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Utilization of Waste Material in Construction Industry : A Review

Swity Ahirwar[1], Ravindra Kumar Raj[2]
P.G. Scholar[1], Assistant Professor[2]
Department of Civil Engineering, Babulal Tarabai Institute of Research and Technology, Madhya Pradesh, India

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ABSTRACT

In the modern scenario, desires from concrete have expanded exponentially, different physical parameters of concrete like strength, durability, serviceability and cost needs change i.e. how successfully we can save the cost of cement without bargain the strength and durability of cement [1]. To defeat the inflation, supplementary cementitious material is utilized as a part of conjunction with OPC so that the durability, maintainability and cost effective can be accomplished. In India, 7.8 million ton GGBS as a by-product obtain in the manufacturing in the blast furnace. As the project financial development and improvement in the steel businesses the measure of generation is probably going to increment numerous folds [2-3]. Because of exponential developing in urbanization and industrialization by item from the steel businesses, for example, GGBS is turning into an expanding worry for reusing and waste material. Being a result utilizing it successfully up to some degree fills in as a stage for a green situation and at a same time remembering that the quality of cement doesn't debased by the use of GGBS. In this paper we presenting review of literatures related to experimental investigation of concrete.

Keywords : Concrete, GGBS, cement, strength, development, utilization of by product.

I. INTRODUCTION

It is a byproduct of the iron manufacturing industry. When raw materials are fed into the furnace and the subsequent molten slag floats over the molten iron having temperature range of around 1500°C to 1600°C [5]. The composition of molten slag having 30% to 40% SiO_2 and around 40% CaO, which is almost, like the chemical composition of Portland cement. After the molten iron is tapped off, the staying liquid slag, which comprises of for the most part siliceous and aluminous deposit, is then water extinguished and cooled quickly, bringing about the development of a polished crystalline granulates [6-7-8]. This glassy granulates appearance are dried and converted into powder form which is known as ground granulated blast-furnace slag (GGBS). When we talk about the replacement of Portland cement with GGBS will offers a carbon dioxide gas emission. GGBS is along these lines an environmental friendly construction material. It can be utilized to replace as much as 80% of the Portland cement utilized as a part of concrete.

II. LITERATURE REVIEW

Vijay Madhavrao Takekar and G. R. Patil (2017) focused on Grounded Blast Furnace Slag (GGBS) as a choice for binder and filler materials in case of ordinary Portland Cement (OPC). The experimental result analyses are investigated for structural houses of fiber reinforced concrete equipped with GGBS. Concrete grade M-50 became taken for have a look at. GGBBS with 0%, 10%, 20%, 30% and 40% with the aid of weight of normal cement turned into brought successively; also 1.5% of steel fiber turned into saved regular. Variables protected combination size (10mm, 12mm and 20mm) with percent of GGBS so that you can observe the impact on compressive energy, tensile electricity and flexural power. 150mmX150mmX150mm size of dice and 100mmX100mmX500mm length of beam have been examined for energy overall performance in shape of compressive and flexural electricity respectively. Samples with duplication of GGBS were cured for fifty six days in assessment to normal cement which calls for up to twenty-eight days. Experiments with these samples had been executed to study the strength characteristics of the concrete. Outcomes indicate that as the percentage of GGBS will increase, the workability of GGBS fiber reinforced concrete additionally increases. The result additionally consists of effect of price and compressive electricity for GBBS fiber reinforced concrete.

K.Vidhya et al. (2017) studied the steel fiber (Hooked end and crimpled) percentage in addition to the weight of cement. The Compressive strength, tensile strength and flexural behaviour of steel fiber reinforced concrete beam with the varying percentage of fiber of M40 grade of concrete.

Namani Saikrishna & Syed Moizuddin (2017) investigated the strength, split tensile strength tests have been performed by means of silica fume in various percentage of 5%, 7%, 10% and 15% to the weight of cement and 0.5%, 1%, 1.5%, and 2% of steel fibers to the weight of concrete of round crimped kind having aspect ratio 45.45 (length 25 & diameter 0.55) were used. Concrete cubes are examined at the age of 7, and 28 days of curing. Sooner or later, the strength performance of steel fiber concrete is compared with the performance of conventional concrete.

Pooja et al (2017) obtained result on higher the strength of steel fiber resistant concrete. Those fibers added may be affected at the workability, density and on various strengths of M60 grade concrete. On this, fiber content material could be various from 0.5% to 2% by using weight of concrete at the period of 0.5%. Here the replacement of cement through 20% of fly ash and 10% of GGBS. GGBS cement will be having higher ultimate strength than the material which is made with the aid of Portland cement. Water-cement ratio may be very critical to keep within the minimum limit, for that we can be the use of the water falling admixture on the way to be superb plasticizer, for you to be very vital position. As this fibre content will increase the workability of soggy blend up is found to be reasonably-priced. As the fibre content will increase in most, it is discovered to be energy structured. FRC over plain high SSC will be increases the electricity and mechanical load carrying ability. Better for cracking and breaking flow is its important assets of steel fibers. To find out the compressive force, cut up tensile force and additionally combating for cracking with the aid of figuring out the flexural force of M45 grade 0%, 0.5%, 1%, 1.5%, 2% through quantity fractions as its element ratio is 50.GGBS of particle diameter of less than three micrometer just contributes to early strength of mortar. For long term strength of mortar, GGBS with extra most effective have micro-aggregate impact.

Anjali Prajapati et. al. (2017) studied the effect of performance of HPC using mineral admixture i.e. fly ash and GGBS with M-60 grade of cube specimen .We partially replaced Portland cement by weight of binder. Fly ash and GGBS replacement varies from 10% to 30%. We used complast SP430-Sulphonated Naphthalene Polymers as a super plasticizer for better workability for high performance concrete. Dosage for super plasticizers is same for all mix proportions. Also, we have replaced fine aggregate in different proportions with foundry sand. We have investigated compressive strength, split tensile strength and flexural strength for all different cases. The HPC mix, grade M 60 concrete is designed as per Indian standards.

Muthu kumar T et. al. (2016) researched on high performance concrete the usage of M50 mix ratio. Excessive overall performance concrete this is performed replaces 100% the best aggregate through grinding sand and partial cement substitute through micro-silica (i.e., five%, 10%, 15%, 20% and 25%). Glenium B233 became added for the workability of the concrete mix. A result obtained has been analysed and as compared with a manage sample. A dating among compressive strength as opposed to days, tensile electricity versus days and bending power as opposed to days, shown graphically. end result facts really shows an growth in the percentage in 7 and 28 days Compressive strength, tensile electricity and flexural power for M-50 grade of concrete. mixture of micro-silica, grinder-sand and super- plasticizer on this experimental research display an exquisite development in compressive power in addition to tensile homes. The cement become changed by using micro-silica with 20%, but the energy extended via 16.5%. powerful high concrete strength is attainable with micro-silica.

Ishwar Chandra Thakur et. al. (2016) focused on the utilization of GGBS in concrete which may be suitably used below the Indian conditions. For this cause, the diverse assessments on houses of inexperienced and hardened concrete have been executed. The homes of green concrete have been analysed by using workability of concrete in terms of hunch fee whereas the houses of hardened concrete had been analysed in phrases of mechanical and bodily properties of concrete. The mechanical houses of hardened concrete encompass the compressive strength, flexural power and break up tensile energy whereas physical homes includes the dry & moist density and water absorption of hardened concrete. On the idea of present paintings we determined that GGBS in concrete improves workability, compressive power, flexural electricity, cut up tensile energy and decreases the density & water absorption traits of hardened concrete and as a result the cost of concrete decreases. additionally GGBS results in the big reduction in the amount of cement which permits the reduction in CO_2 emission and reduction in electricity consumption in production of cement.

Nandhini.J and Kalingarani. K (2016) studied the behaviour of hybrid fiber reinforced concrete beams in terms of flexural energy and ductility factor in assessment to a nominal concrete blend of grade M40. Further to the usage of fibers cementitious substances are replaced for cement which includes micro silica, GGBS and fly ash to collect high energy concrete. Those substances are replaced for its most advantageous stage to the burden of cement content material. The fibres used are steel and polypropylene that are brought in the concrete blend at an extent basis. The flexural power of the strengthened concrete beams are determined via subjecting to four point static loading system. The outcomes received have proven that GGBS replaced concrete specimens display multiplied strength ability and additionally through the usage of fibers in concrete its ductility has improved and the crack widths are reduced and managed tightly.

Praveen Kumar S R et. al. (2016) organized a high strength SCC of high-quality M60 through in part replacing the cement content material with the untreated industrial by-merchandise which include fly ash & ground granulated blast furnace slag (GGBS) and also via changing one hundred% herbal sand with synthetic sand (M. Sand). With the usage of those industrial by way of-merchandise, it consequences in an environmentally friendly environment and additionally solves the trouble of disposal. Their work deals with the comparative observe of mechanical homes which include compressive strength, split tensile strength and flexural electricity of SCC for specific probabilities of powder content material with using glass fibers at zero%, zero.1% and zero.2% of the total extent of the concrete. to combination. in this look at, types of SCC mixes had been prepared, namely traditional SCC, changing the cement content material by 30% with fly ash and Triple-blended SCC, decreasing the cement content material to 50% and replacing the relaxation of the cement content with fly ash & GGBS with 25% each. The samples are poured, cured and examined for the specified range of days.

Sujit V. Patil and N. J. Pathak (2016) investigated the outcomes on compressive strength of concrete of 50 % cement alternative with granulated ground blast furnace slag the use of alkali resistant glass fibers with varying percentage i.e. 0.2%, 0.3%, 0.4% & 0.5% respectively for 7 days and 28 curing days and impact of magnetic water utilized in blending and curing concrete and compare the results with specific percentage of fibers and curing days. Twenty mixes had been tested and studied with exclusive percentage of glass fiber with and without impact of magnetic water. Among the mixes the mixture with substitute of 50 % GGBS and 0.3 % of AR glass fiber is higher with appreciate to strength.

Ram Kumar and Jitender Dhaka (2016) examine M-35 concrete mix with partial substitute with the aid of silica fume with varying 0, 5, 9, 12 and 15% with the aid of weight of cement The paper offers a detailed experimental examine on compressive strength, flexural strength and split tensile strength for 7 days and 28 days respectively. The effects of experimental investigation suggest that the usage of silica fume in concrete has accelerated the strength and durability at all age while as compared to normal concrete. Consequently the use of Silica Fume leads to reduction in cement quantity for construction purpose and its use need to be promoted for higher performance as well as for environmental sustainability.

T. Subbulakshmi and B. Vidivelli (2016) focussed on improvement of alternative materials are included with raw materials of cement, fine aggregate and coarse aggregate due to scarcity of materials and enhancing the strength property with the manufacturing of high performance concrete. Silica fume, bottom ash, steel slag mixture are the admixture materials for replacing raw materials that may obtain high strength and performance based assets. An effort has been made to pay attention on the mineral admixture of silica fume in the direction of their pozzolanic reaction and industrial by-product of bottom ash and steel slag closer to their hydration response may be contributed toward their strength and durability properties for this reason there 3 materials can also use as a partial replacement material in making HPC. In this present examine, the compressive strength of concrete has been predicted using Artificial Neural Network (ANN). Further scanning electron microscope was studied. Microstructure constitutes the character of the strong component and nonsolid portion.

Suchita Hirde and Pravin Gorse (2015) investigated on structural properties of fiber reinforced concrete with GGBS. M50 grade of concrete was considered for the study. Cement was replaced by GGBS with 0%, 10%, 20%, 30% & 40% by weight of cement. Percentage of steel fiber was kept constant as 1.5%. The variables were size of aggregate (10mm 12 mm &

20mm) and variable percentage of GGBS to study the effects of size of aggregate and percentage of GGBS on workability, dry density, compressive strength and flexural strength. Cubes of 150mmx150mmx150mm size for compressive strength, beams of 100 x 100 x 500 mm for flexural strength were cast. Specimens with replica of GGBS were wet cured up to 56 days while normal concrete was cured up to 28 days. All specimens were tested subsequently to study the strength performance of this concrete. Workability of GGBS fiber reinforced concrete was found to be increased with increase in GGBS percentage. Results of compressive strength, cost effectiveness and toughness indices under flexural loading condition for ground granulated blast furnace slag fiber reinforced concrete are presented.

Surekha & Chandra shekhar (2015) investigate the strength properties of GGBS (ground granulated blast furnace slag) and Silica Fume together with polyvinyl chloride dust on the various replacement levels. Large-scale cement production reasons environmental troubles. This has led the researchers to use extra material when making concrete. Polyvinyl chloride dust is a waste product this is produced in the pipe industry. PVC dirt is used as a filling material to use the waste. M40 concrete quality is used in the examine and the design of the mix is carried out. A constant 8% Silica Fume was used to replace cement for all mixes. The effect of GGBS was investigated by replacing cement with 30 to 50%, collectively with PVC dirt 0 to 10 % as an additive. Mechanical strengths which include compressive strength, split tensile strength and flexural strength are tested.

Rajith M & Amritha E K (2015) investigated the behaviour of M30 concrete by partial replacement of cement and fine aggregate by using ground granulated blast furnace slag (GGBS) and granulated blast furnace slag (GBS). Cubes, cylinders and beams are tested for compressive, split tensile and flexural strength after 28 days of curing. Cubes are used to locate the ultrasonic pulse rate. The replacement percentage of cement and high-quality mixture by using GGBS and GBS is 20, 25, 30 and 25, 50 and 75 respectively. The water cement ratio used in this work is 0.45. It's been discovered that via partial replacement of cement by GGBS and sand with GBS the concrete strength in concrete has improved compared to normal mixed concrete.

Biswadeep Bharali (2015) experimental studies are being performed to recognize the fresh and hardened properties of self-compacting concrete (SSC), replacing cement with grinded GGBS and fly ash in various proportions for M30 grade concrete. The ratios in which cement is changed are 30% GGBS, 20% of each GGBS and FA, 40% GGBS, 15% of both GGBS and FA, 40 % FA and 30% FA. The strength behaviour, the bending behaviour and the split tensile strength behaviour of SSC are studied. The parameters are tested at different ages in accordance with the Bureau of Indian requirements (BIS) for the various ratios wherein cement is replaced and also the obtained parameters are as compared with ordinary SSC (100% cement). Super plasticizer GLENIUM B233 a BASF product is used to preserve process ability with constant water-ratio.

E.V.S. Santhosh Kumar and D. Maheswara Reddy (2015) studied the feasibility of adding a few SCMs (extra cementitious materials) which include slag cement or GGBS cement and fly ash are used as an addition to the Portland cement. The steel slag a by-product of steel manufacturing is produced during the separation of molten steel from impurities in furnaces for making steel. This will be used as a coarse aggregate in concrete. These SCMs are partially replaced by filler fabric material such as silica vapour in different mixing ratios of 10%, 20% and 30% in concrete of an M20 mix. Given the above parameters, the aim of the stufy is to look at the overall performance of various properties along with compressive and flexural strength and wet-dry test after 26 and 56 days of concrete.

S. Murali Krishnan & T. Felix Kala (2015) studied the durability properties of concrete wherein manufactured sand (M-sand) is used as a partial and complete replacement of natural sand. To preserve the natural useful resource along with natural sand, this studies attempts to partially replace the natural sand with M-sand. The current article focuses on investigating the characteristics of M60 concrete with partial replacement of cement by GGBS and fine aggregate with the manufactured sand. It seems that because of the partial replacement of cement with the aid of GGBS and fine aggregate with manufactured sand helped to seriously improve the durability of the concrete compared to regular concrete mixtures the durability properties of concrete are advanced by partially replacing 50% of the sand.

Christina Mary V. and Kishore CH (2015) explains strength and durability analysis of GGBS concrete which gives warranty to encourage people running working in the construction industry for the beneficial use of it. This research work specializes in strength and durability characteristics of M40 grade concrete with replacement of cement by means of GGBS with 10%, 20%, 30%, 40% and 50% and substitute of natural sand by M sand with 50% and compares it with conventional concrete. Compressive, split and flexural test were performed on concrete specimens for strength analysis and for durability studies RCPT, Sorptivity and Acid attack test were conducted. HPC mixes have also indicated better resistance to chloride whilst tested in RCPT (Permeability test), Sorptivity and to the attack of chemical along with HCL acid when the HPC mixes were exposed to this acid for 30 days period.

Anusha Suvarna et al (2015) tested on different materials like ground Granulated Blast Furnace Slag, and Silica Fume to gain the favoured results. She will use synthetic fiber (i.e. Recron fiber) in percentage 0.2%, 0.3%, 0.4% to that of general weight of composite and casting may be finished to find out the most appropriate percent of fiber for use. finally she will use different percent of Silica Fume & GGBS with the substitute of cement retaining constant the greatest fiber content and concrete can be casted. Compressive test, splitting test, flexural test can be conducted on the prepared mortar cubes, cylinders& prisms.

Benson. et al, (2014) discussed about the appraisal of allotment of the fibres in a course group of an elevated-piece composite steel, which will be non-breakable cement thickset. The end product of the method of combination & the character of the objective in their portion of the fibre is to calculate by means of destructive & non-destructive performance. More than a few theory has formulate to compute the potency of concrete reinforced with fibres in relationship of tension assumed for fibres & matrix, & guidance, volume fibre spacing of critical fibre, appearance & interfacial coming together linking the fibres & the prevailing conditions.

T. Subbulakshmi et al (2014) replaced the constituent materials by means of mineral admixtures, chemical admixtures and additives additionally; it's far proposed to apply high performance concrete. Also high performance concrete specimens with fiber and without fiber in length 150mm x 150mm x 150mm, cylinder of 150mm x 300mm and prism of 100mm x 100mm x 500mm were cast and the strength tests were determined. Finally mechanical r properties of concrete were done by using ANN modelling.

A Sumathi et al (2014) decided the higher use of super plasticizers does not affect the strength of concrete however it affect the workability of concrete. They decide using hook end steel fibre increase the compression strength, split tensile strength and modulus of rupture. Additionally they decide the most effective use of steel fibre is 2 %.

M. Adams Joe et al (2014) focused on investigating characteristics of M40 concrete with various proportional of replacement of cement with Ground

Granulated Blast furnace Slag (GGBS) and including 1% of steel fibre. Ten mixes were studied with GGBS & steel Fibre the usage of a water binder ratio of 0.35 and super plasticizer CONPLAST SP-430. The cubes, cylinders and prisms had been examined for both Compressive, split tensile, Flexural strengths. A few of the mixes the mixture with replacement level as 10%, 20%, 30%, 40% & 50% of GGBS and 1% steel fibre is higher with respect to strength and durability. Concrete is a mixture of cement, fine aggregate, coarse aggregate and water. It is observed by the 40% replacement of cement with GGBS and steel fibre helped in improving the energy of the concrete significantly in comparison to control concrete.

P. Ramadoss et al (2014) determined addition of steel fibres to silica fume concrete significantly enhances modulus of rupture and durability. Silica fume and steel fibres have the synergistic effect that brings the blended impact of each the materials into play in concrete mix. They also determine residual impact strength ratio and crack resistance factor of HPSFRC at 28-day acquired are approximately 1.3 and 71.2 respectively and at 56-day the values are 1.2 and 55, respectively.

Abhinav S. Pawar (2014) determine optimum use of GGBS the compressive strength and flexural strength increases but higher use of GGBS the compressive strength and flexural strength decreases. It also determines the Portland cement concrete gives the higher strength after 56 days.

Jayie Shah & Ashita Sheth (2014) examines the analysis of the effects of the use of fibers and mineral additives in the mechanical properties of high-strength concrete. This study involves the use of various mineral additives such as fly ash, ground granulated blast furnace slag, silica fume together with steel fibers. It also includes the determination of mixing ratio with various mineral auxiliaries and steel fibers, determination of the water binder ratio, determination of basic properties of concrete such as tensile strength, compressive strength, bending strength and water permeability. This is why it is felt that it is necessary to investigate the feasibility to arrive at an optimal mix with the help of a combination of fibres with two or more mineral additives to increase the properties at minimum cost.

Mojtaba Valinejad Shoubi et al. (2013) reviewed manufacturing method and degree of effectiveness of some industrial by products such as GGBS, Silica Fume and PFA as cement alternative to gain high performance and sustainable concrete which could lead not most effective improving the overall performance of the concrete but also to the reduction of emission of CO2 by reducing the amount and how they have an effect on economic, environmental and social aspects definitely.

Amit Rana (2013) discovered that the ideal steel fibre amount is required to accomplish most extreme number of flexural quality in M25 review has been found. From these thorough and broad exploratory works there has been discover that there was an expansion increment in steel fibre was additionally an amazing increment in flexural quality. For 1% calm of steel fibre the flexural quality was 6.46% N/mm2 was test again on flexural quality was 5.36% for 0%, at last add to 1.1% flexural quality.

Roopa Saira Thomas and Jebitta Fancy Rajaselvi .P (2013) replace the cement with GGBS with 20%,30%, 40% and RHA and steel fiber with constant proportion (10% and 1%) for minimum grade concrete i.e., M30 and is examined for fresh and hardened properties at 7, 14and 28 days to identify the optimum percentage of GGBS in concrete. Replacement of cement by GGBS in M30 grade concrete. Result in compressive strength, split tensile strength and flexural strength improvement as much as the replacement of 30% in all ages.

A. Elahi et al (2013) presented an research of mechanical and durability properties of high performance concrete containing w/c ratio 0.3 which has used supplementary cementitious materials inclusive of silica fume, fly ash, ground granulated blast furnace slag in binary and ternary systems. Portland cement become used with fly ash as much as 40 % and silica fume

up to 15 % and GGBS changed into replaced up to 70% done the fine among all of the mixes to withstand the chloride diffusion.

Reshma Rughooputh and Jaylina Rana (2013) studied the outcomes of partial replacement of OPC by means of GGBS on various properties of concrete along with compressive strength, tensile strength, splitting strength, flexural strength, modulus of elasticity, dry shrinkage and initial water absorption. Cement was partially replaced by 30% and 50% GGBS by weight and the test became carried out at 7 and 28 days. It was found that GGBS in concrete results in a lower early compression strength growth, but a better compression strength benefit. Bending strength of the test samples increased by means of 22% and 24%, the tensile strength accelerated by using 12% and 17% for 30% and 50% replacement respectively. The drying shrinkage increased by 3% and 4%.

A.M. Shende et al (2012) determined the 3% use of steel fibre increase the compression strength, split tensile strength and flexural strength compared to use of 0%, 1%, 2%.They also determine that increase the compression strength, split tensile strength and flexural strength to 11-24%, 12-49% and 3-41% respectively by addition of steel fibre.

Parashivamurthy R and Laxmi. G.G (2012) studied to know the strength of geopolymer concrete by means of including hooked steel bars inside the mix by means of making 3 mixes with various proportion of fly ash and GGBS like 1st mix with 70% fly and 30% GGBS, 2d mix with 50% fly ash and 50% GGBS and subsequently 60% fly ash and 40% GGBS. For all the three mixes hooked steel fibers have been added and from this 24 cubes, 24cylinders, 24 beams casted. And all of the test specimens had been tested for compression test, flexural flexural test and split tensile test. And subsequently strength of geopolymer concrete with steel fibers was decided. They concluded that the workability of the GPC mix diminished with addition of steel fibres. The premiere dosage of steel fibres for an aspect ratio of 50 is

1.5 % via volume of concrete and observed that addition of super plasticizer will improve the workability so long as total water to GPC solid ratio is within 0.35.

B. Siva Konda Reddy (2012) studied on this research program has decide the addition of micro-silica to plane concrete up to 7.5% reduces HPC permeability, however similarly addition does now not reduce the permeability. Addition of micro-silica greater than 10% makes the concrete harsh, dry and hard to work. In addition they determine that addition of steel fibre to HPC improved the resistance to chloride ion penetration.

S. Arivalagan (2012) investigated the strength and strength-efficiency factors of hardened concrete by partially replacing cement by 20%, 30% and 40 % GGBS at different a ages. The samples tested after 7 and 28 days showed an increase in compressive strength for 20% cement replacement. The split tensile strength and flexural strength of concrete additionally accelerated with 20% cement replacement. The increasing strength is because of the filler effect of GGBS. It turned into additionally determined that the process ability of concrete changed into ordinary and this extended with the addition of GGBS.

Yogendra O. Patilet. al. (2012) investigated the effects on compressive strength and flexural strength of concrete with partial replacement of cement by different percentages of GGBS. The tests were performed on 7, 28 and 90 days with replacement ranging from 10% to 40%. It was observed that the strength of concrete is inversely proportional to the percentage of cement replacement by GGBS. The replacement of OPC through GGBS to 20% shows the marginal reduction of 4 - 6% stress and flexural strength at some point of 90 days of curing and greater than that of extra than 15%. He concluded that GGBS as a substitute for OPC with 20% effects in a reduction of the value of concrete at current market interest.

R. Sathish Kumar (2012) studied on concrete blocks of size 150 mm x 150mm had been cast different alternative building materials in different mixing ratio and with different water cement ratio. Their density, process ability and compressive strengths had been determined and a comparative analysis was performed in terms of their physical properties and also cost savings. Test results indicated that the compressive strength of the OPC / RHA concrete blocks will increase with the age of curing and reduces as the percentage of RHA content it increases. It was also found that the other alternative constructing materials together with sawdust, recycled aggregates and brick bats may be effectively used as a partial substitute for cement and conventional aggregates.

Vijaya Gowri et. al. (2011) explored the effects of partial cement replacement by GGBS on compressive strength, split tensile strength and flexural strength of cement after 28, 90, 180 and 360 days. He utilized half GGBS as concrete substitution material for different water/binder proportions i.e. 0.55, 0.50, 0.45, 0.40, 0.36, 0.32, 0.30 and 0.27. He noticed that the high volumes of slag concrete get significant measures of forces at later ages (90 days and later) and this increase with decreasing water/binder ratio. He found that the strength of a high volume of slag concrete is more at later ages due to slower hydration of slag with Ca(OH)2 and water. He presumed that when cement is replaced by 50 % GGBS reduce the cement content of concrete, decreasing the cost of concrete and ensuring the earth against contamination.

M. Ramalekshmi et. al. (2011) talked about the results of partial cement replacement with 50 - 80% of GGBS on compressive strength of concrete at 7, 14 and 28 days. She reasoned that substitution of slag decreases the strength of cement in the transient contrasted with control OPC. In the long term, however, it shows a greater ultimate strength. Along these 50% GGBS indicated most maximum compressive strength following 28 days as replacement. Experiments were additionally performed on bar-column with and without GGBS with 50% replacement. The specimen was tested at 28 days under constant axial load and varying lateral load, which demonstrated an increase in load capacity of the specimen by 6.6%. So 50% GGBS as a substitution can be utilized as a part of RC.

Ahmed M.F et al (2011) clarified that the addition of water improved the workability attributes of freshly prepared concrete mixtures; in any case, the addition of water beyond certain limit resulted in bleeding and segregation of fresh concrete and decreased the compressive strength of the concrete essentially. The results obtained are graphically represented and concluded that the compressive strength of geopolymer concrete altogether decreased as the amount of extra water increased.

Prashant Y. Pawade et al (2011) examined a series of compression tests on 150mm x 150 mm cube and 150mm x 300mm cylindrical specimens utilizing an modified test method that gave the complete compressive strength, static, dynamic modulus of elasticity, ultrasonic pulse velocity and stress-strain behaviour using silica fume with and without steel fiber of volume fraction 0, 0.5, 1.0, and 1.5 %, of 0.5 mm Ø of aspect ratio of 60 on Portland Pozzolona cement concrete.

P.E Swaramoorthi and G.E. Arun kumar (2011) study the performance of concrete using fly ash as the major binding material without of cement. Low calcium fly ash is preferred as a source material than high calcium fly ash because of to reducing more carbon dioxide emission. Alkaline liquid sodium hydroxide and sodium silicate solution are used in geo-polymerization process. Reactions occur at high rate when the alkaline liquid contains soluble silicate, either sodium or potassium silicate compared to the use of only alkaline hydroxides. A mix proportion for geopolymer concrete was designed and carried out tests for different grade of concrete. The tensile strength and compressive strength of geopolymer concrete have been studied and compared with OPC. Polypropylene is one of the cheapest & abundantly available polymers. Polypropylene fibers are resistant to most of the chemicals & it would be cementations matrix which would deteriorate first under aggressive chemical.

Wallah S.E. and Rangan B.V. (2011) studied the sulphuric acid resistance of heat-cured, low calcium, geopolymer concrete. The concentrations of the sulphuric acid solution were 2%, 1%, and 0.5%. The sulphuric acid resistance of geopolymer concrete was evaluated based on the mass loss and the residual compressive strength of the test specimens after acid exposure up to one year. The test specimens, 100 x 200 mm cylinders, were made using Mix 1 and were heat cured at 60°C for 24 hours after casting. The visual appearance of specimens after exposure to sulphuric acid solution showed that acid attack slightly damaged the surface of the specimens. So they concluded that the maximum mass loss of test specimens of about 3% after 1 year of exposure is relatively small compared to that for Portland cement concrete as reported in other studies. As shown in Figure exposure to sulfuric acid caused degradation in the compressive strength; the extent of degradation depended on the concentration of the acid solution and the period of exposure.

Venu Malagavelli et. al. (2010) concentrated on examining strength of M30 concrete with partial replacement of cement with Ground Granulated Blast furnace Slag (GGBS) and sand with the ROBO sand (crusher dust). The cubes and cylinders are tested for both compressive and tensile strengths. It is found that by the partial replacement of cement with GGBS and ROBO sand helped in enhancing the strength of the concrete generously compared with normal mix concrete.

Chandramauli K et al (2010) think about the experimental effect on compressive, split tensile and flexural strength on M20, M30, M40 and M50 grades of concrete. With the utilization of the glass fiber increase in the surface integrity and its homogeneity and reduction in the probability of cracks was found. Additionally the percent increase in the compressive strength for the different grades of the concrete was observed to associate with 20 to 25 % though the percentage increase of flexural and split tensile strength at 28 days was seen from 15 to 20%.

Vaishali G Ghorpade (2010) explored on glass fiber reinforced high performance concrete with silica fume as admixture. In the examination she partially replaced cement with the silica fume by 0%, 10%, 20%, 30% and glass fibers were included the percentage of 0, 0.5, 1.0, and 1.5% to produce the high performance concrete. 14% was the increase in the compressive strength with the optimum dose that is addition of 1% of glass fiber and 10% of silica fume though the percentage increase in the split tensile strength was 18% compared to conventional concrete without the use of glass fiber and silica fume.

III. CONCLUSION

A survey of journal articles published between 2010 and 2017 yields studies that vary in scope and level of analysis, yet with consistently good results.

As our purpose is to develop concrete which does not only concern on the strength of concrete, it also having many different aspects to be satisfied like workability, performance, durability and also economy.

Some of the early studies works had executed using specific pozzolanic materials with the replacement of cement the using super plasticizer for the improvement high strength concrete and high performance concrete. Additionally the improvement in the subject of fiber reinforced concrete alongside pozzolonas. It is reported that using steel fibres in concrete lower the workability of concrete however split tensile strength, strength, modulus of elasticity and poisons ratio. The presence of micro cracks within the mortar-aggregate interface is liable for the inherent weakness of simple concrete. The weak point can be eliminated through inclusion of fibres inside the combination. Different types of fibers, consisting of those used in conventional composite materials can be added into the concrete aggregate to growth its durability, or capability to withstand crack growth. The fibres assist to transfer loads at the inner micro cracks.

Many investigations have been done on replacement of GGBS and fiber with cement in concrete and observed very enthusiastic results.

Studies have shown that the addition of steel fibres in a concrete matrix in proves all the mechanical properties of concrete, especially tensile strength, impact length and toughness. The resulting material possesses higher compressive, tensile strength and better ductility.

From the literature papers referred on various fibres, its properties, significance, effect, impact on strength and durability properties are focused and brought into picture for the study and future research. Following conclusions could be drawn from present papers.

1. The Mechanical properties such as compressive strength, tensile strength, toughness, impact, flexural etc are greatly influenced by addition of fibres, optimum dosage of fibres governs these properties and must carry out optimality study on various fibres.

2. The Type of fibres, selection of fibres, properties like length, diameter aspect ratio, its effect on properties of concrete changes with addition of dosage. The prime importance must be given for selection of fibre, its type etc.

3. The Various fibre used in concrete significantly improves many properties of concrete. The combination of fibres thus shows advanced improvement and great changes in properties of concrete.

4. The Addition of fibres with additional supplementary cementations material such as fly ash, silica fumes etc should better performance by improving workability of concrete and inherent properties of concrete.

5. The Addition of fibres is carried out for special category such as self- compacting concrete, high performance concrete, high strength concrete etc.

IV. REFERENCES

[1]. Pooja, Shreenivas Reddy Shahapur, Maneeth PD, Brijbhushan S, “Evaluation of Effect of Steel Fibres on M45 grade of Concrete by Partial Replacement of Cement with Fly ash and GGBS”, International Journal for Research in Applied Science & Engineering Technology, Vol. 5, Issue 8, PP: 1949-1956.

[2]. T. Subbulakshmi, B. Vidivelli, K. Nivetha, “Strength Behaviour of High Performance Concrete using Fibres and Industrial by Products”, International Journal of Engineering Research & Technology, Vol. 3, Issue 8, PP: 1219-1224.

[3]. Suchita Hirde, Pravin Gorse, “Effect of Addition of Ground Granulated Blast Furnace Slag (GGBS) on Mechanical Properties of Fiber Reinforced Concrete”, International Journal of Current Engineering and Technology, Vol. 5, Issue 3, PP: 1677-1682.

[4]. Nandhini. J, Kalingarani. K, “Effect of Hybrid Fibres on Flexural Behaviour of Reinforced Concrete Beams with Blended Cement”, International Journal of Research in Advent Technology, Vol.4, Issue 6, PP: 70-73.

[5]. A.M. Shende; A.M. Pande, M. Gulfam Pathan, “Experimental Study on Steel Fiber Reinforced Concrete for M-40 Grade”, International Refereed Journal of Engineering and Science, Volume 1, Issue 1, PP: 43-48.

[6]. S.P. Sangeetha, Dr. P.S. Joanna, “Flexural Behaviour Of Reinforced Concrete Beams With GGBS”, International Journal Of Civil Engineering And Technology, Volume 5, Issue 3, PP: 124-131.

[7]. Christina Mary V, Kishore CH, “Experimental Investigation On Strength And Durability Characteristics of High Performance Concrete Using GGBS And Msand”, ARPN Journal of Engineering and Applied Sciences, Vol. 10, Issue 11, PP: 4852-4856.

[8]. Sowmya. S.M, Premanand Kumbar, R. Amar, “An Experimental Investigation on Strength Properties of Concrete by Replacing Cement with GGBS and Silica Fume”, International Journal of Research, Vol. 1, Issue 8, PP: 148-152.

[9]. Sujit V. Patil, N. J. Pathak, “The Experimental Study on Compressive Strength of Concrete using AR Glass Fibers and Partial Replacement of Cement with GGBS with Effect of Magnetic Water”, International Journal of Engineering Technology, Management and Applied Sciences, Vol.4, Issue 8, PP: 21-29.

[10]. Prashant Y. Pawade, Nagarnaik P.B., Pande A.M, “Performance of steel fiber on standard strength concrete in compression”, International Journal of Civil and Structural Engineering Volume 2, No 2, PP: 483-488.

[11]. Nikhil A. Gadge, S. S. Vidhale, “Mix Design of Fiber Reinforced Concrete (FRC) Using Slag & Steel Fiber”, International Journal of Modern Engineering Research, Vol. 3, Issue. 6, PP: 3863-3871.

[12]. T. Subbulakshmi, B. Vidivelli, “Experimental Investigation on the Effect of Industrial by products on the Strength Properties of High Performance Concrete”, Journal of Mechanical and Civil Engineering, Volume 13, Issue 3, PP: 13-21.

[13]. Roopa Saira Thomas, Jebitta Fancy Rajaselvi .P, “An Experimental Investigation on the Effects of Concrete by Replacing Cement with GGBS and Rice Husk Ash with the Addition of Steel Fibers”,International Journal of Science and Research, Volume 5, Issue 2, PP: 2104-2109.

[14]. Vijay Madhavrao Takekar, G. R. Patil, “Experimental Study of Properties of Fiber Reinforced Concrete using GGBS”, International Journal of Engineering Technology, Management and Applied Sciences, Volume 3, Issue 3, PP: 589-594.

[15]. Anusha Suvarna, P.J. Salunke, T.N. Narkehde, “Strength Evaluation of Fiber Reinforced Concrete Using Pozzolanas”, International Journal of Engineering Sciences & Research Technology, Vol. 4, Issue 10, PP: 196-201.

[16]. Namani Saikrishna, Syed Moizuddin, “Strength Properties of Steel Fiber Concrete by Partial Replacement of Silica Fume”, International Journal of Research in Advanced Engineering Technology, Volume 6, Issue 1, Jan 2017, PP: 120-124.

[17]. Dasari Venkateswara Reddy, Prashant Y. Pawade, “Combine Effect Of Silica Fume And Steel Fiber On Mechanical Properties On Standard Grade Of Concrete And Their Interrelations”, International Journal of Advanced Engineering Technology, Vol.3, Issue I, January, 2012, PP: 361-366.

[18]. K. Vidhya, T. Palanisamy, R. Thamarai Selvan, “An Experimental Study On Behaviour Of Steel Fibre Reinforced Concrete Beams”, International Journal of Advanced Research Methodology in Engineering & Technology, Volume 1, Issue 2, March 2017, PP: 178- 183.

[19]. Mohammad Panjehpour, Abang Abdullah Abang Ali, Ramazan Demirboga, "A Review For Characterization Of Silica Fume and Its Effects On Concrete Properties",
[20]. International Journal of Sustainable Construction Engineering & Technology, Vol 2, Issue 2, December 2011, PP: 1-7.
[21]. Vijay M. Mhaske, Rahul D. Pandit, A. P. Wadekar, "Study on Behaviour on High Strength Crimped Steel Fibre Reinforced Concrete for Grade M90", Journal of Ceramics and Concrete Sciences, Vol. 1, Issue 3, PP: 1-12.
[22]. Subhash Mitra, Pramod K. Gupta and Suresh C. Sharma, "Time- dependant strength gain in mass concrete using mineral admixtures", Indian Concrete Journal, Vol. 1, Issue 3, November, 2012, PP: 15-22.
[23]. A. Annadurai, A. Ravichandran, "Flexural Behaviour of Hybrid Fiber Reinforced High Strength Concrete", Indian Journal of Science and Technology, Vol 9, Issue 1, Jan 2016, PP: 116-122.
[24]. Ram Kumar, Jitender Dhaka, "Review Paper on Partial Replacement Of Cement With Silica Fume And Its Effects on Concrete Properties", International Journal For Technological Research In Engineering Volume 4, Issue 1, September-2016, PP: 83-85.
[25]. Neeraja, "Experimental investigation of Strength Characteristics of Steel Fiber Reinforced Concrete", International Journal of Scientific & Engg. Research, Vol-4, Issue-2, PP: 89-94.
[26]. Vikrant S. Variegate, Kavita S. Kene (2012), "Introduction to Steel Fiber Reinforced Concrete on Engineering Performance of Concrete" International Journal of Scientific & Technology Research Volume 1, Issue 4, PP: 54-61.
[27]. M. V. Mohod, "Performance of steel fiber reinforced concrete" International Journal of Engineering and Science, Vol. 1, issue 5, PP. 01 – 04.
[28]. ISO 901:20089, "International Organisation for Standard".
[29]. ASTM A-820, "Standard Specification for steel fiber reinforce concrete", 2011.
[30]. M.S.shetty {Book},"concrete technology (theory and practice)", 2011.

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