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### EXPERIMENTAL EXPLORATION ON PHYSIOGNOMIES OF CONCRETE USING FSA AND SS

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**Abstract**— Reuse of a large amount of waste materials such as fly ash, Rice Husk Ash, Lime Powder, etc. are done in large extents in the manufacture of cement and Cementitious products. For advance this FSA can reduce the carbon attach, it can be used as a partial supplant for cement. The construction industry relies heavily on cement for its operations in the development of shelter and other infrastructural facilities. The use of Ordinary Portland Cement (OPC) and Fins Scales Ash (FSA) will reduce the carbonation attach because it acts as pozzolana material. Then the Sea shell is crushed and replaced for Fine aggregate and the optimum value of FSA is found and also mixed with those concrete of M30 grade .The compression test is done at 28 days. The Sea shell is replaced with fine aggregate in different proportion 20%, 25%, 30% & 35%.

**Keywords**— *FSA, fly ash, Rice Husk Ash, Lime Powder*

#### 1.INTRODUCTION

Recycling of a large amount of waste materials such as Fly ash, Rice Husk Ash (RHA), Lime powder (LP) etc. is being done in large extents in the manufacture of Cement and Cementitious products. This Pozzolanic property of SCMs has been the reason for the enormous utilization of SCMs in cement. The replacement of cement by supplementary material not only results in savings of the materials, but also reduces the CO<sub>2</sub> emission in the atmosphere, since one ton of cement production results in one ton of CO<sub>2</sub> emitted in the atmosphere.

The Fish place a major role in food chain of human beings because it has rich in proteins and nutrients. It was rich in proteins but it cause some hazardous to us by it waste and other decomposing process. When the fish fins, scales and flesh of them make some poor odour it will affect the environment and it is frequently caused in fish market and other places. Sea shell has a rich in carbon content and it has high strength in flexural properties. One of the important scientific challenges in recent decades is finding appropriate measures of controlling the global climate change which is driven by human activities, particularly CO<sub>2</sub> emissions. Ordinary Portland cement (OPC) is responsible for over five percent of CO<sub>2</sub> emissions worldwide, the waste material reuse in the supplant for cement (eg:- Fly ash, RHA, CHA, Sea Shell ash, etc.,). It also optimize the carbon di oxide emission. To make the use of this fish waste (Fins and Scales) it is converted in to ash and it can be replaced to cement as partial supplant. The aim to find the optimum percentage of the replacement to cement is found using the mortar cubes. The mortar cubes gives the optimum percentage of FSA and the optimum percentage of replacement is found. By using the optimum

percentage of FSA cement is partially replaced and Sea Shell is partially replaced for fine aggregate. Concrete cubes are made for finding the compressive strength for M30 concrete proportion.

Wan Ahmad Soffian Bin Wan Mohammad, Nor Hazurina Othman et al - In this paper emphasis on various sea shells ash as partial cement replacement and its objective is to create sustainable environment and reduce problems of global warming. Results show that the optimum percentage of seashells as cement replacement is between 4 – 5%. [15]

Eun-Ik Yang, Soeng-Tae Yi et al - The main aim of this paper is to study the mechanical and chemical properties of the known mollusc shells. It is rich in calcium carbonates and other macromolecules (mostly proteins and polysaccharides). Tensile strength, fineness, fracture property, crushing strength, abrasiveness are done. [6]

Monita Olivia, Annisa Arifandita Mifshella et al - The results were used to determine the optimal values for the shape, size and volume fraction of the structural elements with regards to hardness, Young's modulus and fracture toughness.[13]

Eun-Ik Yang, Seong-Tae Yi, Young-moon Leem -This paper shows about the mechanical characteristics of oyster shell and how it is replaced in concrete it also shows the properties of fresh and hardened concrete, this paper also shows the interaction between OS and cement paste. It also shows relation between the fine modulus and substitution rate. [8]

Ade Sri Wahyuni, Fepy Supriani, Elhusna, Agustin Gunawan - This paper aims to investigate the tensile strength of concrete with 0.50% addition of bamboo fibre based on cement weight. To increase strength of concrete, the mixture of rice husk ash and sea shell ash was used as partial replacement of fine aggregate. The replacement was done in four different percentage based on the fine aggregate. [1]

Erni Setyowati and Gagoek Hardiman - It shows that Oyster shell and other types of shells has the power of absorbing the sounds and acts as a acoustic materials. It is mainly used in the airport side housing. [7]

## 2. SELECTION OF MATERIALS

### 2.1. Cement

Ordinary Portland Cement of 53 Grade conforming to IS 8112-1989 [17] with specific gravity 3.15 was used.

### 2.2. Course Aggregate

Coarse aggregates used were crushed angular aggregates of normal size 20 mm with specific gravity 2.75.

### 2.3. Fine Aggregate

Fine aggregate used was river sand with specific gravity 2.62, passing through 4.75mm sieve and falling under zone IV as specified in IS 383-1978 [18].

### 2.4. Fins and scales Ash

FSA was taken from Virudhunagar fish market, Virudhunagar, Tamilnadu, with specific gravity 3.09.

### 2.5. Water

Ordinary potable water conforming to IS 456-2000 [16] was used for concreting and curing.

### 2.6. Mix Design

The concrete mix proportion for M30 concrete was arrived based on IS10262-2009 [19] method and is given in Table 1.

*Table 1: Mix proportion for M30 concrete*

Materials/m <sup>3</sup> of Concrete	Water	Cement	FA	CA
Kg	197	438	672.30	1173
Mix	0.45	1	1.53	2.68

### 3. EXPERIMENTAL PROGRAM

The main objective of this investigation is to find the compressive strength for the concrete specimen of grade M30 in which the proportion of 1:1.53:2.68 with FSA and Sea Shell as partial replacement for cement and fine aggregate. The below table shows the mix proportion of FSA and SS.

*Table 2: Percentage replacement of FSA & SS for M30 concrete*

Concrete Mix ID	FSA %	SS %
FSA0-SS0	0	0
FSA10-SS20	10	20
FSA10-SS25	10	25
FSA10-SS30	10	30
FSA10-SS35	10	35

### 4. RESULTS AND DISCUSSION

Compressive Strength variation for Concrete Cubes with varying proportions of Fins and Scale Ash (FSA) and sea shell as replacement for cement and fine aggregate is done to find out the compressive strength. The compressive strength values are displayed in the Table 3.

*Table 3: Compressive strength variation*

Mix ID	Average Compressive Strength for 28 days (N/mm <sup>2</sup> )
FSA0-SS0	33.25
FSA10-SS20	35.50
FSA10-SS25	36.60
FSA10-SS30	37.50
FSA10-SS35	31.45

From the Table 3, it is found that the compressive strength increases when it reaches the optimum percentage of both FSA and SS.

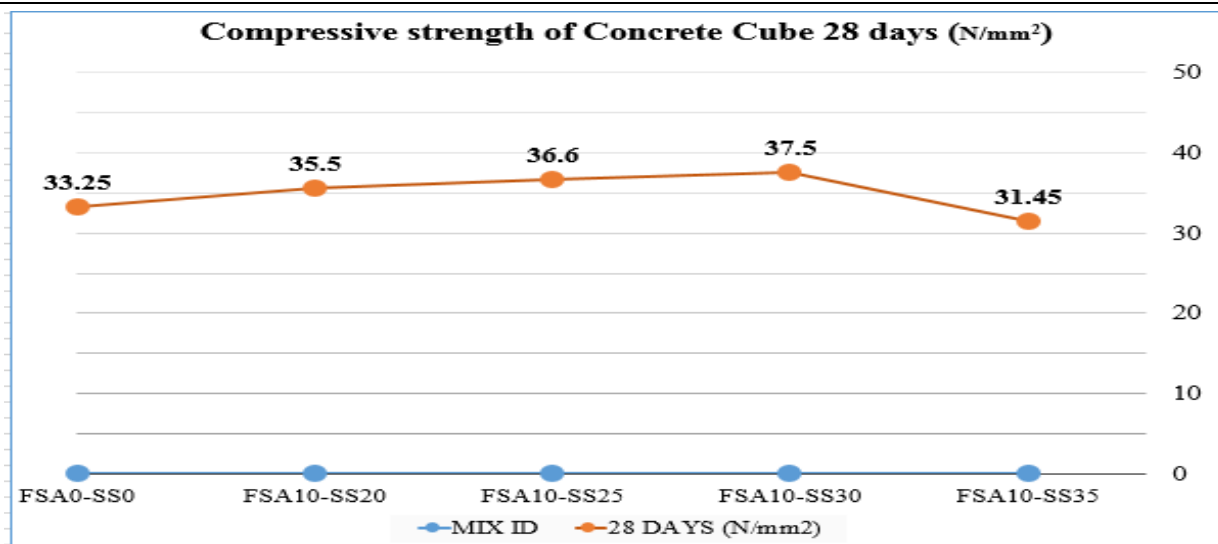


Figure 1: Compressive strength variation for 28 days

Therefore fig.1 shows the increase in compressive strength and the peak value increase shows 12.78% increase in strength compared to the control concrete mix. The final replacing percentage of FSA10-SS35 shows the reduction in compressive strength compared to the control mortar mix. The difference in compressive strength between the control mix and the last proportion mix is 5.72% reduction in compressive strength compared to the control mix. The comparison between the peak and the previous values are 2.4% increase in strength is obtained while increasing the replacing proportion of SS.

## 5. CONCLUSION

The compressive strength for the concrete mix of M30 is achieved by replacing cement and fine aggregate by FSA and SS. The replacement of cement with FSA reduce the CO<sub>2</sub> emission in concrete and the SS replacement shows the use of sea waste in concrete. The gradual decrease in the value shows the excessive amount of FSA and SS is added to the concrete. The increase in compressive strength and the peak value increase shows 12.78% increase in strength compared to the control concrete mix.

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