AN EXPERIMENTAL STUDY OF EGG SHELL AND FISH BONE REINFORCED CONCRETE

Mrs.N.Shifu jahan,M.E.,Ms. .Susmitha.R.M,M.E.,

Mrs.N.shifu jahan ,M.E, Assitant professor, Anna university, Tamil nadu,India

ABSTRACT

In order to conserve natural resources and economize energy, weight reduction has been the main focus of machine parts manufacturers in the present scenario. The egg shell powder composite is one of the potential items for weight reduction of about 20% - 30%. The introduction of egg shell powder composite materials was made it possible to reduce the weight without any reduction on load carrying capacity, more elastic strain energy storage capacity and high strength to weight ratio as compared with those of steel. This project presents structural tests with normal strength fibre reinforced concrete with reinforcement ratios that varied between 0 to 30%.

KEYWORD : *Egg shell, Fish bone, compressive strength test, split tensile test, flexural strength test.*

1. INTRODUCTION

According to the literature, by the beginning of the next century the wood will be scarce for the whole world. This situation has led to the development of alternative material. Among various synthetic materials that have been explored and advocated, plastics claim a major share as wood substitutes. Plastics are used for almost everything from the articles of daily use to the components of complicated engineering structures and heavy industrial applications. However, during the last decade, the study of filled plastic composites has simulated immense interest in meeting the future shortage of plastic materials. In fact, synthetic fibers such as nylon, rayon, aramid, glass, polyester and carbon are extensively used for the reinforcement of plastics. Nevertheless, these materials are expensive and are non-renewable resources. Because of the uncertainties prevailing in the supply and price of petroleum based products, there is every need to use the naturally occurring alternatives. Egg shell powder is a natural fibre extracted from the husk of egg shell powder and used in products such as floor mats, doormats, brushes, mattresses, etc. Egg shell powder is the fibrous material found between the hard, internal shell and the outer coat of a egg shell powder. Other uses of brown egg shell powder (made from ripe egg shell powder) are in upholstery padding, sacking and horticulture. White egg shell powder, harvested from unripe egg shell powders, is used for making finer brushes, string, rope and fishing nets. Ropes and cordage have been in use from ancient times. Indian navigators who sailed the seas to Malaya, Java, China, and the Gulf of Arabia centuries ago used egg shell powder for their ship ropes. Arab writers of the 11th century AD referred to the extensive use of egg shell powder for ship ropes and rigging.

1.1 LITERATURE SURVEY

S.M. Sapuan et al. [1] were carried out the experiments of tensile and flexural (three-point bending) tests using natural fibre with composite materials (Musaceae/epoxy). It was found that the maximum value of stress in x-direction is 14.14 MN/m^2, meanwhile the maximum value of stress in y-direction is 3.398 MN/m^2. For the Young s modulus, the value of 0.976 GN/m2 in x-direction and 0.863 GN/m_2 in y-direction were computed. As for the case of three-point bending (flexural), the maximum load applied is 36.25 N to get the deflection of woven banana fibre specimen beam of 0.5 mm. The maximum stress and Young s modulus in x-direction was recorded to be 26.181 MN/m^2 and 2.685 GN/m^2, respectively. Statistical analysis using ANOVA-one way has showed that the differences of results obtained from those three samples are not significant, which confirm a very stable mechanical behaviour of the composites under different tests.

Z.N. Azwa et al. [2] evaluates the characteristics of several natural fibre composites exposed to moisture, thermal, fire, and ultraviolet degradation through an extensive literature review. The effects of chemical additives such as fibre treatments, fire retardants and Ultraviolet (UV) stabilizers are also addressed. Based on the evaluation conducted, optimum fibre content provides strength in a polymer composite but it also becomes an entry point for moisture attack. They concluded that an optimum blend ratio of chemical additives must be employed to achieve a balance between strength and durability requirements for natural fibre composites.

J. Rout et al. [3] Surface modifications of glass and s involving alkali treatment, bleaching, and vinyl grafting are made in view of their use as reinforcing agents in general-purpose polyester resin matrix. The mechanical properties of composites like tensile, flexural and impact strength increase as a result of surface modification. Among all modifications, bleached (65 C) egg shell powder-polyester composites show better flexural strength (61.6 MPa) whereas 2% alkali-treated egg shell powder/polyester composites show significant improvement in tensile strength (26.80 MPa). Hybrid composites comprising egg shell powder mat (7 wt.%), glass and mat (13 wt.%) and polyester resin matrix are prepared. Hybrid composites containing surface modified glass and s show significant improvement in flexural strength.

2. EXPERIMENTAL AND TESTING

- Compressive strength test
- Split tensile test
- Flexural test

3.1 COMPRESSIVE STRENGTH ON CUBE TEST

There are four proportions used in the mixing of concrete. Compressive test is carried out on specimen cubical in shape. The cube specimen is of size 150mm *150mm*150mm is used.

Table-1: Overall Results of Compressive Strength

Mix designation	Compressive strength (N/mm^2)		
	7 days curing	**14 days curing**	**28 days curing**
M0	29.03	35.03	44.58
M1	21.70	24.95	36.88
M2	13.55	19.44	29.18
M3	11.77	18.07	20.07
M4	10.81	14.66	14.59

3.2 SPLIT TENSILE TEST

There are four proportions used in the mixing of concrete.Spilt tensile is carried out on specimen cylindrical in shape.The cylindrical specimen is of size 150mm *300mm is used

Table-2: Split Tensile Strength of ERC Concrete for 28 days

Mix Designation	Curing period	Failure load (KN)	Tensile strength	Avg Tensile strength
M0	28 days	210	2.97	3.11
		230	3.25	
M1	28 days	175	2.47	2.43
		170	2.40	
M2	28 days	170	2.47	2.64
		200	2.82	
M3	28 days	120	1.69	1.83
		140	1.98	
M4	28 days	100	1.41	1.58
		125	1.76	

4. CONCLUSIONS.

The study on the effect of fibers can still be a promising work as there is always a need to overcome the problem of brittleness of concrete. The following conclusions will be being drawn from the investigation.

1. Density of concrete is more as the percentage of fiber increases.
2. Slump will lose at the higher percentage of fiber & lesser fly ash content.
3. Workability of concrete is improves when fly as percentage increases.
4. The specimen will give good Compressive strength and Flexural strength.
5. The Super-plasticizer is necessary for higher grade to get required slump & workable mix.

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