Improving The Properties of Cement Bricks By Tamarind Kernel Powder As An Additive

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Abstract- *The primary objective of this project is to reduce the organic wastes such as the tamarind seeds. Our project deals with the usage of the tamarind kernel powder to increase the properties of the cement bricks. The tamarind seeds generally having the high toughness and the heat reduction so that it will be used with the cement brick. By using these organic wastes for the manufacturing of the building materials will be more effective and eco-friendly. And also the kernel powder will have the sufficient amount of adherence property so that the bonding in the brick will also be improved. The tamarind kernel powder shall be used in the proportions of 5%, 10%, and 15%.*

I. INTRODUCTION

The conventional brick is losing its value in the modern days as it does not serve the present needs. In order to improve the properties at the brick in manufacturing stage, the admixtures are added. So in this work, the tamarind kernel powder is added for the purpose of improving the properties in the bricks. Because, the tamarind will generally reduce heat and absorb CO2 in a smaller manner and which is eco-friendly thus the tamarind kernel powder shall be used to manufacturing the cement bricks as a part.

The tamarind kernel powder having the high adherence so that it will easily bind with the other particles in the brick.

The durability of the thermal insulated brick by the tamarind kernel powder will be at the maximum and the absorption property shall be limited when compared to the conventional brick. Thus concluded that the replacement these waste materials provide good thermal insulation and compressive strength at low cost and environmental friendly.

II. MATERIALS USED

General:

As much as possible, the current practice followed in the brick manufacture and usual test on brick was followed.

Materials:

- Tamarind kernelpowder
- M sand
- Cement

Tamarind kernel powder:

Tamarind seed is an underutilized by-product of the tamarind pulp industry. Only a small portion of the seed, in the form of tamarind kernel powder (TKP), is used as a sizing material in the textile, paper, and jute industries. Though many applications of this seed are possible, there have been hardly any other uses for it including using it as an additive in food formulations. The excellent gelling cum adhesive characteristics of the decorticated seed powder can lead to several applications in food and pharmaceutical industries which are evident by the number of research papers as well as patent applications. This article thus focuses on the possibilities of using the seed in several food and non-food industries with particular reference tophysical and engineering properties, hydration behaviour, rheological properties, functional and nutritional characteristics, and the processing of the tamarind seed for wider applications.

Tamarind kernel powder

M Sand:

Natural Sand is being used as fine aggregate in concrete making and is preferred as fine aggregate. It is mostly mined from the river beds and indiscriminate mining of sand has reportedly causing damages to the environment. We also see that dependency on this source has led to high material costs also. Now there is high scarcity of natural sand. Due to this shortage of good quality natural sand and heavy dependency on this, for concrete manufacturing, there has been seen usage of poor quality natural sands for construction. Thus it becomes almost obligatory to find alternatives to natural sand and evaluate these alternatives for use in concrete production. Out of the many available alternatives, crushed stone sand has emerged as the most easily available material. This material is available at all the crushing units as a by-product during production of 20mm and 10mm size aggregates. Another form of crushed stone sand is manufactured sand (M sand), which is better in terms of quality and fulfils the requirements of suitable material for use in concrete. M sand is manufactured by any of the methods- by crushing of coarse aggregates (20mm& 10mm) in separate sand plants or using 3 stage VSI crushers. Then this material is further processed either by washing with water or dry sieving, if required to improve the grading and reduce fine powder content. This comparison study gives an insight into thevarious characteristics of fine aggregates playing role in making good pumpable concrete along with other important hardened concrete properties.

M Sand

Cement:

Cement is a popularbinding material and a very important civil engineering material. Cement is a crystalline compound of calcium silicates and other calcium compounds having hydraulic properties. Lime and clay are used as a cementing material over the centuries. Clay provides silica, alumina and iron oxide while calcined lime basically provides calcium oxides.

Cement

III. MANUFACTURING OF BRICKS

General:

The material has been collected and the collected materials are properly weighted for the making of TKP bricks material and a very important civil engineering material. Cement is a crystalline compound of calcium silicates and other calcium compounds having hydraulic properties. Lime and clay are used as a cementing material over the centuries. Clay provides silica, alumina and iron oxide while calcined lime basically provides calcium oxides.

Manufacturing process:

For casting all the modulus were cleaned and oiled properly. These were securely tightened to correct dimensions before casting. Care was taken that here is no gaps left from where there is any possibility of leakage out of slurry careful procedure was adopted in the batching, mixing and casting operations.

Material preparation:

The selection of tamarind kernel powder, m sand and cement were in proportion accordance with the mix design and current practice used in making of TKPbrick.

Mixing:

The materials are mixed with dry condition manner. The water is added and the materials are mixed with proper. So that the slurry can be made.

Placing:

The mould is cleaned and to fix the position. The inside portion of the mould is cleaned with water. The mix is placed in the mould and the compaction action is done by using compacting rod. The surface of the brick is leveled. Finally the mould is removed in very carefully. The mould was cleaned and used for make brick for another mix.

Size of mould:

Size of the mould used for brick manufacture is 190 X 90 X 90mm.

IV. TESTING OF BRICKS

Compressive strength test:

This is the main test conducted to test the suitability of the brick for construction work. This test is executed with the help of compression testing machine. A brick is placed in a compression testing machine. The load is applied till it breaks. Then the maximum compressive load of the brick is recorded from the compression testingmachine.

The minimum compressive strength of eco brick is 10-12 N/mm^2.

Water absorptiontest:

Clay Bricks should not absorb water more than 12%. The dry weight of the brick is taken and noted as W_1.The brick is immersed in water for 24 hrs, after this was weighted and noted as W_2.

The following formula is used to find out the water absorption of eco-friendly brick Water absorption in% by weight = $(w_2 - w_1/w_1)$ x 100. The average of three bricks should be taken.

Efflorescence test:

It is the test to identify the salt content I the brick. Immerse the brick in water up to 2.5cm depth. Examine the brick after this and find out the percentage of white spots to the surface area of brick. If any difference is observed because of presence of any salt deposit then the rating reported as 'effloresced'. If no difference is noted, the rating is reported as 'noteffloresced'.

Dimensionaltest:

The 15 bricks are taken and the loose particle of clay and small projections from the brick is removed. Arrange them on a level surface in contact with each other and in a straight line. The total dimensions of the brick are measured and the changes are noted.

Soundness test:

This sound is carried out to find out that a clear ringing sound is produced or not when the two bricks are struck with each other without breaking any of the two bricks. If the two bricks are not broken after striking with each other and a clear ringing sound is produced then this means that the bricks are sufficiently sound.

Hardness test:

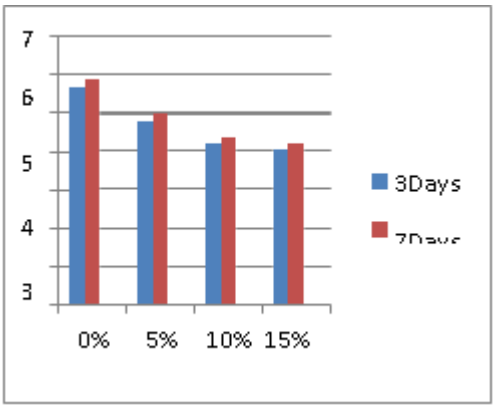
This test is carried out to see that the brick is sufficiently hard or not. We can judge hardness of the brick by making impression on the surface of the brick with the help of a finger nail. This test is carried out for all samples of bricks.

V. RESULT AND DISCUSSION

Compressive strength test:

S. No	TKP (%)	Avg. Stress (N/mm^2)	
		3 days	7 days
1	0%	5.67	5.88
2	5%	4.79	5.02
3	10%	4.21	4.37
4	15%	4.08	4.19

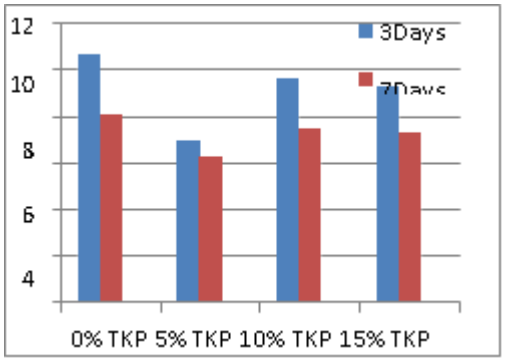
Efflorescence test:



Comparison of 3 & 7 days compressive strength test

Water absorption test:

S. No	TKP (%)	Avg. WA (%)	
		3 days	7 days
1	0%	10.66	10.66
2	5%	6.94	6.94
3	10%	9.61	9.61
4	15%	9.33	9.33



Comparison of 3 & 7 days water absorption test

Efflorescence test:

S.No	Observed value
1	Slight
2	Slight
3	Nil
4	Nil
5	Nil

Soundness test:

S.No	Soundness test	
	Passing	Non-passing
1	All mix	Nil

Hardness test:

S.No	Hardness test	
	Passing	Non-passing
1	All mix	Nil

VI. CONCLUSION

Following are the conclusions drawn based on the analytical investigations carried out to characteristics study on brick by using tamarind kernel powder, M sand and cement. Maximum test are carried out to find out the optimum mix.

From the results we found the maximum compressive strength of brick is 5.88 N/mm^2. All the mixes have their water absorption less than 20%. The bricks were passed in all the tests. The best mix for making the brick is MIX II. The mix proportional is tamarind kernel powder 5%, M sand 75%, cement 5%. The bricks were passed in all other test such as efflorescence test, soundness and hardness test.

The brick is more suitable for using the construction works. The wastage material shall be effectively used in the brick. It gives more strength and lower water absorption. From the cost comparative study the brick manufacture cost is moderate to other bricks. The minimum kernel powder for the optimum mix is calculated in based on the compressive strength ofbrick.

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