Impact Resistance of Ternary Concrete Using Scba and Silica Fume as Partial Substitute of Cement in Concrete

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ABSTRACT: Concrete structures inevitably encounter dynamic loads throughout the planning lifetime of structure. Impact resistance is necessary factor for evaluate the dynamic concert of concrete. To fulfill the necessities of strength and toughness properties of concrete we have a tendency to use the industrial by-products likecoal bottom ash, silica fume, metakaolin, etc., as supplementary building material. During this research work the experimental investigation was investigation to gauge the Impact resistance of TBASF concrete mixby cement is partially substitute with silica fume 10% and also the SCBA 0%, 5%, 10%, 15%, 20% and 25%. The Impact resistance of TBASF concrete mix is additionally compared with normal concrete. This study is additionally conducting elaborated investigation of TBASF concrete for mineralogical properties by using Optical microscope and XRD keeping Impact resistance in view. The maximumpercentage of SCBA is obtained at 15% replacement of cement.

Keywords: Impact test, SCBA, Silica fume, Optical microscope, XRD.

I. INTRODUCTION:

At present, concrete industry is cursed with the insufficiency of the aggregates and atmosphere pollution from cement production. The cement industry contains an important contribution in global warming on account of combustion of fuel within the cement kiln and also the electricity used for grinding the clinker, emit great amount of co_2. Cement industry is liable for regarding 5% of world co_2emissions. Therefore, it becomes terribly essential and additional important to try to find the substitute for each cement in addition natural aggregates. Aside from it, the continual growth of agro and industrial waste is that the principle reason for several environmental issues and burdens which may be reduced.Groundnut shell from Groundnut, rice husk from Paddy, wheat husk and wheat straw and from Wheat and bagasse from Sugarcane are the wastes of agriculture. In these 3 components cement is that the most significant constituent of concrete. Throughout the cement production one among the greenhouse gases known as greenhouse emission is emitted, which can cause global warming. So as to decrease this global warming a number of the agro wastes are utilized in construction materials. Because of the flexibility of concrete many waste materials realize their approach within the cement replacement and aggregate within the concrete production.

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Flyash enhanced industrial additionally as technical feasibleness directed many researchers to utilize alternative waste and ashes in concrete. These resulted within the utilization of silica fume, rock dust, sludge, SCBA, siliceous stone powder, egg shell powder, and alternative such materials in concrete. The bagasse ash utilization in concrete effectively serves to conserve the natural resources and lowers the cement consumption. To alleviate the rising price of materials particularly cement for the assembly of concrete, maximized waste utilization is needed through utilizing sugarcane bagasse ash.

II. EXPERIMENTAL INVESTIGATION MATERIALS:

CEMENT: Ultra-tech cement ofOPC 53 grade, accordance withBIS: 12269-1987 was used.

FINE AGGREGATE:
Fine aggregate regarding to Zone-2, accordance withBIS: 2386-1963 was used.

COARSE AGGREGATE:
Coarse aggregate of size 20mm, accordance withBIS: 2386-1963 was used.

SUGARCANE BAGASSE ASH:
SCBAcollect from NCS sugar limited, Vizianagaram district, Andhra Pradesh, India, was used as mineral admixture.

SILICA FUME:
Commercially accessible densified silica fume from Vizag chemicals private limited, Visakhapatnam district, Andhra Pradesh, India was used as mineral admixture.

MIX PROPORTION:
During this work, W/C ratio of 0.45 wasused for M30 grade concrete. Silica fume of 10% and SCBA of 0%, 5%, 10%, 15%, 20% and 25% were partially replaced by cement in concrete.

MIXING PROCESS AND SAMPLE MOLDING:
The blending process was choosing to take upby trial and error technique.Within the starting cement, silica fume and SCBA were mixed completely till uniform colour and so coarse aggregate and fine aggregate was addedsupplementary to cement mix together by adding water and mix it for 10 minutes.

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Every mixture of newly TBASF concrete mix was then cast into cylinders (150 x 300mm), cubes (100 x 100 x 100mm) and prisms (500 x 100 x 100mm) that were utilized in the splitting tensile, compressive and flexural tests respectively. Cylindrical discs (96 x 50mm) be cut as of the cylindrical concrete samplesbe used for the impact test.

III. IMPACT TEST:

The impact resistance of the concrete samplesascertain in a manner in accordance with to the process within the ACI committee 544.2R-89. The deliberations are specified within the subsequent section.

For drop weight impact test, count the blows until the concrete sample completely failure. The 13.5 kg hammer was dropped constantly at a height of 413 mm on top of a concrete sample that was located at the bottomshield of the impact testing machine.

IV. RESULTS AND DISCUSSION

RESULTS:

The average compressive strength, split tensile strength, flexural strength and impact strength results be graphically shown in fig 2, fig 3, fig 4 and fig 5.

Compressive strength:

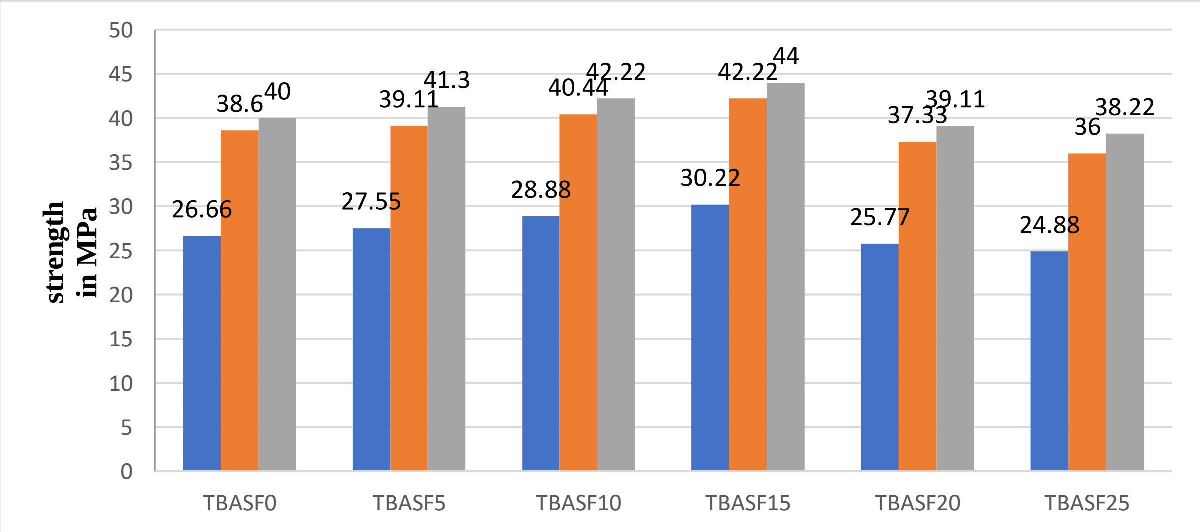

Fig 1: compressive strength of TBASF mix

Flexural strength:

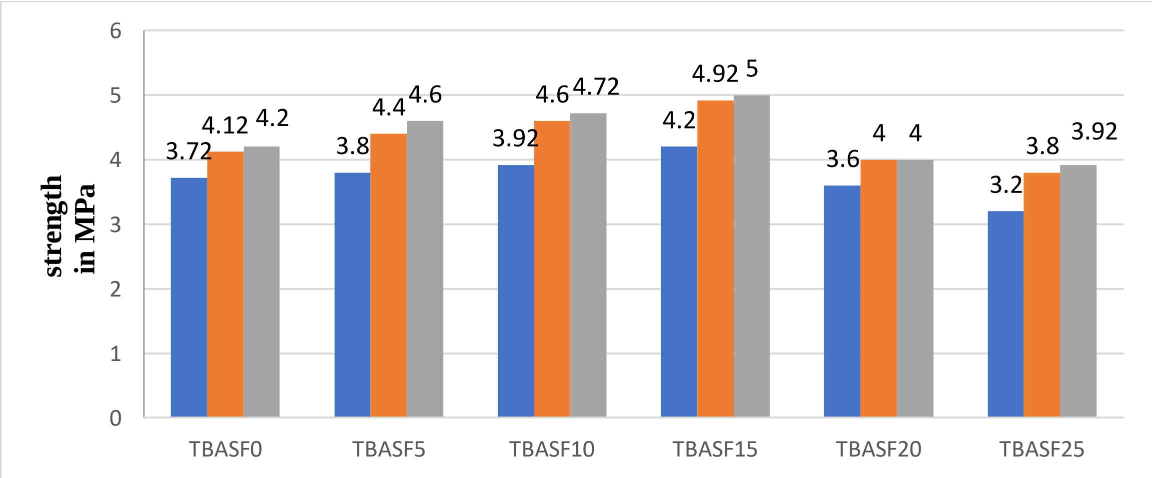

Fig 2: flexural strength of TBASF mix

Split tensile strength:

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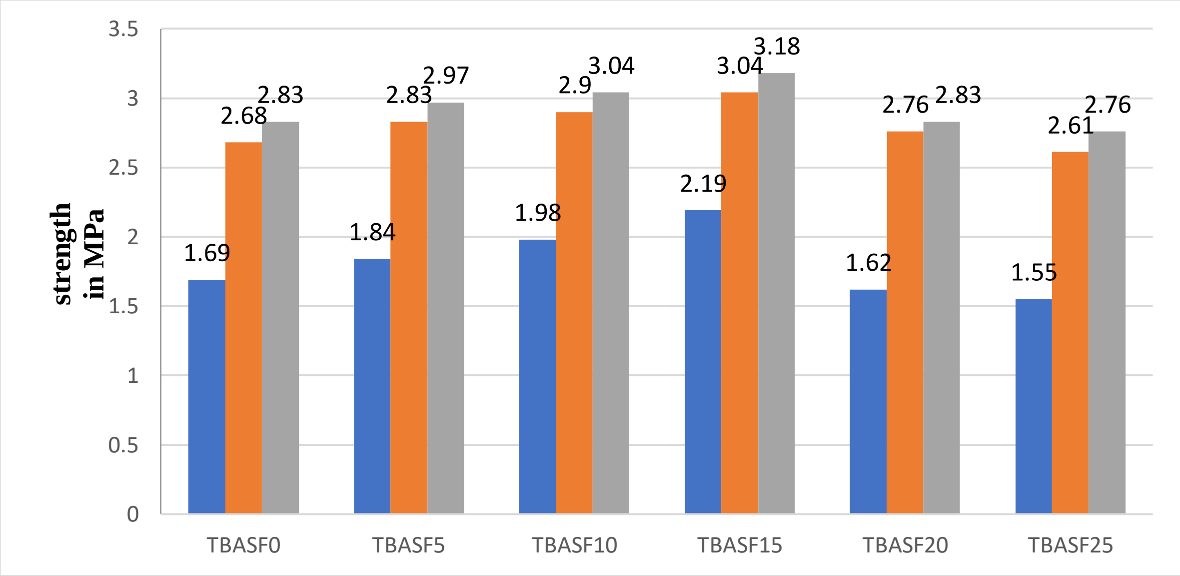

Fig 3: split tensile strength of TBASF mix

V. IMPACT TEST:

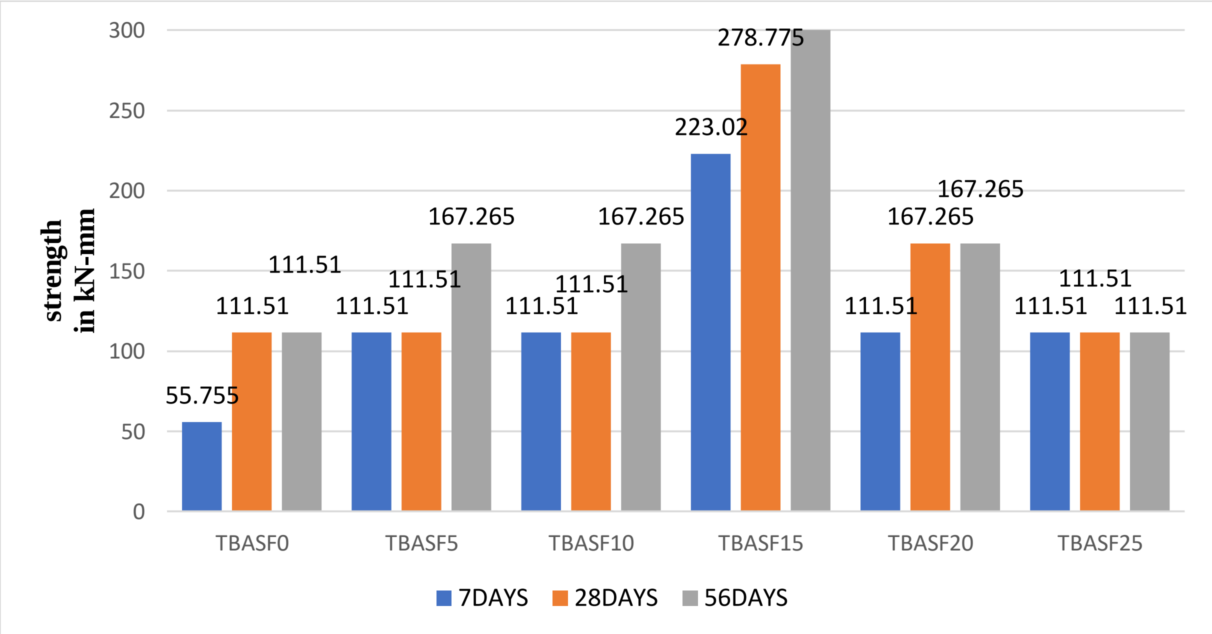

Fig 4: Impact strength of TBASF mix

VI. Optical microscopic analysis:

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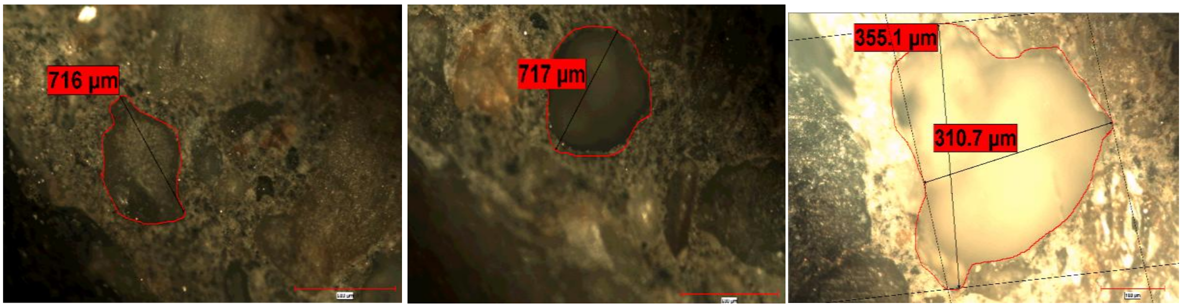

Fig 5: Air voids present in the TBASF0, TBASF5, and TBASF10

Fig 6: Bonding between aggregates and cement paste for TBASF15

X-Ray diffraction:

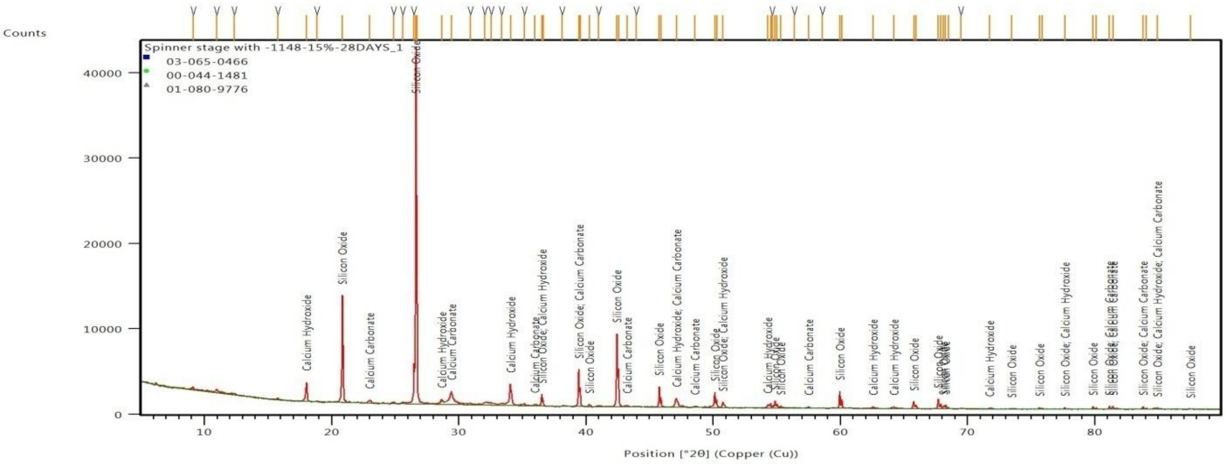

Fig 7: X-ray diffraction pattern of TBASF15

VII. DISCUSSIONS:

- From fig 1, it is observed that the compressive strength of TBASF15 is greater than that of TBASF0. The optimum value occurs at TBASF15 i.e. 44Mpa. Further, increasing in SCBA percentage results in decreasing compressive strength due to presences of air voids and improper bonding among the aggregates and cement paste.
- From fig 2, it is observed that the flexural strength of TBASF15 is greater than that of TBASF0. The optimum value occurs at TBASF15 i.e. 5Mpa.
- From fig 3, it is observed that the split tensile strength of TBASF15 is greater than that of TBASF0. The optimum value occurs at TBASF15 i.e. 3.18Mpa.
- From fig 4, it is observed that the impact resistance also increased the energy absorption for TBASF15 increased. The optimum value occurs at TBASF15 i.e. 278.775kN-mm.
- From fig 5, it is observed that the images of the optical microscope show the presences of air voids hence the strength decreased for TBASF0, TBASF5, and TBASF10.
- From fig 6, it is observed that the images of the optical microscope show the good bonding among aggregates and cement paste hence the strength increased for TBASF15.
- From fig 7, the major compounds identified in the TBASF15 by XRD are silica fume; calcium hydroxide and calcium carbonate are observed.

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VIII. CONCLUSIONS:

From the test result of the experimental investigations the following observations were drawn for optimum concrete mix TBASF15:

- TBASF15 concrete mix showed much higher compressive strength when compared TBASF0 by 11.83%.
- TBASF15 concrete mix showed significantly higher flexural strength when compared TBASF0 by 14.4%.
- TBASF15 concrete mix showed significantly higher split tensile strength when compared TBASF0 by 18.8%.
- TBASF15 concrete mix showed the energy absorption significantly higher when compared TBASF0.
- TBASF15 concrete mix showed the good bonding between aggregates and cement paste and Sio_2 was the only component identified as pure silica fume by observing through optical microscope and XRD.
- The utilization of agriculture waste like SCBA reduce the utilization of cement thus reduces the possible greenhouse emission. In addition, this would help in reduction of disposal of bagasse and health problems near the sugar manufacturing industry**.**

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