

A Comparison Investigation On The Effect Of Base Oil And Recycle Oil On The Concrete Performance

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Abstract: In the present investigation recycled oils used in concrete mixture. The lubricant grade are according to the US standard 5w20 , 5w30 , 10w30 collected from internal combustion engines. The amount of added oil ranged from (10-15) % from the water content hence a reduction of water by the same percentage was take place from the standard unit of concrete (cubic meter), however, the amount of this reduction was calculated and found that the oil added to the single test cube is 50 ml, then SP90 also added to the concrete mixture by amount of 150 ml. A comparisons was made between the lubricant and SP90 for the concrete mixture . The study showed that the results match fairly with the findings of other researchers. The recycle oil used in concrete mixture increase the workability , maintain and improves compressive strength and increases air content. The study also investigate and compare the effect of recycled oil and fresh oil on the concrete mixture and no significant effect observed aluminum sulphate were used to remove the debris from the used oil , which proved efficient in this field according to the practical results mentioned in this work.

Keywords: recycle oil, concrete, compressive strength, base oil

1. Introduction

The used oils are considered as one of the most important pollutants in the environment. The researchers have worked on different methods for the purpose of benefiting from them and not allowing more pollution to the environment through rehabilitation with some additions for the purpose of preserving their properties and use in road asphalt, concrete mixture, for the purpose of improving the performance of such works to some optimum percentage. the used oils contain many residues, especially hydrocarbon and residues of metals between the rotary surfaces, since these oils were used for the purpose of lubricating the rotary parts and for the purpose of disposal of hydrocarbons and other suspended substances. A aluminum sulfate are used for deposition purposes.

2. Aim of the Study

The main objectives of this work can be summarized by the following points:

1. To improve the production of concrete, by adding plasticizers with different specifications up grading the concrete properties in both cases, soft and relevant.
2. To take advantage by using the waste oil in concrete which intern reduce the environment contamination.

3. Literature review

EL-Fadel, M. Khoury (2002), they investigate the strategy vehicles waste-oil management a case stud " for Resources conservation and recycling. The study showed that the use of used oils is a type of plasticizer in various concrete mixtures, in addition to the positive effect on the

environment and increasing the workability of the concrete. while Hamad, B.Sc. Rteil, A.A., EL-Fadel, M.(2003) described Effect of Used Engine Oil on Properties of Fresh and Hardened Concrete. The researchers in this work showed significant positive impact through the disposal of polluters by 45% and drastic effect on the reducing of the population in the land and other field however increasing the air content effect the compressive strength positively and increase the workability and slump. AL-Hayali, O.M.(2006) they declared a Comparative Study of Some Properties of Concrete Containing Admixtures Under Effect of High Temperatures. The comparative study to this source in high temperature shows the same conclusion for other researchers. Mohammed Noori Hussein (2013) showed Concrete structure is produced from cement, aggregate and water. The construction industries are turning out to be more challenging than any other time in recent memory. To be competitive, the field of engineering related to the industries need to a chance to be made. One of the areas that can be established is the used of material in the construction purposes.

4. Experimental work

Local resistant cement was used with water, fine and coarse aggregate, as well as the use of SP90, as well as fresh and recycle oil as follows:

1. The Iraqi specifications IQS which confirm the international specifications local cement according to Table No. 1 and Table No. 2 of the chemical and physical specifications respectively as below:

Table (1) Chemical composition of cement (according to QS o.5/1984)*

Compound Composition	Chemical Composition	Percentage by weight	Limits of (IQS NO.5 /1984)
Lime	CaO	60.14	-----
Silica	SiO ₂	19.77	-----
Alumina	Al ₂ O ₃	4.38	-----

Iron oxide	Fe ₂ O ₃	5.20	-----
Sulphate	SO ₃	2.15	≤ 2.5 % If C ₃ A < 5% ≤ 2.8 % If C ₃ A > 5%
Magnesia	MgO	1.71	≤ 5 %
Free lime	Free CaO	1.12	-----
Loss on ignition	L.O.I.	3.19	≤ 4 %
Insoluble residue	I.R.	1.23	≤ 1.5 %

Table (2) Physical properties of cement (according to IQS No.5/1984)*

Physical properties	Test results	Limits of (IQS)
Fineness (Blaine Method)	310	≥ 230 m ² /kg
Compressive strength, MPa	18.7 26	≥ 15, MPa ≥ 23, MPa

* Physical tests are conducted in Construction Materials Laboratory of Al-Mustaqbal University College.

Table (3) Grading of Fine Aggregate (according to IQS No.45/1984)*

Sieve size	Passing (%)	
	Fine aggregate	Limits of Iraqi specification No. Zone (2) 45/1984 for
10 mm	10	100
4.75 mm	98.58	90-100
2.36 mm	84.5	75-100
1.18 mm	72.08	55-90
600 μm	36.83	35-59
300 μm	9.92	8-30
150 μm	8.67	0-10

Table (4) Physical and chemical Properties of Fine Aggregate (According to IQS No. 45/1984)*

Physical properties	Test results	Limits of Iraqi specification No. 45/1984 for Zone (2)
Specific gravity	2.60	-
Sulfate content SO₃	0.28 %	≤ 0.5 %
Absorption	0.75%	-
Clay content	3.67%	≤ 5 %

Table (5): Physical and chemical Properties of Coarse Aggregate

Physical properties	Test results	Limits of Iraqi specification No. 45/1984 for Zone (2)
Sulfate content	0.10 %	≤ 0
Clay content	0.14%	≤ 3 %

❖ **Specifications of the proposed mixture:**

The proposed mixture consists of 9.46kg resistive cement, 3.3L water, 0.15L plasticizer (SP90), 25.3 kg gravel and sand 14.85Kg, standard cubes. The models were tested for 28 days at room conditions. As the proposed mixture provides compressive strength of more than 30 MPA according to Table 7 and as follows:

Table(6) : Standard mix

No	weights and volumes of quantities	Type quantities
1	150ML	Added SP90
2	3.3LITER	WATER
3	9.46KG	Cement
4	14.85KG	sand
5	25.3KG	Gravel

The used oils from 10w30, 5w20 and 5w30 were used by recycling and settling all impurities through the use of aluminum alumina (alum) and then a filter.



Fig.1 . Fresh and used oil representation used in concrete

The cubes were examined for 28 days in the compression-resistance examination equipment available in the laboratories according to the attached pictures.



Fig.6: test apparatus

5. Results Discussion and conclusion

Table (6) : Results of different mixtures

Compression resistance (mpa)	Blending mode	Added		Weight ratios for mixing	The NO of the mixture
		Motor oil	SP90		
38.46	Add SP90 Just	-----	150 ml	1:1.5:3	M1
36.34	Add SP90 + oil add	oil add 10w30	150 ml	1:1.5:3	M2
35	Add SP90 + oil user	oil user 10w30	150 ml	1:1.5:3	M3
34	Add SP90 + user oil + alum	oil user 10w30	150 ml	1:1.5:3	M4
37.10	Add oil only	oil add 10w30	150 ml	1:1.5:3	M5
39.90	Add SP90 + oil add	oil add 5w30	150 ml	1:1.5:3	M6

34	Add oil only	oil add 5w30	150 ml	1:1.5:3	M7
38	Add SP90 + oil user	oil user 5w30	150 ml	1:1.5:3	M8
39	Add SP90 + user oil + alum	oil user 5w30	150 ml	1:1.5:3	M9
40	Add oil only	oil add 5w20	150 ml	1:1.5:3	M10
36.80	Add SP90 + user oil	oil user 5w20	150 ml	1:1.5:3	M11
33	Add SP90 + user oil + alum	oil user 5w20	150 ml	1:1.5:3	M12

The results are shown in graphical form as shown in the following figure:

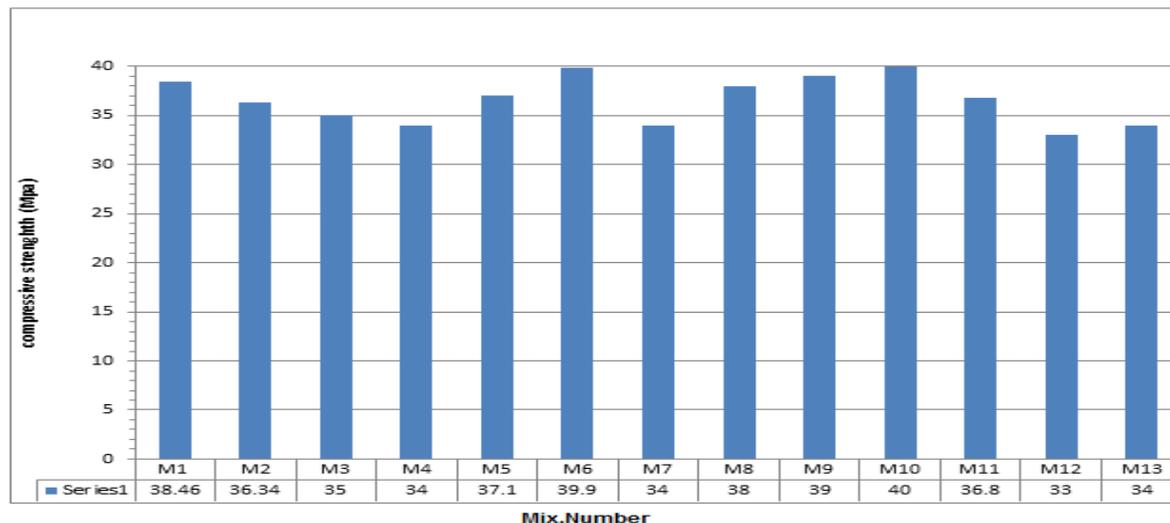


Fig.(3) final results charts

Table 6 shows the final results of the different mixtures, taking into consideration the various additives such as the plasticizer SP90 and the different oils used and not used as indicated in the table with the stability of the weight ratios of all the mixtures to give an acceptable comparison different cases starting from mixture M1 to mixture M12. Mixture M1 with addition of plasticized SP90 only resulted in compressive strength of 38.46 Mpa. The M2 mixture gave a compressive strength of 35 Mpa with the additives mentioned in the same table and this in relation to the other mixtures to mixture No. 12. All experiments have been used the same cement mentioned chemical and physical specifications in the tables as well as for sand and gravel and, same gradient are used as in the tables number and the strength of compression in all cases ranging from 33Mpa to 40Mpa. Fig.3 represent the final result by chart for the purpose of fair comparisons between the different mixtures with different additive.

6. Conclusion:

The results indicated in table 11 and fig.7 declare very clear that the effect of adding lubricant either fresh, used or recycle were very close to the that mix with sp90, so we can conclude that by adding oil we will gain two goal the first one improve the concrete mixture and avoid the contamination either in land or water. The recycle oil used in concrete mixture increase the workability , maintain and improves compressive strength and increases air content. The study also investigate and compare the effect of

recycled oil and fresh oil on the concrete mixture and no significant effect observed.

7. References:

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