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"Experimental Analysis on the Properties of Concrete by Using Partial Replacement of Cement as Wood Ash and Copper Slag"

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Abstract- In this paper, in this assessment the connection wood debris and copper slag, substantial quality using damaging test gear has been finished. In this examination three kinds of wastes materials (wood debris and copper slag,) and common total were used for getting ready 3D square examples. There are M35 grade of mixed degree are utilized. Waste materials are utilized in concrete with the replacement obligation of 10%, 20%, 30% and 40%. These pillars, chamber and 3D square are taken a stab at 7, 14, and 28 days. The compressive quality, flexural quality, and not entirely set in stone with the assistance of horrendous test types of gear.

Keywords- concrete, wood ash, copper slag, partial replacement of cement, compressive strength, crushing loads.

I. INTRODUCTION

Concrete is a composite material, where coarse and fine totals are filler material and concrete glue is restricting material. Concrete is composite of sand, rock, squashed rock, or other total kept intact by a solidified glue of pressure driven concrete and water. The completely blended fixings, when appropriately proportioned, create a plastic mass which can be projected or formed into a foreordained size and shape. Endless supply of the concrete by the water, concrete becomes stone like in strength and hardness and has utility for some reasons. Concrete is a most famous development material on the planet.

It is made by blending coarse and fine totals, water, concrete, and added substances in a specific endorsed extent.

Reusing is the act of recuperating utilized materials from the waste stream and afterward integrating those equivalent materials into the assembling system. Reusing is one of the unmistakable issues in this naturally cognizant time. There are three fundamental contentions for reusing: first, it saves the valuable normal assets; furthermore, it limits the transportation and its related expenses; and thirdly, it dodges the natural burden brought about by squanderer material, for example space prerequisite. The extraordinary steps have been made to increment reusing rates overall lately. The significant thought to help reusing all around the world is the extension of foundation for reusing. The need to reuse electronic squanders is clear.

More than 22 million tons of electronic squanders are disposed of every year in the junk. While electronic squanders represent just 9.2% (in 2000) of the rubbish Americans create every year, electronic byproducts don't deteriorate in landfills and are hard to diminish in size. There are a couple of innovative and monetary requirements that at present breaking point the full and proficient reusing of electronic waste squanders into valuable items.

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Concrete is a coupling material used as a piece of improvement works out. The use of cement is extended as pace of advancement extended. Concrete is utilized as a piece of improvement of various structure and non planning structures (at this very moment structures). Still up in the air by the survey, 10-12 million tons waste materials are make and consume. We are displacing the fine totals (Concrete) with wood powder and copper slag. Choose the properties while displacing the concrete (some rate) with wood powder and copper slag, quarry dust.

The issues of productivity, economy, quality and condition, they need to match other development materials, for instance, concrete, totals, sand thus outward. Anyway this issue can be grasping by substitute of totals and concrete with some holding material or by midway rebuilding or by supplanting of total with waste materials.

II. LITERATURE REVIEW

In this part we have talked about the distinctive materials which are much of the time utilized for mentioning the concrete and objective facts of the diverse creators by utilizing the diverse materials by literature review.

Kamlesh Saini 2017 Found out about the effect on quality trait of cement by using waste wood powder as inadequate replacement of concrete. The essential reason behind this endeavor is utilization of waste materials (wooden powder) as fine totals which are mixed (development and partial replacement) with OPC to research the impact of these waste materials on various restriction of substantial survey for example M30. The wooden residue is displaced in changing degree set up of sand (0%, 5%, 10%, 15%, and 20%). Undertaking is calculated that the replacement of fine totals by wooden powder in concrete generally extends a conclusive nature of cement. The going with centers is as:

- The compressive quality, flexural quality and split versatility were diminished as the wooden residue is extended more than 25%.
- The replacement of 10% wooden powder with sand, there is around 10% reducing in weight and 3% diminishment in progress cost.
- We are examining to find the ideal degree of the wooden powder by which the most outrageous quality is achieved and the substantial will have light in weight vary with the commonplace cement and condition very much arranged.

Rohini, V.Arularasi, (2017). Have performed about effect of quarry dust and fly debris as a partial substitution of concrete and fine total in concrete. Assessments were under required to convey negligible exertion concrete by blending in different extents of hypo slop with concrete. The substantial association can moreover be proper for inadequate substitution (up to 60%). The fly debris, quarry shake residue can be utilized as edge an of 20% substitute of concrete and fine total in concrete.

It was concentrated to avoid regular corruption on account of modern wastes shape concrete handling plants. The results were enabling in that they uncovered that substantial of the necessary compressive quality can be made. It is assumed that one more advancement material with insignificant exertion can be made available.

- Thus we get the Concentrate unquestionably shows that 40% of replacement of concrete and fine total by fly debris and quarry shake dust is engaging and the compressive properties is more than the standard cement.
- Consequently, 40% substitution is recommended which might end up being viable. The more than 40% substitution gets hold assets of 30% of the total expense in M30 of cement.

Dr. Suji 2016 has assessment that in regards to preliminary thoroughly considers on midway replacement of fine total with saw dust and quarry dust. In readiness of fine total with concrete is mostly superseded by saw dust and quarry dust. This assessment had been embraced to ponder the impact of quarry residue and saw dust by quarry residue of 0%, 10%, 20%, 30% and 40%. Likewise, saw residue of 0%, 5%, 10%, 15% and 20% with the fine total grew fine total has shaped. That's what the result incorporate

- The compressive and split rigidity of 30% of quarry dust and 15% of saw dust gives a generally outrageous of compressive strength of 36.26 N/mm2 and split elasticity of 3.8 N/mm2 for 28 days separately.
- The experience found inside the assessment is that the saw dust is frequently added most noteworthy up to 15% without impacting any of the physical or mechanical properties.

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- A fascinating and most important point found is by speeding up how much saw dust, the worth of the total substantial blend will be lessened and furthermore the weight is diminished up to 20.

N, Kavibala 2016 has found out about test analyze on partial replacement of fine total with quarry dust and concrete with marble powder with development of polypropylene fiber. The course of action of tests are light-emanating diode to think over the impact of 5%, 10% and 15% replacement of concrete with marble powder on compressive strength and split flexibility and differentiation it and furthermore the customary cement and additionally to look through out the best replacement of marble powder between 10% to 145%. With the best replacement of quarry dust and marble powder is traded for fine total at 10%, 20% and 30% and tried for compressive strength and split inflexibility. With these ideal results polypropylene fiber is incorporated for advance change in quality. Considering the results presented over, the going with end can be drawn:

- The Compressive strength of Shapes is extended with the development of marble powder up to 12% substitute by weight of concrete.
- Ideal pace of replacement of concrete with marble powder and fine combination with quarry dust is 12% and 30 min. The compressive strength is extended around 8.5% and part versatility is extended around 8.57% once appeared differently in relation to ordinary cement.
- There is reducing in usefulness as the substitution level additions, and hence the super plastizer is used.

The compressive strength of cement extended around 13.87% and split flexibility is extended around 15.08% with the further development of 0.5% polypropylene fiber by heap of concrete to the substantial.

III. MATERIAL AND TESTS

1. General:

In this examination a study on the partial replacement Fine aggregate by wood ash & copper slag. The methodology took after, tests directed for determination of configuration blend is examined in this part.

1.1 Specific gravity Test:

- Specific gravity Test for cement
- Specific gravity Test for fine aggregates
- Specific gravity Test for coarse aggregates

1.2 Water absorption Test:

- Water absorption Test for fine aggregates
- Test for coarse aggregates
- Sieve analysis
- Surface moisture Test
- Bulk density Test
- Water adsorption
- Fineness of cement Test .

1.3 Destructive Test:

- Compressive Strength

2. Material Used:

2.1 Cement:

Concrete is a fine, dim powder. It is blended in with water and materials like sand, rock, and squashed stone to make concrete. The concrete and water structure a glue that ties different materials together as the substantial solidifies. Customary Portland concrete having 28days compressive strength of 46 MPa (ASTM 1994) was utilized for arrangement of every single substantial shape. By utilizing one sort of concrete, the effect of differing the kinds of coarse total in concrete is examined.

Table 1. Properties of cement.

S. No.	Characteristics	Values obtained	Standard values
1	Normal consistency	33%	
2	Initial Setting Time	47 min	Not less than 30 min.
3	Final Setting Time	573 min.	Not Greater than 600 min.
4	Sp.Gr.	3.12	
5	Fineness	4.8	

2.2 Fine Aggregate:

The sand utilized for the trial customized was privately acquired and adjusted to Indian Standard Details IS: 383-1970. The sand was first sieved through 4.75 mm sifter to eliminate any particles more noteworthy than 4.75 mm and afterward was washed to eliminate the residue.

2.3 Coarse Aggregate:

The wrecked stone is by and large utilized as a coarse total. The idea of work chooses the most extreme size of the coarse total. Locally accessible coarse total having the greatest size of 20 mm was utilized in our work. The totals were washed to eliminate residue and soil and were dried to surface

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dry condition. The totals were tried according to Indian Standard Determinations IS: 383-1970.

2.4 Wood debris:

The Wood debris used was gotten from tree wood. In the wake of get-together, the wood debris was clearly warmed. The debris was ground to the necessary degree of fineness and sieved by 90µm sifter remembering the ultimate objective to remove any defilement and greater size particles. Wood debris is a waste material, the development powder left after the start of wood, for instance, consuming wood in a home smokestack or a modern power plant. It is used for the most part by grower as a fair wellspring of potash when it is at absolutely no point in the future sensitive.

Wood powder is fundamentally made from calcium, potassium, phosphorus, and magnesium, besides contains go to after lengths of iron, manganese, sodium, boron, zinc, copper, and molybdenum.

Since it's made through the consuming of plant materials, it holds a basic number of the portions guessed that would uphold new improvement and has for a significant length of time been involved by plant professionals and ranchers as a brand name soil change.

2.5 Copper slag:

Copper slag is generally utilized for surface impact cleaning. Crushing influencing is utilized to clean and shape the outer layer of metal, stone, concrete and different materials. In this framework, a flood of cruel grains called coarseness are prompted against the work piece. Copper slag is just one of a concentrated kind of materials that will be utilized as cruel coarseness. Pace of coarseness utilization, proportion of clean made, and surface completion quality are a touch of the parts impacted by the decision of coarseness material.

Copper slag is a by-outcome of copper sifting and cleaning process. Copper slag which is a mechanical waste gotten from purifying and refining method of copper from Sterlite Industry Ltd., Tuticorin, and Tamilnadu. Practically 4 tons of copper is acquired as waste is planned to grounds acknowledger's trademark influences. So it very well may be reused as establishing materials. In treatment facility plants when copper metal conveyed by extraction prepare by then copper slag is made in an expansive total in the time of copper metal. Around 2-2.5 lots of copper slag conveyed for every 1 ton of copper creation.

IV. METHODOLOGY

Concrete expects to be a basic part in controlling and confirming the idea of bond concrete. Intentional testing of rough material, new concrete and cemented concrete are bound together piece of any quality control program for bond concrete, which is help to accomplish higher reasonability of material used and wonderful certification of the execution of the substantial as for both strength and toughness. It is the one of inspiration driving testing set concrete is to certify that substantial used at site has developed the require fortitude.

In this examination the assessment wood ash, copper slag, quarry perfect and substantial strength using hazardous test gear have been finished. In this examination three kinds of wastes materials (copper slag and wood ash) and average total were used for preparing strong shape models. There are

M35 of mixed degree are utilized. The substantial support point, 3D square and barrel organized on standard total and 60% and 40% assorted size 10 mm (40%), 20 mm (60%), use for substantial strong shapes and waste material are utilized in concrete with the replacement obligation of 10%, 20%, 30% and 40%. These shafts, barrel and 3D shapes are taken a stab at 7, 14 and 28 days.

The compressive strength, flexural strength, and flexibility are settled with the help of ruinous test sorts of stuff. The bond utilized as a piece of all blenders is standard Portland concrete and trademark sand is utilized as a piece of the test. The degree of sand is 2 mm to 4.75 micron. It is acknowledged that the compressive trait of substantial 3D shapes at 7 days is 80% of the strength at 28 days.

The damaging was performed on 156 solid shapes, 39 pillars and 39 chambers from various HSC combinations. To decide the effect of waste materials, 3D shape, shaft and chamber examples with standard aspects were investigated at 3 ages, for example 7, 14 and 28 days. The choice of the strength of every blend and example ages depend on the mean of 3 examples.

First Trial (Replacement of Cement by Wood Ash)

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- Normal mix (control) i.e. cement + coarse aggregate + sand+ water.
- Special mix 1 i.e. cement (10% of WA replaced by weight of the cement) + coarse aggregate + sand + water.
- Special mix 2 i.e. cement (20% of WA replaced by weight of the cement) + coarse aggregate + sand + water.
- Special mix 3 i.e. cement (30% of WA replaced by weight of the cement) + coarse aggregate + sand + water.
- Special mix 4 i.e. cement (40% of WA replaced by weight of the cement) + coarse aggregate + sand + water.

Second Trial (Replacement of Cement by Copper Slag)

- Normal mix (control) i.e. cement + coarse aggregate + sand + water.
- Special mix 1 i.e. cement (10% copper slag replaced by weight of the cement) + coarse aggregate + sand + water .
- Special mix 3 i.e. cement (20% copper slag replaced by weight of the cement) + coarse aggregate + sand + water.
- Special mix 4 i.e. cement (30% copper slag replaced by weight of the cement) + coarse aggregate + sand+ water. Special mix 4 i.e. cement (40% copper slag replaced by weight of the cement) + coarse aggregate + sand + water.

V. RESULT AND DISCUSSION

1. Consistency of Cement Test:

The Ordinary Consistency of Concrete is depicted as that degree of water expected to convey a bond glue of standard consistency. For confirmation reason, common consistency is taken as the water content at which vicat's unclogger enters up to a state of 5 to 7 mm from the foundation of the vicat's edge.

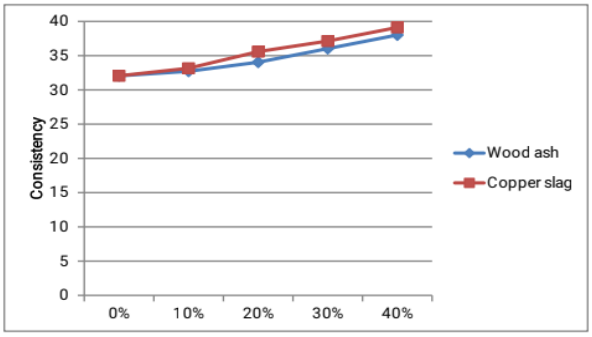

Fig 1. Normal Consistency of Cement.

At the point when we add water to the bond, the glue begins setting and gets quality. The major point is to find the water content expected to make a security glue of standard consistency as exhibited by the Might be: 4031 (Section 4) - 1988.

Table 2. Standard Initial and final setting time of cement.

Type of cement	Initial setting time			Final setting time		
Portland-pozzolona cement 43 grade	As per IS (IS 4031: PART 5)		Test time 46 min	As per IS (IS 4031: PART 5)		Test time 573 min
	Minimum	Maximum		Minimum	Maximum	
	30 min	55 min		190 min	600 min	

2. Workability of Concrete:

In this part different test results on concrete are presented and analyzed. This includes workability of concrete include copper slag, & wood ash blended mortar which is assessed by the compressive strength of concrete with M35 grade as shown in Table 4.7

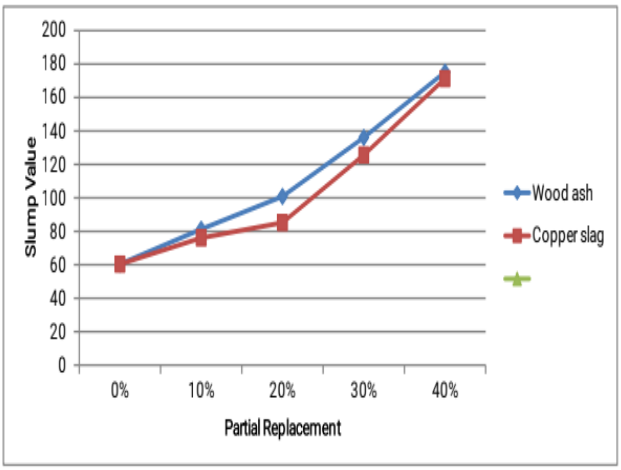

Fig 2. Slump Values of Different Waste Material.

3. Compressive Strength:

It is a disastrous test. Substantial blocks examples models are attempted by CTM. These example examples contain different amalgamation of total having standard total piece test with 10 mm (40%) total, and 20 mm (60%) total having particular waste materials (copper slag, and wood debris) used the

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degree of 10%, 20%, 30% and 40% as replacement of bond used in substantial strong shape models.

3.1 Compressive Strength of Containing Wood Ash:

Fig 3. Compressive Strength of M35 Grade Contain of Wood Ash.

3.2 Compressive Strength of Containing Copper Slag:

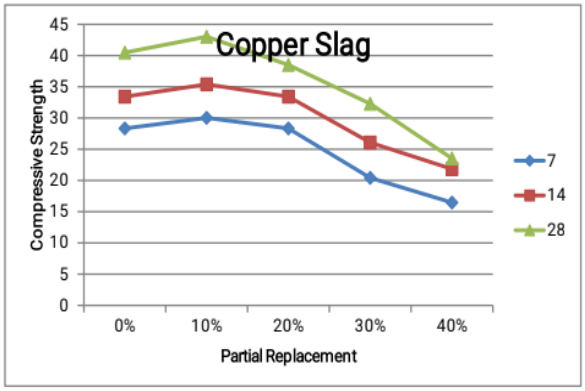

Fig 4. Compressive Strength of M35 Grade Contain of Copper Slag.

4. Split Tensile Strength Test:

The result of the Split tensile strength determine by compression testing machine, with the incomplete substitution of copper slag, wood ash & quarry dust by cement with level of 10%, 20%, 30% and 40% with result determine the age of 28 days are appeared in the fig. 4.6 for M-35 concrete.

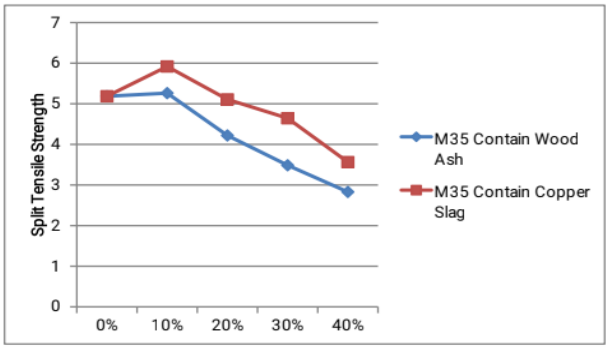

Fig 5. Split Tensile Strength of Copper Slag, & Wood Ash.

5. Flexural Strength Test:

Flexural power additionally called as modulus of rapture. In concrete flexure is the bowing minute caused by the applied load, in which a concrete beam has pressure at top and tensile worry at the base side. Shafts on testing will bomb in strain because of its property and shear will show up on concrete.

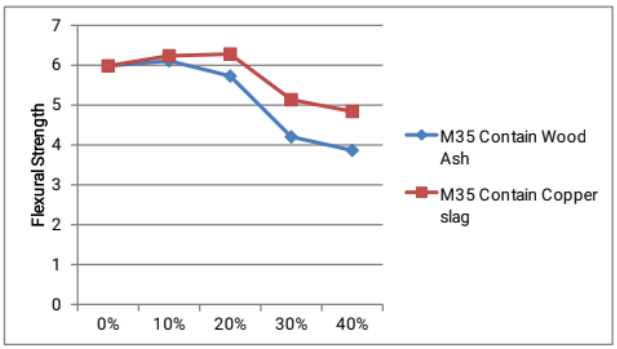

Fig 6. Flexural Strength of M35 Grade Contains of Wood Ash, and Copper Slag.

VI. CONCLUSION

From the above explores the review focus on the overall execution of cement by use the copper slag and wood debris as halfway substitute of concrete. In the ongoing work the strength examination is execute which is dissected in the accompanying focuses:

- Each of the glues containing copper slag, and wood debris showed ordinary consistency equivalent and higher than the control glue. Up to 10%, and 20% substitution the standard consistency was for the most part steady minor contrasts, at 30% and 40% substitution the standard consistency had shown a slight augmentation to 39%.
- From the above results for droop exhibits that the usefulness increases with the extension in the paces of contain wood debris, copper slag. All investigated containing wood debris, and copper slag mixes had height droop regards and commendable functionality.
- From the above table it is seen that the compressive strength results addresses that substantial projected with in M35 grade of cement at 7, 14 and 28 days are decline when the level of the wood debris increase from 0% to 40%.
- From the above table it is seen that the compressive strength results addresses that substantial projected

with 35 grade of cement at 7, 14 and 28 days are decline with substitutions of 20 to 40%, and increases, when the level of the copper slag increase from 10% at 7, 14 and 28 days.

- It is seen that the Split rigidity of cement is diminishes with the replacement of wood debris. Likewise, elasticity is extended with the replacement of copper slag increases correlation with wood debris, with the age of 28 days.
- It is seen that the flexure strength in M35 grade of cement at 28 days, with the augmentations, when the 10% of level of the wood debris increase and diminishing from 20%, 30% and 40% utilized of wood debris with the age of 28 days. Flexural strength is increments when the 10% and 20% of level of the copper slag addition and decline from 30% and 40% utilized of copper slag with the age of 28 days. 0% to 15% and marginally diminished with 20% substitution at 28th days.

VII. FUTURE SCOPE

- In this investigation we have partially replaced cement with copper slag & wood ash. In future it can utilize as waste material because it's economical, cost effective and environment friendly.
- In this experimental work has been done for M-35 grade of concrete, in future work different grades of concrete can be used.
- In future work we can partially replace cement for high strength of concrete with copper slag & wood ash and reduce cost of construction material.

REFERENCES

[1] Binaya Patnaik, Seshadri Sekhar.T, Srinivasa Rao, (2015). Strength and Durability Properties of Copper Slag Admixed Concrete, International Journal of Research in Engineering and Technology, eISSN: 2319-1163, pISSN: 2321-7308, 4(1), 158-166.

[2] Chavan, R., & Kulkarni, D. (2013). Performance of copper slag on strength properties as partial replace of fine aggregate in concrete mix design. Int. J. Adv. Engg. Res. Studies/II/IV,E-ISSN2249–8974, 95, 98.

[3] Dr.suji.D, Narayanan.A.M, Kartic Kumar.M, Perarasan. M, (2016). Experimental Study on Partial Replacement of Fine Aggregate with Quarry Dust and Saw Dust, International Journals of Advancement in Engineering Technology, Management Applied Science, ISSN NO. 2349-3224, 3(6).

[4] I Rohini, V.Arularasi, (2016). Effect of Fly Ash and Quarry Dust as a Partial Replacement of Cement and Fine Aggregate in Concrete, International Journal of Latest Research in Engineering and Technology, ISSN 2454-5031, 02(08), 15- 33,

[5] Jayapal Naganur & Chethan B. A. (2014), Effect of Copper Slag as a Partial Replacement of Fine Aggregate on the Properties of Cement Concrete, International Journal of Research, ISSN 2348-6848, 1(8), 882-893.

[6] J. Ramesh Kumar, K. V. Ramana, (2013). Use of Copper Slag and Fly Ash in High Strength Concrete, International Journal of Science and Research, ISSN: 2319- 7064, 4(10), 777-781.

[7] K.S. Johnsirani , Dr. A. Jagannathan, (2015). Study on Effect of Self- Compacting Concrete with Partial Replacement of Mineral Admixtures Using Quarry Dust, International Journal of Engineering Research and Development, e-ISSN: 2278- 067X, p-ISSN: 2278-800X, 11(11), 01-07.

[8] Kamlesh Saini, Vijay Chaudhary, Ankush Bisnohi, Harshit Agarwal, Meghalal Ram, Sandeep Saraswat, (2016). Effect on strength properties of concrete by using waste wood powder as partial replacement of cement." International Journal of Civil Engineering 3: 172-176.

[9] Kayathri, K., Vigneshkumar, C., Rani, G., & Karthick, K. (2014). Effect of Copper slag, Fly Ash and Granite Power as a Partial Replacement in Fine aggregate. International Journal of Innovative Research in Science, Engineering and technology, pISSN: 2347 – 6710, 3(5), 439-443.

[10] Lakshmidevi, K., & NarasimhaRao, A. (2015). Effect of Fly Ash and Quarry Dust on Properties of Concrete. International Journal of Innovative Research in Science, Engineering and technology, pISSN: 2347-6710, 4(9), 8343-8350.

[11] Mohammad Iqbal Malik, Syed Rumysa Jan, Junaid A. Peer, S. Azhar Nazir, Khubbab Fa Mohammad, (2015). Study of Concrete Involving Use of Quarry dust as Partial Replacement of Fine Aggregates, IOSR Journal of Engineering, ISSN (e): 2250-3021, ISSN (p): 2278-8719, 05(02), 05-10.

[12] N.Kavibala, (2016). Experimental Study on Partial Replacement of Cement with Marble Powder and Fine Aggregate with Quarry Dust and with Addition of Polypropylene Fiber. International Conference on Current Research in Engineering

International Journal of Science, Engineering and Technology

An Open Access Journal

Science and Technology, E- ISSN: 2348 – 8352, 39-42.

[13] Obilade, I. (2014). Use of saw dust ash as partial replacement for cement in concrete. IJESI, ISSN (Online), 2319(6734), 36-40.