of crude oil from 6% to 15%, where it was noted that the addition of 10% of crude oil to fine aggregate improves concrete by 7% for a 7-day age (The compressive strength without addition is 14Mpa, and adding 10% is 15 N/mm^2) and then this resistance slows down.

Either at the age of 14 days or note that adding 10% of crude oil to fine aggregate improves the compressive strength of concrete by 14% (compressive strength without addition It is 17.5 N/mm2, and the addition of 15% will be 20%…..As for the age of (28) days, note that the addition of 6%, 10%, and 15% contributes significantly to improving the compressive strength of concrete by 13.6% (strength The compression without addition would be 22 N/mm^2 and with the addition of 15% it would be 25 N/mm^2.

Either at the age of (56) days or note the addition of 6%, 10% and 15% contribute significantly to improving the compressive strength of concrete by 15% (compressive strength Without addition, it is 23.5 N/mm2, and with a 15% addition, it is 27 N/mm2

The impact of crude oil ratio on concrete workability and compressive strength has been studied, and the following conclusions were reached:

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- Following the different practical and analytical procedures used to determine the concrete's strength in relation to the influence of crude oil, and Once concrete comes into contact with liquids other than portable or fresh water, it may be harmful to the cement base material, particularly if it is OPC, because it has a low resistance to environmental and chemical reaction effects, resulting in slow strength development and, eventually, low compressive strength when hardened, and also early rotting.
- The magnitude of concrete slump rises in tandem with the quantity of pollution from petroleum compounds.
- The concrete strength varies depending on the quantity of crude oil used.
- In general, using a percentage of crude oil (6% - 15%) leads to improving the compressive strength properties of concrete. This indicates the possibility of using crude oil to enhance the strength of concrete, although more research is necessary in this field.

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