International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

Review on Utilization of Industrial waste for Construction Industry

Santosh Alwekar[1]

Asst. professor, School of Architecture, DYPCET, Kolhapur, santoshalwekar@gmail.com

Abstract - *It is since the last decade, due to the modernization of both, industries and the human lifestyle, there is an elevation in the amount and types of wastes produced globally. The problem of industrial waste management and accumulation over the years has been seen as a global issue. These industrial wastes include agricultural wastes, by-products, slag, rice husk ash, fly ash, cement dust, glass, tires, and electronic wastes, etc. in the present age the industrial waste is a huge concern to both the environment and the health of its components as almost all of it is dumped in rivers, landfills, oceans, etc. endangering sustainability. The construction industry is one of the oldest and most vast industry and has a larger demand for both natural as well as synthetic resources which results in the depletion of natural resource reserves. This paper is an effort to develop awareness among the people and spread the importance of industrial waste management its utilization in a productive manner , for the betterment of other industries. This paper focuses on utilization of industrial waste for the construction industry to provide sustainable development. Where the industrial wastes will be blended with cement to gain various variety of cements for different construction purposes.*

Key words **- Endangering, Industrial wastes, Modernization ,Sustainable, Utilization.**

1) INTRODUCTION - Humans are the most upgraded animals on earth, capable of bringing about a revolution. Industrialization is one such revolution. Industrialization rate is increasing globally at a very fast rate with an annual increase of 10 % to 15%.It results in production of considerable amount of waste of more than 267.8 million tons per day which includes industrial and agricultural wastes. The industrial wastes are mostly in the form of by- products like fly ash, rice husk ash, cement dust, slag, glass etc. The increase in waste generation is dangerous for environmental sustainability and human health. The construction

Industry is the largest user of natural resources (like limestone, sand, etc).

In addition, large amount of waste is generated by demolition of existing buildings. The building material industry is a domain of interest for reuse of industrial wastes. Various researchers have contributed to introducing new construction materials with utilization of these wastes. These new techniques of building materials are developing to establish the sustainable constructions. Concrete is obtained from ingredients like natural aggregates, sand, cement and water. All these are natural resources except cement. Cement is produced in fabrics, processes which polluting the environment (for producing 1-meter cube of concrete a quantity of 480 kg of CO2 is liberated int the atmosphere.)In recent years the consumption of concrete has seen a tremendous hype causing an increase in overall construction cost. Usually, Concrete of different grades is manufactured using different proportions of ingredients. In order to reduce this aggregate and cement consumption, the replacing materials obtained from wastes are studied below

Many researchers have studied about reutilization of industrial waste in construction and papers have been published. Some of them are:

2) UTILIZATION OF INDUSTRIAL WASTE IN THE CONSTRUCTION INDUSTRY

Rastogi and Umesh Sharma in this study has chosen three industrial wastes for blending with Portland cement. They are Fly ash, Blast furnace slag & waste of glass industry. All these three waste after grinding properly are blended with ordinary Portland cement in different proportions. They have carried out tests on blended cement to check Fineness, Standard Consistency; Soundness, Setting time & Compressive Strength of blended cement. All three wastes are in powder form with cementitious properties; they are proved best when blended with Cement. They also found improved results related to most of the properties of cement as compared to the ordinary Portland cement. The authors underline huge production of this industrial waste in our country and say that instead of disposing off these wastes if they are utilized in such a manner then it will provide an eco-friendly Solution, reduce pollution and emerge as an

International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

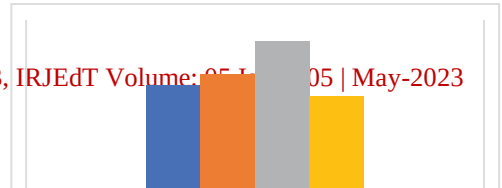
economic
al solution, which will contribute in the progress of the nation. In conclusion, authors say that blended cement is cheaper than Ordinary Portland Cement. Fly ash based blended cement is comparatively more sound than that of the glass waste blended cement and plain cement whereas glass waste blended cement imparts more compressive strength.

Wastes	Source
(1) Pulverized fly ash	Thermal Power station at Dipnagar. Tal. Bhusawal, Dist. Jalgaon
(2)Ground blastfurnace slag	ISPAT steel industries, Dharamtar. Alibagh
(3) Glass waste silica powder	Taloja glass unit, New Bombay

3) Experimental study on usage of industrialwastein roadconstruction

M.G. Prathap, N. Balaji, J.S.Sudarsan, in this paper, have carried out experimental investigation of different test on concrete for its compressive strength, flexural test, split tensile test, and Characteristics of partial replacement of cement with 10%, 20%, 30% of Industrial Waste(phosphogysum).They identify Phosphogypsum as an industrial waste produced from the chemical industries, which can be used in concrete. This technique converts the waste materials into value added products. They say, if the industrial waste is utilized in construction industry, will increase the availability of materials for construction purpose. It will also reduces the expenditure on disposal of industrial such industrial wastes. It will reduces the pollution too. The substitute material for changing materials used for laying pavement is got from industrial waste with agriculture based industrial waste. From the results of the experimental study, they state that 20% replacement of cement with industrial waste gives a good test result then the other mix percentage. They recommend to use 20% industrial waste in concrete for construction of rigid pavements which will solve problem of environmental pollution too.

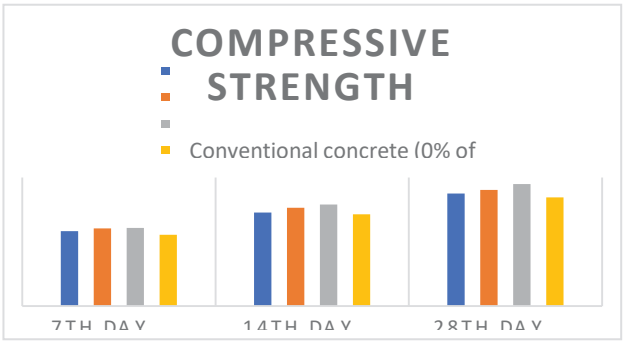
1) **Slump cone test:**



Comparisons of Obtained values of SLUMP CONE TEST

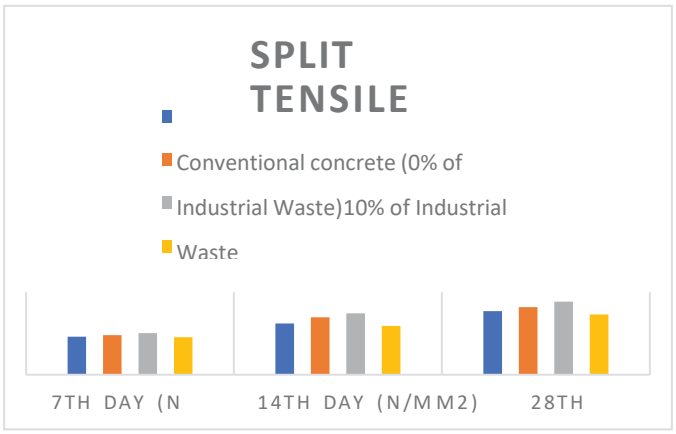
- Blue colour - normal concrete,
- Orange colour - concrete with 10% replacement,
- Grey colour - concrete with 20%replacement
- Yellow colour - concrete with 30% replacement.

2)Compressive Strength Test:



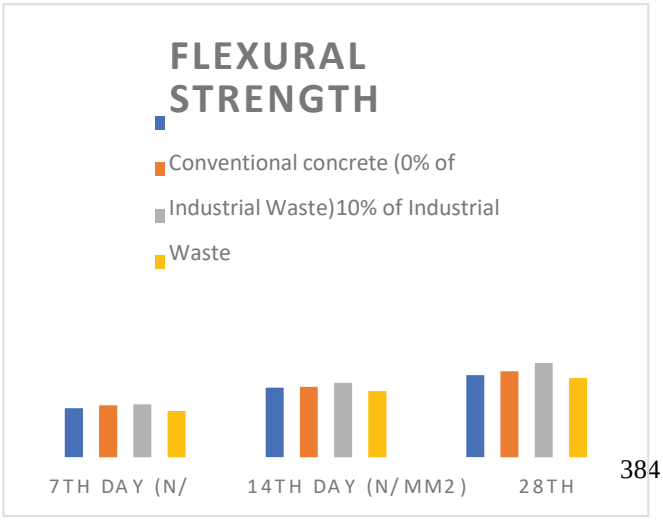
Comparison of obtained values of compressive strength

3)Split Tensile Strength test:



Comparison of obtained values of split Tensile Strength

4)Flexural Strength test:



International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

Comparison of obtained values of Flexural Strength

4) An Overview on Utilization of Industrial Waste in Civil Ezgineering

Parveen Berwa ,Rajesh Goel, in this paper, have presented a review study of using industrial waste like red sand from bauxite industry in concrete production to replace fine aggregate. They say, fine aggregate being very important ingredient determining the concrete volume and concrete properties, its selection is important. According to them proportioning of fine aggregate should be given careful attention. Use of fine aggregate such as red sand in concrete production with coarse aggregate will help in achieving economy in construction industry as well as saving environmental degradation in term of reduced mining and less pollution. In this study they have used red sand in different proportion in concrete mix to study various strength properties

Physical Characteristics of Fine Aggregates

Parameters	Specific gravity
Natural sand	2.66
Red sand	2.52

Water Absorption of Fine Aggregates (%)

Property	NS	RS	Method
Water absorption	.78	1.05	IS

Fineness Modulus for Various Fine Aggregates

Property	NS	RS	Method
Fineness Modulus	2.68	1.70	Calculation

Workability Experienced of Concrete Mixes

Mix	M1	M2	M3	M4	M5
Average slump	80	75	70	60	55

5)USE OF INDUSTRIAL WASTE SLAG IN THE DEVELOPMENTOF SELF-COMPACTING CONCRETE FOR SUSTAINABLE INFRASTRUCTURES

K.P. Sethy,K. K. Sahoo,Biswajit Jena, have carried out this research to study the advantages of using industrial slag which is a by-product of Iron industry, in concrete. They say use of industrial slag in construction minimize the hazardous effects of concrete on environment. It also reduce problem of handling industrial slag after its generation. They also find that industrial slag can substitute concrete for up to 20% by mass. They feel that industrial slag also enhances the properties of concrete like strength, improved fluidity due to more paste volume, improved dimensional stability, more dense concrete, and increased durability. They suggest that researchers should highlight the benefits of industrial slag for its maximum use for the benefit of community. This is an innovative material, which can be used in general construction.

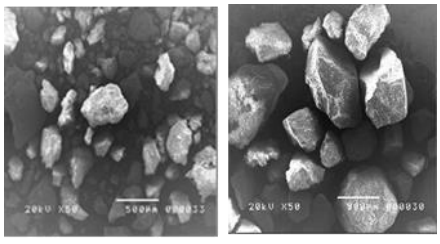
Strength Grade[MPa]	Name	Compressive Strength [MPa]			
		3 days	7 days	28 days	90 days
20	SCC20	16.53	19.07	27.27	34.22
30	SCC30	25.52	37.86	46.5	54.98
60	SCC60	25.33	54.17	72.33	80.79
90	SCC90	33.93	64.84	92.28	103.3
100	SCC100	47.59	66.36	96.83	104.8

6) UTILIZATION OF AGGREGATE QUARRY WASTE IN CONSTRUCTION INDUSTRY

Mary Ann Q. Adajar, Euclid de Guzman, Ryan Ho, Cesar Palma Jr. III, and Dennis Sindico, through this paper have tried to investigate the structural performance of concrete with aggregate quarry waste(WAQ) as substitute for fine aggregates in a concrete mix. They define it as an innovative effort of using solid waste in construction to reduce environmental degradation causing due t quarrying activities. They suggest, this solid waste can replace fine aggregates in concrete mix to make it a sustainable technique of construction. It also eliminates disposal problems of quarry solid waste and reduces cost of concrete products. Their study revealed following facts.

- Achieves 78% to 85% compressive strength of concrete.
- Achieves 69% to 72% flexural strength of concrete.
- No significant effect in unit weight of concrete.
- Reduce workability, hence require high water-cement ratio.

Hence, the authors say concrete with aggregate quarry waste is proved as substitute for fine aggregates in concrete.



International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

WAQ Sand

Micrographs at 50X magnification

	Mix Proportions				
	0B	**25B**	**50B**	**75B**	**100B**
Sand m^3	0.028	0.021	0.014	0.007	0.0
kg.	75.60	56.70	37.80	18.90	0.0
WAQ m^3	0.0	0.007	0.014	0.021	0.028
kg.	0.0	17.99	35.98	53.97	71.96
Gravel kg	109.8	109.8	109.8	109.8	109.8
Water liter	15	15	15	15	15 to 18
Cement bag	1	1	1	1	1

Element	**WAQ** %	**Sand*** %
Magnesium (Mg)	0.59	2.06
Aluminum (Al)	8.15	6.33
Silicon (Si)	24.43	18.91
Potassium (K)	1.00	0.43
Calcium (Ca)	2.77	1.66
Iron (Fe)	6.92	0.93
Sodium (Na)	1.10	3.68
Total Carbon (C) and Oxygen (O)	55.41	34.00

Compressive strength of concrete with varying percentage of WAQ

Average Compressive Strength (MPa)					
Curing Day	**0B**	**25B**	**50B**	**75B**	**100B**
7D	21.07	11.68	10.02	17.18	12.62
14D	24.23	14.64	13.13	19.12	14.94
21D	26.28	15.88	14.70	21.51	18.95
28D	28.44	17.28	15.93	22.19	20.61

7)CONCLUSIONS

Blended cement is cheaper and sustainable alternative to Portland cement, which must be adopted by construction industry on larger scale for economy as well as protection of environment.20% use of Industrial Waste (phosphogysum) to replace cement can be effectively used in construction of rigid pavements, which will reduce the problem of waste disposal and pollution too. Red sand from bauxite industry can replace fine aggregates to minimize environmental degradation by reducing mining. Use of industrial slag in concrete reduces problem of its disposal and it enhances strength and quality of concrete. Aggregate quarry waste can be used as another sustainable and economical material to partially replace fine aggregates and it will solve problem of pollution.

REFERENCES

[1] UTILIZATION OF INDUSTRIAL WASTE IN THE CONSTRUCTION INDUSTRY, D. Rastogi[1], Umesh Sharma[2] ,Civil department MITS Gwalior 474005, India, deepak_rstg_mits@yahoo.co.in[1],Sharmaumesh729@gmail.com[2].

[2] M. G. Prathap, N. Balaji and J. S. Sudarsan

[3] Parveen Berwal,Galgotias College of Engineering and Technology (GCET),cam Manila, Philippines

[4] * Mary Ann Q. Adajar[1], Euclid de Guzman[2] Ryan Ho[2], Cesar Palma Jr. III[2], and Dennis Sindico[2] [1]Associate Professor, De La Salle University, Manila, Philippines.

[5] Use of Industrial Waste Slag in the Development of Self-Compacting Concrete for Sustainable Infrastructures, Kaliprasanna Sethy, Indian Institute of Technology Bhubaneswar, Biswajit Jena,Dhaneswar Rath Institute of Engineering and Management Studies