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Impact of Petroleum Products on Strength of Concrete

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Abstract **– Concrete is the main component for the construction purposes which provide strength to the buildings. Concrete is composed of fine and coarse aggregates bonded together with cement mixed with water in a fixed proportion that hardens over time. Compressive strength of a concrete plays a major role in construction of a structure. This paper investigates the impact of petroleum products on the properties of the concrete. Concrete produced in regions where petroleum products are exploited can have significant changes on the property of the concrete which can adversely affect the construction**

Keywords – Concrete, Petrol, Kerosene, Diesel, Slump, Compressive strength

1. INTRODUCTION

The main aim of this paper is to study about the changes occur on the property of the concrete with contamination of petroleum products to the concrete mix with fixed proportions. So that we could know the effect of petroleum products are how much negative on the properties of the concrete.

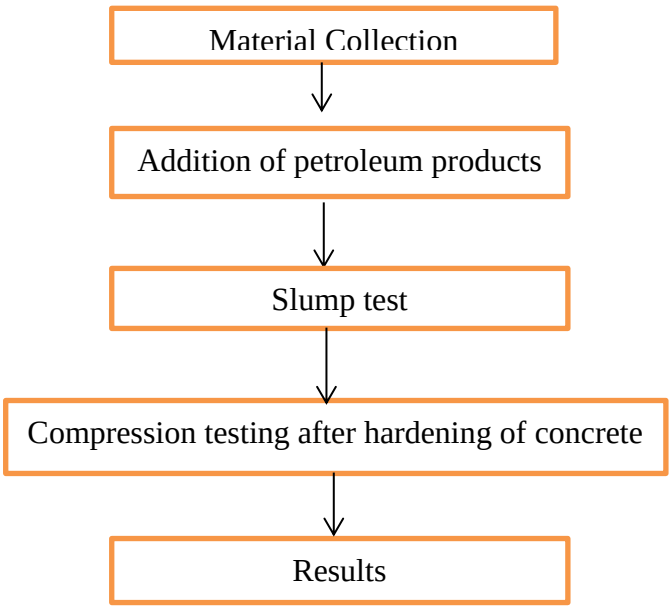
Oil spills in the Niger Delta have been a regular occurrence, and the resultant degradation of the surrounding environment has caused significant tension between the people living in the region and multinational oil companies operating there. It groups, the federal government, and the foreign oil companies operating in the area commenced steps to mitigate the impacts. Large areas of the mangrove ecosystem have also been destroyed.

It is necessary to find the impact of petroleum products (kerosene, petrol and diesel) on the strength as well as other properties of the concrete. This will help us to study if water contaminated with petroleum products is used in making a concrete structure then what will be the results to the properties of the concrete on the basis of percentage of contamination.

2. MATERIALS AND METHOD

Cement
Coarse Aggregates
Fine Aggregates
Water
Petroleum Products (kerosene, petrol, diesel)

In this paper, concrete cubes of grade M20, M25 and M30 are made, first with normal water and then by replacing the water by 2%, 4% and 6% with petroleum products (Kerosene, Diesel and Petrol) then comparing the values of the strength of the plain and contaminated concrete blocks with each other with the help of compression testing machine to check the strength of the concrete before use for residential purpose, industrial purposes and also comparing the workability (by slump test) of concrete which tells about working time with concrete.



Compression tests are done on 3rd, 7th and 28th day after proper curing in fresh water.

2.1. Batching of the Constituent Materials

In general, concrete is mixed with the accurate proportion according to the nominal design as well as calculated mixed design. Batching is done in a quality control laboratory.

For batching of concrete properly coarse aggregates are further taken into two parts in which 60% aggregates are taken which are passing from 20mm size sieve and retaining on 10mm size sieve, and the remaining 40% aggregates are taken which are passing from 12.5 mm size sieve and retaining on 2.36 mm size sieve, Cement used was 43 grade ordinary Portland cement and fine aggregates

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or sand are mixed in the mixer with water with a water cement ratio of 0.45.

1.1. Slump Test

The slump values of the concrete mix was achieved by the help of slump cone in the shape of frustrum with upper diameter as 100mm, bottom diameter as 200 mm and height as 300mm. It iis used for determine the workability of concrete . Workability determines the ease and homogeneity with which it can be mixed, placed, consolidated and finished.

2.2. Compression Testing

Compression testing is the main test done on concrete to determine the strength of the concrete. For compression testing Universal Testing Machine is use which is a machinery assembly which apply load on the concrete cube(of size 150mm * 150mm * 150mm) by 10 KN per minute.

3. RESULTS

3.1. Slump Test

For M20

S.No.	Plain Concrete	With 2% petrol	With 4% petrol	With 6% petrol
1	25.5mm	26mm	26.7mm	30mm

S No.	Plain Concrete	With 2% kerosene	With 4% kerosene	With 6% kerosene
1	25.5mm	25.9mm	26.5mm	29mm

S.No.	Plain Concrete	With 2% diesel	With 4% diesel	With 6% diesel
1	25.5mm	25.7mm	26.5mm	28.2mm

For M25

S.No.	Plain Concrete	With 2% petrol	With 4% petrol	With 6% petrol
1	40.8mm	45.4mm	55.4mm	Shear Slump

S.No.	Plain Concrete	With 2% kerosene	With 4% kerosene	With 6% kerosene
1	40.8mm	41.5mm	47.6mm	52mm

S.No.	Plain Concrete	With 2% diesel	With 4% diesel	With 6% diesel
1	40.8mm	37.5mm	41mm	42.6mm

For M30

S.No.	Plain Concrete	With 2% petrol	With 4% petrol	With 6% petrol
1	65.5mm	72.1mm	Shear slump	Collapse slump

S No.	Plain Concrete	With 2% kerosene	With 4% kerosene	With 6% kerosene
1	65.5mm	71.3mm	74mm	Shear slump

S.No.	Plain Concrete	With 2% diesel	With 4% diesel	With 6% diesel
1	65.5mm	70mm	72.7mm	74mm

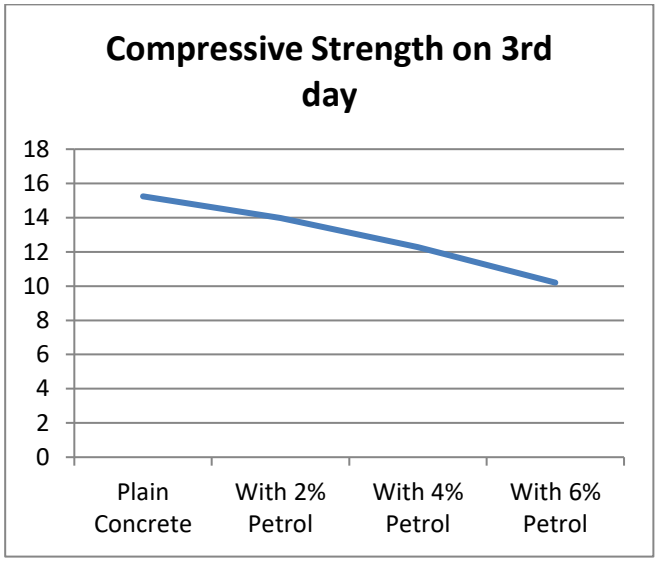
Workability of the concrete mix is increasing with the increase of percentage of petroleum products.
Finally addition of higher percentage of petroleum products is leading to the segregation of the composition of the concrete i.e., Cement, aggregates, Sand which results in the collapse of slump.

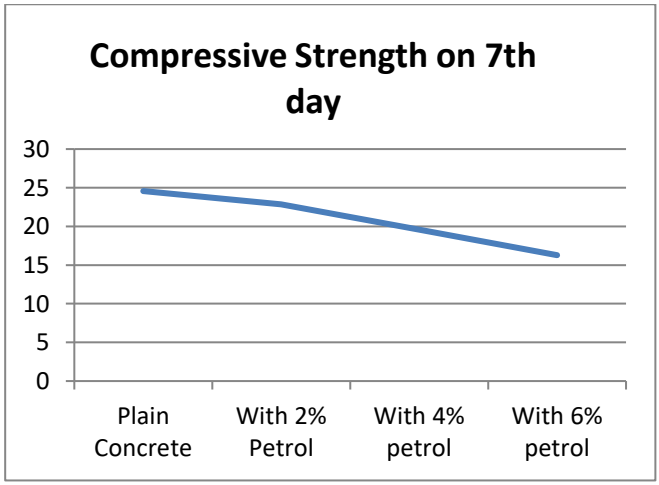
3.2. Compressive Strength Test on Cubes

Compressive strength in N/mm2

Type	3rd day	7th day	28th day
Plain concrete	15.244	24.57	38.11
With 2% diesel	15.11	24.23	37.75
With 4% diesel	12.44	20.215	31.10
With 6% diesel	12.12	18.78	30.30
With 2% petrol	13.98	22.86	36.81
With 4% petrol	12.28	19.59	33.21
With 6% petrol	10.20	16.28	26.70

FOR PETROL





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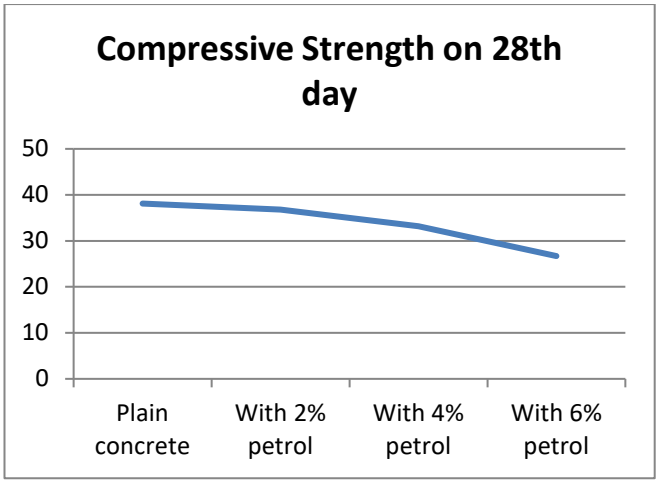
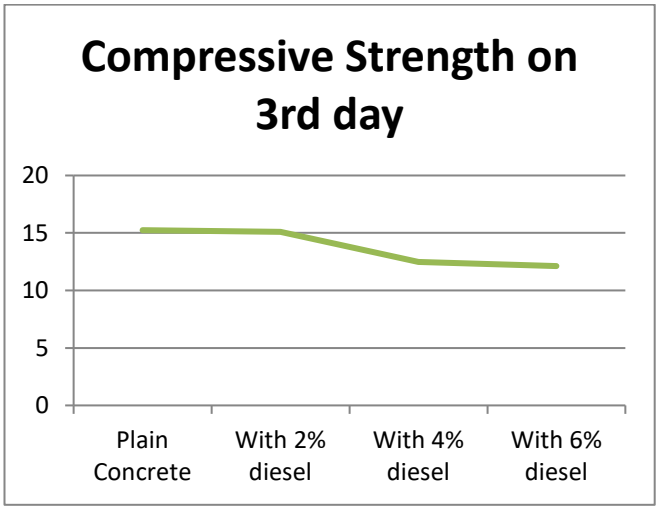
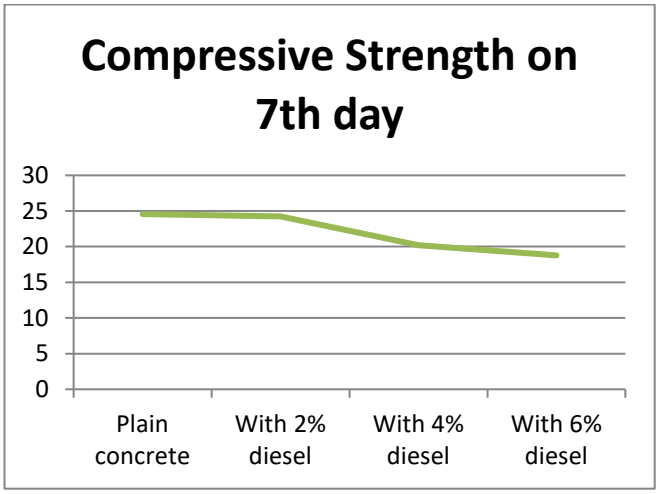
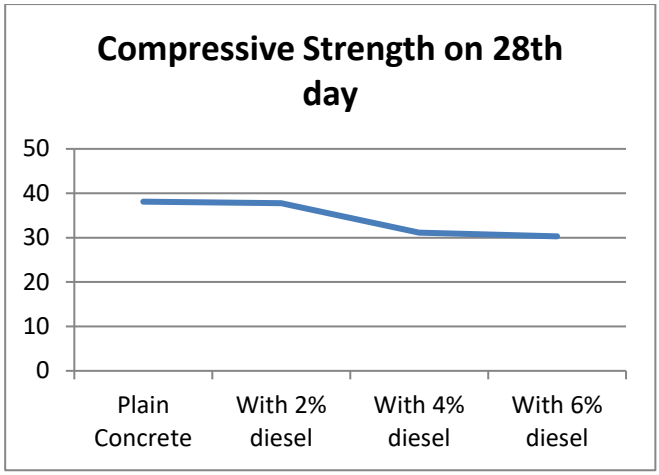


FOR DIESEL







4. CONCLUSION

Value of slump of concrete is increasing with the increase with amount of contamination of the petroleum products.
Strength of the concrete is decreasing with increase of amount of petroleum products.
Increase in contamination of purest form of petroleum product is bad for concrete.
Contamination of the petroleum products in concrete decreases the binding property of cement.
With the help of this research paper we have concluded that contamination of petroleum products in concrete is harmful for concrete.

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