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Sustainable use of Industrial Wastes as Replacement for Fine and Coarse Aggregate in Production of Self Compacting Concrete – A State of the Art

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Abstract: ***From recent global research developments, lot of natural and artificial materials are coming from industries those are normally discarded or used as landfills are investigated for potential construction applications. There are different industry waste materials like steel slag, copper slag, electric furnace slag etc., which are used in various types of concretes such as conventional, geo-polymer self-compacting concretes. Now a day's utilization of Self- Compacting Concrete (SCC) is increasing speedily because of its attractive characteristics like effective fresh, mechanical and durability properties and its large applications in construction. In addition to this, SCC materials are associated with sustainability issues. Necessity of SCC expected to continuously increases with increasing developments around the world. Therefore required an ideal solution and sustain technology; such as utilization of alternative materials. The present study explains application of industrial waste materials to replace fine and coarse aggregates in self-compacting concrete production. Also, effective limitations in using some of the waste materials as sustainable alternatives for coarse and fine aggregates have been mentioned. From this review, it is evident that factors like carbon emissions, energy for production and cost production of SCC can be notably decreased by incorporating of waste materials in place of fine and coarse aggregates in Self-Compacting Concrete.***

Key words: ***Self-Compacting Concrete, Sustainability, Copper Slag, Steel Slag***

I. INTRODUCTION

The In recent years, advances in concrete and building material research, have better way for use of alternative materials as sustainable alternatives for conventional fine aggregates and coarse aggregates. Waste materials represent mostly industrial, construction and agricultural wastes.

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Therefore recycling those waste materials (industrial, construction and agriculture) contribute to an effective waste management through reusing and it leads to sustainability developments in construction industry.

This study explains about different waste potential materials coming from different sources like industry, construction and agriculture and their utilization in making Self Compacting Concrete (SCC). SCC is the concrete which is concrete compacted by its own weight or little vibration. Now a day's in construction industry the production of SCC enormously increased, due to its excellent workability properties and more over it offers more resistance to segregation and bleeding compared to Conventional Concrete (CC), and also it has more ability to flow, fill and passing in complex formwork sections. SCC can also significantly reduce energy consumption (no energy required to compact it) in making. it reduces the cost and construction time of the project since it is having superior characteristics. Generally cost production of SCC is high compared to conventional concrete, which is one of the major drawbacks. Conventional materials like OPC, fine aggregates and coarse aggregates are used to make SCC compensate more cost compared to CC. Therefore, need alternative potential materials as partial or complete replacement for conventional materials to make SCC more sustainable. By adopting those sustainable materials in SCC gives cost savings as well as achieving desirable properties.

There are many waste materials discovered for applied into SCC, as partial and complete replacement of fine aggregates as well as coarse aggregates. They are steel slag, copper slag, recycled aggregate, granite waste, atomized steel, electric furnace slag. Most of the researches were found that these materials were suitable in terms of fresh, mechanical and durability characteristics of self compacting concretes. Actually these waste materials having some poor physical properties, which are major challenges for researchers to achieving workability of SCC mix in its fresh state and better mechanical properties in its hardened state. Generally these poor properties of waste materials overcome by effective processing methods. Some of the studies were reported that performance characteristics decreased due to usage of these waste materials in place of fine and coarse aggregates compared to CC.

But those decreased characteristics are within the permissible limits. There was little research is going on usage of waste in SCC compared to CC. Therefore, there is a need incorporating the waste materials in SCC to obtain the sustainability developments in concrete industry and also it reduces the carbon footprints on the environment.

II. METHODOLOGY

In concretes, coarse and fine aggregates play important role. At present usage of concrete in construction industry increasing rapidly. Then demand for coarse and fine aggregate will also increase; but in future there may scarcity will occurred. So an alternative/supplement material is required to encounter this problem. Many researches were suggested that industry waste materials used as fine and coarse aggregates in Conventional Concretes (CC). But usage of those waste materials in Self Compacting Concretes (SCC) is very less.

Present review paper reveals the industry waste materials used as coarse aggregates and fine aggregates in place of conventional coarse and fine aggregates in Self Compacting Concretes (SCC). For that a detailed literature study was carried out on waste materials usage in Self Compacting Concrete (SCC) in place of both aggregates. In this review literature carried out separately on fine and coarse aggregates. In SCC conventional coarse aggregate was partially/completely replaced with coarse recycled concrete aggregates, copper slag and steel slag. Whereas conventional fine aggregates partially/completely replaced with fine recycled aggregates, copper slag, atomized steel slag, electric furnace dust and granite waste. From literature review presents effect of various waste materials on properties of Self Compacting Concrete (SCC). Finally from this review presents the conclusions in the form of summary.

III. REVIEW OF LITERATURE

This review work is taken to particularly expose experimental works, in which industry rejects/waste materials were utilized in concrete industry as partially or fully replacement of fine aggregates as well as coarse aggregates. This review explains the effectiveness of the waste materials on properties of self compacting concrete. This review also more helpful and guide the stakeholders of concrete to incorporate different waste materials into SCC.

Effect of various waste materials on properties of SCC:

Conventional Concrete (CC) and Self Compacting Concrete (SCC) have different properties at their fresh and hardened states. Among all those key engineering properties of SCC were most important to obtain workability of concrete. Therefore, Key engineering properties of fresh SCC are flowability, filling ability, passing ability, and resistance to segregation and bleeding. The differences in materials composition of SCC affect properties as strength (mechanical), shrinkage, creep, and durability. These properties may be affected due to replacement of industry waste materials as fine aggregates and coarse aggregates in SCCs. This study explores effect of different waste materials on the properties of SCC.

Waste Materials Used in Coarse Aggregate Replacement:

In concrete or mortar Aggregate is a structural filler. It plays crucial role in concretes regarding workable and strength point of view. Generally in any concretes aggregate occupies most of the volume. It has stuff that coats and binds cement paste together. Composition, shape and size of the aggregate have remarkable impact on workability, mechanical and durability properties of concrete. Generally aggregates are classified into fine aggregates and coarse aggregates as per their sizes. In concrete construction both fine and coarse aggregates are needed. In future there may be occurred scarcity for both fine and coarse aggregates due to drastic developments in all aspects. So to encounter this problem alternate or substitution materials are needed in place of fine and coarse aggregates. Different waste materials vary in their properties and composition since they are extracted from different ores. That is why this was study carried out to find out whether industry waste materials are effective alternate material for replacing natural aggregate.

Coarse Recycled Concrete Aggregate:

Normally Coarse Recycled concrete aggregates (CRCA) are extracted from demolished concrete elements or structures. The demolished concrete elements are like testing specimens in concrete laboratories are also crushed to make the recycled coarse aggregates. In demolished structures, elements like concrete slabs, concrete beams and concrete columns are used to make the recycled coarse aggregates. Now a day's enormous research are going on utilization of coarse recycled concrete aggregates in concrete industry. But incorporating these coarse recycled concrete aggregates in self compacting concrete is very lesser. So need more researches on this to develop the sustainability. This study explored the utilization of industry wastes as coarse aggregate in self compacting concrete.

Z.J. Grdic et al (2010) used recycled aggregates in Self Compacting Concretes (SCC) in place of natural aggregates. Three mixtures were made and conducted experiments to find out the various properties (fresh and hard states of concrete). In their study coarse aggregates were replaced by using recycled aggregates at different percentages (0%, 50% and 100%). Consistency was achieved during mixing of all concrete mixtures. From the obtained results; it was evident that properties of SCC mixes have slight difference compared with conventional mixes.

L.A. Pereira-de-Oliveira et al (2014) carried out research on Self-Compacting Concrete (SCC) made with Coarse Recycled Aggregates (RCA). Main objective of study was determining durability (permeability) properties of SCC mixes with recycled aggregates. Four types of mixes were produced, in which natural coarse aggregates replaced by RCA at various percentages (20%, 40% and 100%). durability properties of SCC mixes related to air and water permeability along with capillary absorption were determined.

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finally from this study it was concluded that Fresh, mechanical and durability properties were viable seen as to replace natural coarse aggregates with RCA in SCC.

Y.F. Silva et al (2016) experimental work on Self Compacting Concrete (SCC) made by using Recycled Coarse Aggregates (RCA). Mineral admixture also used. Total Five SCC mixes were cast in the study, in which natural coarse aggregates were replaced by recycled aggregate at two percentages (0% and 100%).

Fresh (flowability, passing ability and filling ability) and mechanical properties of SCC were determined. From their study it was concluded that the workability values are appropriated compared to the conventional concrete. Mechanical properties were decreased with the increased RCA content after its optimum level. This was occurs due to very weak adhesion between existed old mortar and aggregate.

S. Manzi et al (2017) carried investigation on durability properties of Self-Compacting Concrete (SCC). Shrinkage and creep durability properties of mixes were studied. Mixes were made with Coarse Recycled Concrete Aggregates (CRCA) as well as Fine Recycled Concrete Aggregates (FRCA). Both natural coarse and fine aggregates were replaced up to 40% with CRCA and FRCA. In this study mechanical and durability properties of SCC were determined. From this study it was evident that creep behavior more influenced than shrinkage behavior presence of RCA in SCC. This study was also showed the mechanical properties of RCA based SCC same/equal to that of conventional concrete.

J. Hu et al (2017) developed Eco Self-Compacting Concrete (SCC) using low powder contents, Recycled Concrete Aggregate (RCA) and viscosity modifying agents (VMA). RCA used in this study was at various percentages (0%, 50% and 100%). Results showed that use of RCA affect fresh as well as mechanical properties of SCC, are better and also comparable with conventional concrete (CC) mixes. In this study an environmental performance evaluation was also presented to justify the environmental benefit of Eco SCC.

J.J. Assaad (2017) developed Self Consolidating Concrete (SCC) using Recycled Concrete Aggregate (RCA). The main objective of study was effect of rheology and dynamic or static stability of SCC. RCA replaced in this study was at various percentages (0% to 100%). The test results indicated that increased in RCA percentages reduces flow and passing abilities of mixes; while resulting in improved static stability. This happened because of greater water absorption of RCA. So this study was concludes the incorporating RCA in SCC little bit reduces rheological properties but that effect was overcome by adopt four-bladed slotted vane rotator.

N. Singh and S.P. Singh (2018) reported results of carbonation resistance, fresh, compressive strength and micro structure analysis (scanning electron microscopy) of a Self Compacting Concrete (SCC). Mixes were made with Coarse Recycled Concrete Aggregates (CrRCA) and Fine Recycled Concrete Aggregates (FnRCA) instead of conventional ones. The replacement of CrRCA were kept at different percentages (20%, 50%, 75% and 100%). similarly FnRCA kept at 50% and 100%. Total 17 SCC mixes were prepared and grouped into two with and without Silica Fume (SF). SCC mixes were shown better compressive strength, carbonation resistance when those mixes incorporating with SF. And also the results evident that micro structure point view (scanning electron microscopy analysis) higher or comparable to that of standard SCC mixes.

E. Güneyisi et al (2019) performed an experimental work on effect of old existed cement mortar composite on Self Compacting Concrete (SCC). In their work conventional coarse aggregates were replaced by Recycled Concrete Aggregate (RCA).Main objective their work was identifies effect of recycled aggregate treatment (processing) methods on essential properties of SCC mixes by using potential aggregate treatment methods. In their study SCC mixes were made natural coarse aggregate replaced 100% with coarse RCA. Their Test results were evident that the surface treatment of RCAs affected the concretes self compatibility properties.

K.J.N.S. Nitesh et al (2019) developed Self Compacting Concrete (SCC) mixes with Recycled Coarse Aggregate (RCA). SCC beams were made with 25% of natural coarse aggregate replaced with RCA. Steel fibers were also added to the mixes of 0.5% by volume of concrete. These concrete mixes (SCC) were compared with Conventional Concrete (CC). Two grades of concrete (20 MPa and 80 MPa) were cast by using natural coarse aggregate as well as RCA. From their study that it was concluded that significant increase in torsional properties in SCC compared to CC for both natural aggregate and RCA by addition of fibers.

Copper Slag:

Yasser Sharifi (2019) investigated the acidic behavior of Self Compacting Concrete (SCC) incorporating Copper Slag (CS) and a series of seven mixtures were made with varying percentages of CS for cement replacement was produced. Specimens replaced by 0%, 5%, 10%, 15%, 20%, 25% and 30% CS of total binder. Fresh properties, compressive strengths, mass losses, and volume variations of SCCs containing CS as partial replacement of binder in acidic environments were investigated. The test results were showed that incorporating CS increased workability and fresh properties of SCC. As expected, acid attack decreased mechanical properties, but incorporating CS by up to 15% improved the resistance characteristics. Finally, the results show that incorporating CS as supplementary cementitious material in SCC improved acidic resistance of the material.

Zhihong Pan et al (2019) introduced self-compacting concrete (SCC) with Steel Slag Powder (SSP) and Recycled Aggregate (RCA). The main aim their study was improves the sustainability of industry waste materials (steel slag and recycled aggregate) in SCC. In their study RCAs were used to replace conventional coarse aggregates of 30% and SSP was used to replace Ordinary Portland Cement (OPC) at various percentages (10%, 20%, 30%, 40%, and 50%).The Workability tests were performed on its fresh state where as mechanical as well as durability (resisting to chloride penetration and carbonation) tests were carried on its hardened state.

This study was evident that incorporation of SSP in mixes improves the filling and passing abilities of mixes. From mechanical and durability point of view 10% of replacement of SSP with recycled aggregate showed better values.

Steel slag:

Yeong nain Sheena et al (2016) presented research work on Self Compacting Concrete (SCC) made with Oxidizing Slag. Oxidizing slag used to partially replace conventional fine and coarse aggregates with varying percentages (0%, 50% and 100%). In their study Reducing Slag used as partial replacement for Ordinary Portland cement at various percentages (0%, 10%, 20% and 30%). Tests were performed on its Hardening state to know the properties of SCC mixes. Destructive and non-destructive tests were conducted. Their study evident that hardening properties values were within the ambit of good quality concrete requirement; when 100% of oxidizing slag and 30% reducing slag were used. They also evident that with this substitution reduce up to 43% cost of SCC.

Shashank Gupta et al (2018) developed High Strength Self Compacting Concrete (HSSCC) with Steel Slag (SS). In their study conventional coarse aggregate partially replaced with steel slag for. From their work it was verified that self compactness achieved due to self-weight increased with use of steel slag and special admixtures. Mechanical properties also increased by a certain percentage because steel slag basically acts as a filler. This is because of its fineness as well as way it fits into spaces between grains

R. Manjunath et al (2019) developed Self Compacting Concrete (SCC) mixes by using Steel Slag sand (SS) and Electric Arc Furnace slag (EAF slag). SS and EAF slags were used in place of fine aggregates and coarse aggregates respectively. All mixes were exhibit higher flow characteristics and better mechanical properties as like SCC mixes. The study evident that the higher fluidity, good filling and passing abilities were observed in mixes and they satisfied EFNARC recommendations for SCC mixes.

Fine aggregate replacement:

To get adequate workability in mortars and concretes, volume of cement paste must be high enough to surround aggregate particles. This will also give workability to the concrete in fresh state. This paper presents the Influence of industrial waste materials like recycled concrete aggregates, steel slag, copper slag, granite waste, atomised steel slag and electric furnace slags are used in place of natural fine aggregates on Self Compacting Concrete (SCC) performance characteristics. Several investigations are reported that there is remarkable influence on fresh (flow), mechanical and durability characteristics of SCC when these industrial wastes used as fine aggregates. It was found that properties of SCC have lower influence on fine aggregate types used and their particle size distribution.

Fine Recycled Concrete Aggregate:

Generally Fine Recycled Concrete Aggregate (FRCA) is made concrete demolition structures or elements. Depending on crushed sizes of FRCA, different tests are conducted to estimate zone, gradation and fineness modulus values to comparing with natural fine aggregates. Preliminary tests must and should conduct before their usage in concrete and mortars. The present study reports that utilisation of FRCA in self compacting concretes, for that the following literature carried out.

K. Kapoor et al (2017) prepared Self-Compacting Concrete (SCC) mixes with Fine Recycled Concrete Aggregates (FRCA) as well as Coarse Recycled Concrete Aggregates (CRCA). Fine Natural Aggregates (FNA) replaced with FRCA at various percentages (0%, 25%, 50%, 75% and 100%). But Coarse Natural Aggregates (CNA) was 100% replaced CRCA. Rapid Chloride Penetrability Test (RCPT), initial surface absorption, water penetration and capillary suction tests were conducted to appraise durability properties of mixes with FRCA and CRCA. Mixes microstructure was also studied. From their test results it was concluded that replacement of CNA with CRCA significantly affects the SCC properties; but properties of SCC mixes improved to some extent by 25% FRCA replacement. Furthermore, up to 50% FRCA replacement has marginally deteriorated.

S.C Kou and C.S Poon (2009) made Self-Compacting Concrete (SCC) with Recycled Concrete Aggregates (RCA). In this work RCA was partially and completely replaced both conventional coarse aggregates and fine aggregates. Main objective their study was determines fresh as well as hardened properties of proposed SCC mixtures. Maintained 100% coarse recycled aggregate as constant. And fine aggregate replaced with fine recycled aggregates at various percentages (0%, 25%, 50%, 75% and 100%).two different water binder ratios were used in this investigation. in their study fresh(flow, passing and filling ability), mechanical and durability (chloride penetration) properties were studied. The results showed that the properties of SCCs mixes made with river sand as well as fine recycled aggregate almost same values.

Copper slag:

Rahul Sharma and Rizwan A Khan (2017) developed Self-Compacting Concrete (SCC) with copper slag. They were replaced conventional fine aggregates by copper slag at different percentages (0%, 20%, 40%, 60%, 80% and 100%). They were replaced copper slag partially and fully in place of conventional sand (fine aggregate). Fresh and mechanical properties of SCC were evaluated. They were also performed microstructural analysis. From their study it was observed that flowing properties of mixes were remarkably increased with increased copper slag content. From strength point of view strength increased up to a certain percentage substitution of CS and then decreased. But notable strength achievement was observed at 60% copper slag replacement. It was reported that through Scanning Electron Microscopy analysis was illustrated that more voids, capillary channels and micro cracks were occurred with increase in copper slag content compared to standard mix.

Rahul Sharma and Rizwan A Khan (2017) evaluated the durability properties of Self Compacting Concrete (SCC) by using Copper Slag (CS).

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They were replaced conventional fine aggregates by copper slag at different percentages (0%, 20%, 40%, 60%, 80% and 100%). Finally they concluded that there was benefit in construction industry by using copper slag as alternate for conventional fine aggregates. This research also concluded that using 60% of copper slag replacement is optimum to get better and comparable durability properties in SCC.

Nikita Gupta and Rafat Siddique (2019) prepared Self Compacting Concrete (SCC) mixes by using Copper Slag (CS). They used copper slag as fine aggregate in their study. They were maintained water to binder ratio constant in all mixes (0.42). And also fine aggregates were replaced at various percentages (0%, 20%, 40% and 60%) with copper slag. Main objective of study was determining performance characteristics like fresh, mechanical and durability. They also performed micro structural analysis (SEM). Mechanical as well as chloride migration properties of SCC determined after 28 days of curing. They conclude that use 30% copper slag in compressive strength point of view and 60% in split tensile strength point of view. Their results evident that the all properties of SCC increased by replace copper slag up to certain percentages.

Anisha Mariya Paul and Elba Helen George (2019) studied fresh as well as hardened characteristics of M50 Self-Compacting Concrete (SCC). Mixes were made with and without curing compound (PEG) and also incorporating 15% of Fly Ash for cement replacement. Optimum dosage of curing compound (PEG) was fixed in SCC based on strength characteristics. The main focus of the study was through strength characteristics; determine optimum content of Copper Slag in Self Compacting Self-Curing Concrete. Fine aggregate was replaced at various percentages (10%, 20%, 30%, 40% and 50%). Comparison also carried between normal aggregate and copper slag based Self Compacting Self-Curing Concretes. Finally they concluded that utilization of Fly Ash as along with Copper Slag indirectly reduces waste and also reducing consumption of cement and aggregates in construction practices.

Atomized steel slag:

Jung-Hoon Yoo ea tl (2005) used atomized steel slag aggregate in Self Compacting Concrete (SCC). In their study they used Atomized steel slag aggregate for replacement of fine aggregate. From their observations it was found that Atomized steel slag aggregate has high specific gravity than conventional fine aggregates. Due to this self-compactness achieved very easily compared to conventional Self-Compacting Concrete. They were performed tests on SCC during its fresh and hardened states. From their results they concluded that SCC with and without atomized steel slag aggregate showed same results in fresh and hardened states.

Electric Arc Furnace Dust:

A. Lozano Lunar et al (2019) analysed Self-Compacting Mortars from durability point of view by incorporating Electric Arc Furnace Dust (EAFD). In their study EAFD was replaced fine aggregate in different ratios (25%, 50%, and 100%). Fresh, mechanical and also durability characteristics of Self-Compacting Mortars were measured at different curing ages. Durability properties of Self Compacting Mortars like water absorption, carbonation effect were affected by using of EAFD as fine aggregate. Finally results evident that utility and replacing of EFDA up to 25% is desirable in durability point of view.

Granite Waste:

Abhishek Jain et al (2019) investigated Compressive Strength, Abrasion Resistance and Sorptivity of Self Compacting Concrete (SCC) with granite waste (GW). GW was used to replace fine aggregate between 0% –100% with an increment of 20%. Tests were performed on SCC in its fresh and hardened states. Workability properties were satisfied by incorporating GW up to 80% in place of conventional fine aggregates. Those workability properties satisfied the EFNARC standards. From the results it was evident that incorporating GW up to 40% and 60% in SCC yields better compressive strength as well as abrasion resistance properties respectively.

IV. RESULTS

Table: 1 Effect of Coarse RCA replacement % on Slump of SCC

Percentage of Coarse RCA (%)	Slump (mm)				
	L.A. Pereira-de-Oliveira et al (2014)	S. Manzi et al (2017)	Y.F. Silva et al (2016)	Z.J. Grdic et al (2010)	J.J. Assaad (2017)
0	650	700	750	750	705
20	650	-	-	-	-
25	-	750	700	-	710
40	675	725	-	-	-
50	-	-	705	750	680
75	-	-	700	-	715
100	675	700	600	725	700

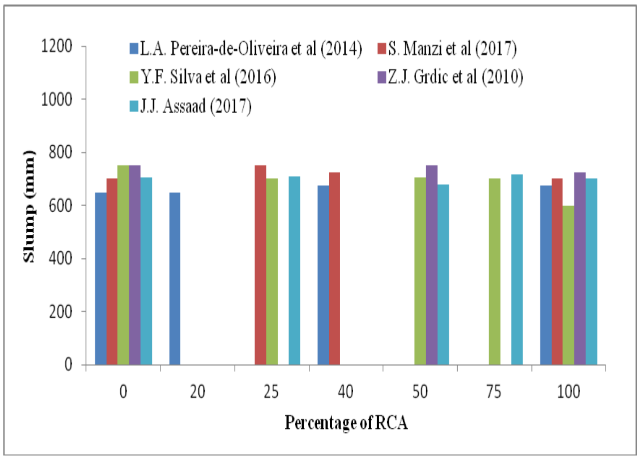

Fig. 1 Effect of Coarse RCA replacement % on slump of SCC

Table: 2 Effect of Coarse RCA replacement % on Flow Rate of SCC

Percentage of Coarse RCA (%)	Flow Rate (Sec)				
	L.A. Pereira-de-Oliveira et al (2014)	S. Manzi et al (2017)	Y.F. Silva et al (2016)	Z.J. Grdic et al (2010)	J.J. Assaad (2017)
0	13	11	4	6	5.5
20	14	-	-	-	-
25	-	11	6	-	6
40	18	5	-	-	-
50	-	-	15	6	7.5
75	-	-	18	-	13.5
100	15	5	26	7	18.5

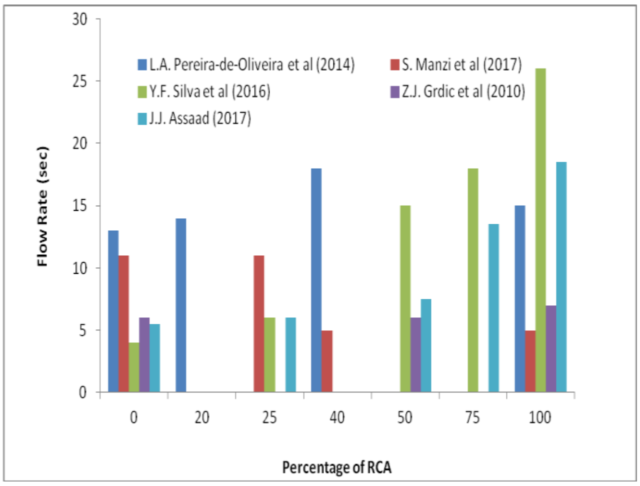

Fig. 2 Effect of Coarse RCA replacement % on Flow Rate of SCC

Table: 3 Effect of Fine RCA replacement % on Slump of SCC

Percentage of Fine RCA (%)	Slump (mm)	
	S.C. Kou et al (2009)	K.Kapoor et al (2017)
0	760	690
25	765	700
50	775	680
75	785	680
100	795	670

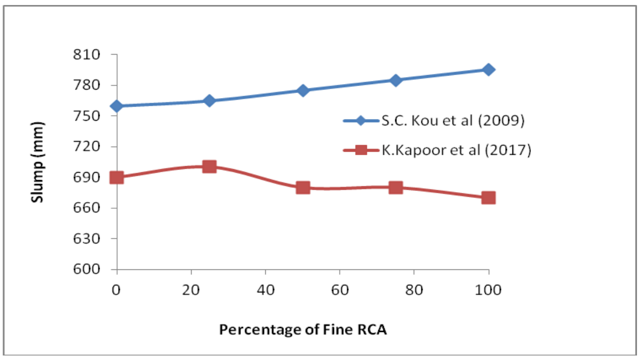

Fig. 3 Effect of Fine RCA replacement % on slump of SCC

Table: 4 Effect of CS replacement % on slump of SCC

Percentage of CS (%)	Slump (mm)	
	Rahul Sharma et al (2017)	Nikita Gupta et al (2019)
0	705	690
10	-	730
20	710	730
30	-	730
40	710	735
50	-	740
60	720	750
70	-	-
80	725	-
90	-	-
100	735	-

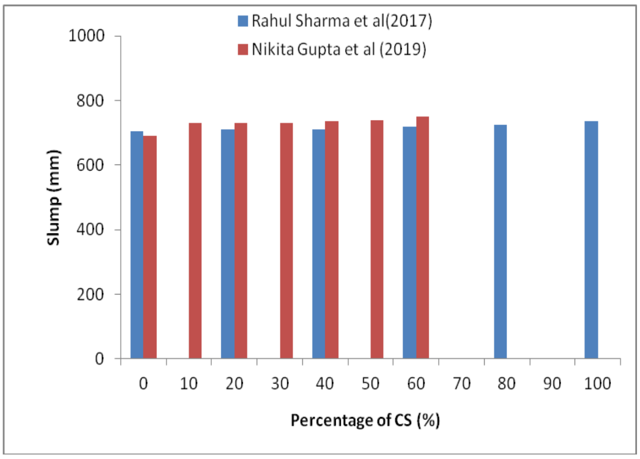

Fig.4 Effect of CS replacement % on slump of SCC

Table: 5 Effect of CS replacement % on Strengths of SCC

Percentage of CS (%)	Nikita Gupta et al (2019)	
	Compressive Strength MPa	Split Tensile Strength MPa
0	36	2.2
10	38	2.5
20	39	2.9
30	38	3.5
40	36	3.4
50	36	3.3
60	36	3.4

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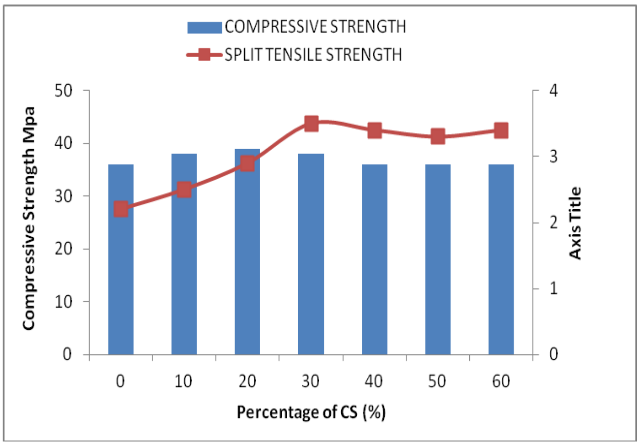

Fig. 5 Effect of CS replacement % on Strengths of SCC (Nikita Gupta et al (2019)

V. CONCLUSIONS

Now a day's concrete manufacturing technology achieving sustainability goals by the usage of industry waste materials as alternate for the conventional concrete materials. And is most important incorporating the waste materials as complete/partial replacement for both fine aggregates and coarse aggregates. In present construction/concrete technology, Self Compacting Concrete (SCC) is one of the most remarkable concrete materials. Since developments and applications of this SCC material seems inevitable. There are certain technologies and developments there in SCC with conventional materials. But very little works are done with usage of industry wastes. Therefore need more research to promoting and producing sustainable SCC using waste materials, especially alternates for fine aggregates and coarse aggregates.

Present overview explored about use of different industry waste materials as complete/partial replacement fine and coarse aggregates in Self compacting concrete and how its properties are to be affected.

Following conclusions were made from this study:

• Self compacting concrete is having superior properties and is a more ecofriendly concrete when compared to other types of concretes. This is due to its capability of reducing the cost, energy consumption to produce it and pollution of the environment.

• Most of the researchers found that incorporating recycled coarse aggregate in SCC; fresh and mechanical properties were slightly decreased. This problem occurred because of weak bonding between existed mortar (old strata) and the aggregate. However, those decreased properties are under the permissible limits. But this problem can be enhanced by adopt the suitable recycled aggregate processing method.

• Incorporating steel slag as fine aggregate as partial replacing in SCC improved fresh and mechanical properties and led to higher durability. Self-compactness is achieved due to self-weight which increased with the use of slags from industry and special admixtures.

• It is also evident that replacement of copper slag and atomized steel slag are in SCC is with an optimum content mechanical properties and durability properties of SCC enhanced. Most of studies are evident that 60% of copper slag optimum in mechanical properties point of view. By adopt granite waste we can easily replace 40% of fine aggregate in SCC.

• Some of results are found that, some properties of SCC decreased due to usage of industry waste materials by coarse aggregates and fine aggregates. Those decreased properties are within permissible limits. But those decreased properties can be ignored due to the several superior advantages offered in terms of sustainability and cost.

• Finally from this review it is evident that very little research on use of industry rejects/wastes materials as replacement for conventional aggregates, i.e. both fine and coarse aggregates. Industrial rejects/wastes give better results and do contribute to sustainable development in construction industry.

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