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Experimental Studies on Properties of Concrete by Addition of Neem oil as a Natural Admixture

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Abstract: Concrete is the most essential construction material in all over the world. Due to change in climate or mode of construction various admixture have come into practice to satisfy the need of every individual construction. These admixture mainly constitute some chemical process which in turn somehow have an adverse effect to the environment. In order to make it eco-friendly, these various admixture can be extracted from naturally available products in the environment, which significantly increase the amount of green productivity in the environment. One such naturally available admixture source is Neem oil, due to this consumption in concrete the demand of Neem oil will indirectly leads to the plantation of enormous Neem trees in the environment, which play a vital role for Green Environment. In this project the role and behaviour characteristics of Neem oil used in concrete will be studied.

Keywords: Neem oil, natural admixture

I. INTRODUCTION

Concrete is the material which most widely used in construction field over the world. Nowadays, the utilization of concrete is amazingly high. From the statistic shown that, concrete is produced over six billions ton each year, and is the most generally utilized substance than other man-made material in the earth. It is specific to different applications like reconstruction, renewal and construction. They include bridges, building structures, dams, basements, tunnels, streets, pavements, airports, and so on normally, concrete consists of cement, sand, coarse aggregate and water.

Since concrete the most critical part in structural construction, its blend content should be in a form of good quality for structural purposes. Concrete is comprised of aggregate, cement and water. Through this blend of materials, three – quarter of the blend is administered by aggregate. The aggregate itself is classified as fine and course aggregate, and water is the assistant factor for the hydration process.

Water reducers are maybe the most broadly utilized admixtures in the concrete industry, their utilization in ready-mixed concrete being especially common. The main water-reducing mixes are lignosulphonates and hydro carboxylic acids and they work by connecting themselves to cement grains, imparting a negative charge which causes grains to disperse more adequately.

Water reducing admixtures will give side effects include air entrainment and retardation of set, though these are only slight at normal doses. Plasticizers are relatively cheap and form an economical means of improving concrete quality if used to increasing the strength when the water/cement ratio decreased. The effect of super plasticizers is short-lived only 30-45 minutes, hence they are usually added to concrete just before placing. Care is necessary to avoid segregation but hardened properties, such as strength, shrinkage and creep do not appear to be adversely affected. Cement is a main material in concrete; however, in the process of producing cement, one important issue that has been carried out is air pollution. The production of one ton of Portland Cement release approximately one ton of carbon dioxide and other greenhouse gases into the atmosphere. In the broadest sense, the term cement can be described as a material with adhesive and cohesive properties which make it capable of bonding mineral fragments into a solid form. For construction purposes, the term cement is restricted to the bonding materials used as a binding agent for sand, stone and other aggregates within the manufacture of mortar and concrete.

There are two types of cement; hydraulic cements and non- hydraulic cements. Hydraulic cements consist mainly of silicates and aluminates of lime, and can be arranged comprehensively as natural cements, Portland cements, and high alumina cements. Hydraulic cements set and harden by internal chemical reactions when mixed with water. Meanwhile, non-hydraulic cements will only harden gradually by ingestions of carbon dioxide from the air.

Aggregate was originally a composition of a concrete mix with the proportion to the cement content and also as an inert material dispersed throughout the cement paste largely for economic purposes. It is possible to take into account that aggregate is a building material connected into a cohesive whole by means of the

cement paste, as a comparison similar to masonry work in building construction. Actually, the aggregate can assimilate heat, water, chemicals and also its physical properties will influence the performance of concrete.

Bond between aggregate and cement paste is an essential variable to create a strength of concrete hence because of this reason a fully understood about the material properties is very significant.

So, concrete industry has considered recycling industrial by- products to be used as concrete additives in order to produce higher quality and more sustainable construction material.

Generally, there are two classes of additives; they are mineral additives and chemical additives. Mineral additives are fly ash, slag, silica fume, and different pozzolans. Then again, the chemical additives are such as accelerators,

Antifreeze admixtures, retarders, air-entrainment, and waterreducers, super plasticizers and water repellents. These additives are typically added to create different practices of concrete indicated by their applications.

II. MATERIALS

2.1Cement

Ordinary Portland cement is the most common type of cement in general utilize around the world because it is a basic component of concrete, mortar, stucco and most non- specialty grout. The type of cement utilized in this study is imported Portland cement. Table1 shows the chemical composition of Portland cement.

2.2 Aggregates

Locally available natural sand with 4.75 mm maximum size was used as fine aggregate. Crushed granite with 10 mm maximum size was used as coarse aggregate. Both fine aggregate and coarse aggregate conformed to IS: 383-1970.

2.3 Water

Water used in mixing of concrete, including that free water on the aggregates, should be clean and free from impurities of oils, acids, alkalis, salts, organic material or other substances that may be deleterious to concrete.

2.4 Neem Oil

In this study, used neem oil is shown in Figure 1. They are used as additive in the concrete. The used neem oil can be obtained from neem tree.

III. MIXING AND CASTING

For these blend proportions, required amounts of materials were weighed. Cement, coarse and fine aggregates were blended dry independently. After adding water and neem oil all materials were combined to get the homogeneous blend. Subsequent to doing the tests for fresh properties, final casting of the mixes was done immediately. After casting, test samples were left in the casting room for 24 h at a temperature of about 20 _C. The specimens were removed from mould after 24 h and were put into a water-curing tank until the time of the test or according to prerequisite of the test. The cubes of size 150 mm were cast for determination of compressive strength. The cubes were tested at the ages of 7, and 28 days to study the development of compressive strength.

The details of samples are shown in Table 1.

Table 1: Types of Concrete Mixes and Test Ages

Concrete mix	Test age days	
	7 days	28 days
Concrete without neem oil	3	3
Concrete with 1.5% of neem oil	3	3
Concrete with 2% of neem oil	3	3

IV. RESULTS AND DISCUSSION

5.1 Fresh Concrete Properties

The results of various fresh properties tested by slump test and Compressive strengthTest, for various mix compositions are given in Table 2 and Table 3 respectively. The slump test results show that the concrete with 0.75 % used engine oil have the highest slump value followed
by Concrete with 0.75 % used neem oil and control sample. Concrete added with neem oil also has workability higher than control sample. The result achieved from the slump test indicates that the use of engine oil will increase the workability of concrete. In the concrete, neem oil will act as lubricant that makes the concrete more workable. concrete with used engine oil and new engine oil have lower compacting factor compared to control sample and concrete with 0.48 W/C ratio.

Table 2: Result of Slump Test

Control mix	Slump (mm)
Control	67
Concrete with 1.5% of neem oil	73
Concrete with 2% of neem oil	77

5.2 Cube Compressive Strength test

For determining the compressive strength of the concrete, the method used is in accordance with BS 1881: Part 116: 1983[10]. The load on the cube is applied at a constant rate until the specimen crushes at the maximum load applied.

Table 3: Result of cube when concrete with 1.5 % of neem oil

Curing period(days)	Load (kN)	Compressive strength(N/mm2)
7	310	13.77
28	540	24

Table 4: Result of cube when concrete with 2 % of neem oil

Curing period(days)	Load (kN)	Compressive strength(N/mm2)
7	245	10.88
28	380	16.88

Table 5: Result of split tensile strength when concrete with 1.5% of neem oil

Curing period(days)	Load (kN)	Split tensile strength(N/mm2)
7	110	4.3
28	190	6.5

Table 6: Result of split tensile strength when concrete with % of neem oil

Curing period(days)	Load (kN)	Split tensile strength(N/mm2)
7	80	3.13
28	160	5.42

V. CONCLUSION

- Concrete with used neem oil has the highest workability followed by concrete with admixtures.
- Concrete added with neem oil also has workability higher than control sample. The result achieved from the slump test indicates that the use of neem oil will increase the workability of concrete.
- In the concrete, neem oil will act as lubricant that makes the concrete more workable.
- However, concrete with neem oil have lower compacting factor compared to control sample and concrete

VI. REFERENCES

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