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Experimental Studies on Concrete Containing Welding Waste Slag

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ABSTRACT

In the field of construction concrete is the largest utiliser of natural sources and industrial materials by products available in the world. The concrete is a essential material to fulfill the requirements of industries, domestic housing and basic infrastructural needs of our society. Rapid increase in urban infrastructural developments in developing countries such as India leads to the need for natural resources such as river sand. The accessibility of the natural resources is diminishing rapidly. At present, other sources of fine aggregates are in great demand. This work concentrates on the utilisation of weld slag (slag left after the welding process) as fine aggregate in concrete. In this research study of strength of a new construction material named as Welding Waste Slag Concrete. Welding Waste Concrete is a concrete made by some quantity replacement by welding slag on the place of natural sand. Welding slag is waste slag of weld which is residue after process of arc welding. Results shows that the compressive strength of 10% replacement is best which also greater then conventional concrete. And results also shows that 10% by welding slag also shows greater strength then conventional.

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Key words

Welding waste slag, compressive strength, workability, split tensile strength.

Introduction

Concrete is basic need of construction. Main ingrediants of concrete are cement, sand, aggregates and some admixers. The main problem is aggregates basically used (fine or coarse) in concrete are natural stones. And as we know use of concrete is increasing day by day so there will be problem with availability of natural aggregates in future. So we have to find some alternative to avoid this problem. Other motive of my work is to reduce the cost of concrete construction.

The use of iron in making so many product increase the process of weld of iron. By increase in demand of vehicles, the production and use of weld are also increased in the developed and developing countries both. Worldwide iron manufacturing is increasing and so welding process also at even higher percentage. Welding Waste Slag is byproduct of arc welding whether weld of vehicles and trucks, in my research work topic is decided to focus on welding waste of slag. After the process of welding by product slag is just a waste, so we have to discard that slag. Weld waste slag is not biodegradable so it is hazardous to environment.

In last few years, handling and management of waste is the main issue infrant of the countries world wide. The problem of waste is faced as one of the most hazardous problems in the world as a cause of the environmental pollution. One of the wastes to be managed is 'Welding waste slag' because; Now development in contries worldwide has produced big amount of iron products, so that they required welding process and produces big amount of welding waste slag. The disposal of the waste is now a big problem in frant of management worldwide.

2. Materials used

2.1. Cement

Ordinary portland cement (OPC) 43 grade. All tests on cement was performed as per Indian standard code IS 8112-2013.

2.2 Fine aggregates

Locally available sand was used in research work. All the specifications as per IS:383-1970.

2.3 Coarse aggregates

Locally available coarse aggregates having size less then 20mm was used. All the specifications as per IS:383-1970.

2.4 Water

Normal drinking water was used for mixing.

2.5 Welding waste slag

Welding waste slag used in experimental work was collected from local welding workshops.

3. Tests performed

3.1 Slump test

Slump check is carried out of every sample to check workability of concrete. The slump value was checked as per procedures given in IS: 1199 – 1959 in India.

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3.2 Compressive Strength test

Compressive Strength tests were perfomed on concrete sample after 7 days and 28 days. As per specifications given in IS:516-1959.

3.3 Split tensile strength

Split tensile strength tests were performed as per IS:5816-1999. Performed after 7 days and 28 days.

4. Litrature review

Effect of replacement of Welding waste slag in place of fine aggregates stated and results shown that there is no effect on workability of concrete with replacement of fine aggregates with welding waste slag in all the perpotions of replacement (5%, 10% & 15%). Compressive strength of concrete contains welding waste slag 5% shows greater strength after 28 days of curing. It shows 3% increase in strength. In Samples with 10% it shows 8% and 10% increament in strength after 7 days and 28 days of curing. In samples with 15% replacement it shows 5% and 6% increament in compressive stremgth after 7 days and 28 days. In split tensile strength with 5% replacement it shows 6% increment in strength. In samples with 10% replacement of fine aggregates it shows 14% increment after 28 days of curing.

5. Results

Table 1:- Effect of welding waste slag on compressive strength.

S.no	Specimen Id	Compressive Strength (MPa)	
		7 Days	28 Days
1	FR00	16.5	30.22
2	FR05	16	31.11
3	FR10	17.78	33.33
4	FR15	17.44	32

Results show that with 5% replacement of fine aggregates with welding waste slag compressive strength was decreased at 7 days and there is an increase of 3% in compressive strength tested at 28 days of curing. At 10% replacement of fine aggregates with welding waste slag shows greater compressive strength it shows 8% and 10% increament in strength after 7 days and 28 days of curing.

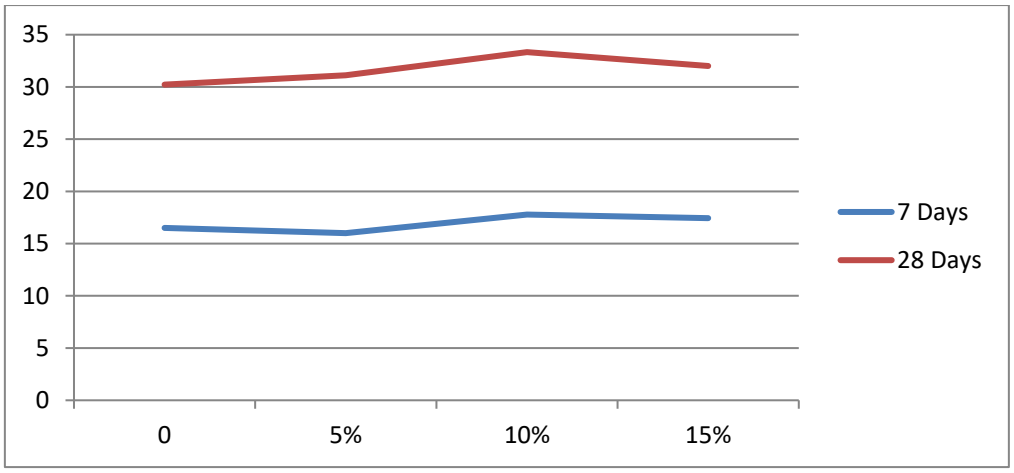

Figure 1:- Effect on compressive strength

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Table 2 :- Effect on Split tensile strength.

Sr. no.	Specimen Id	Split tensile strength 28 days
1	FR00	2.96
2	FR05	3.15
3	FR10	3.39
4	FR15	3.25

Results of split tensile strength showed 6% increament in strength in samples with 5% replacement with welding waste slag. It showed 14% increament in split tensile strength in samples with 10% replacement of fine aggregates with welding waste slag.

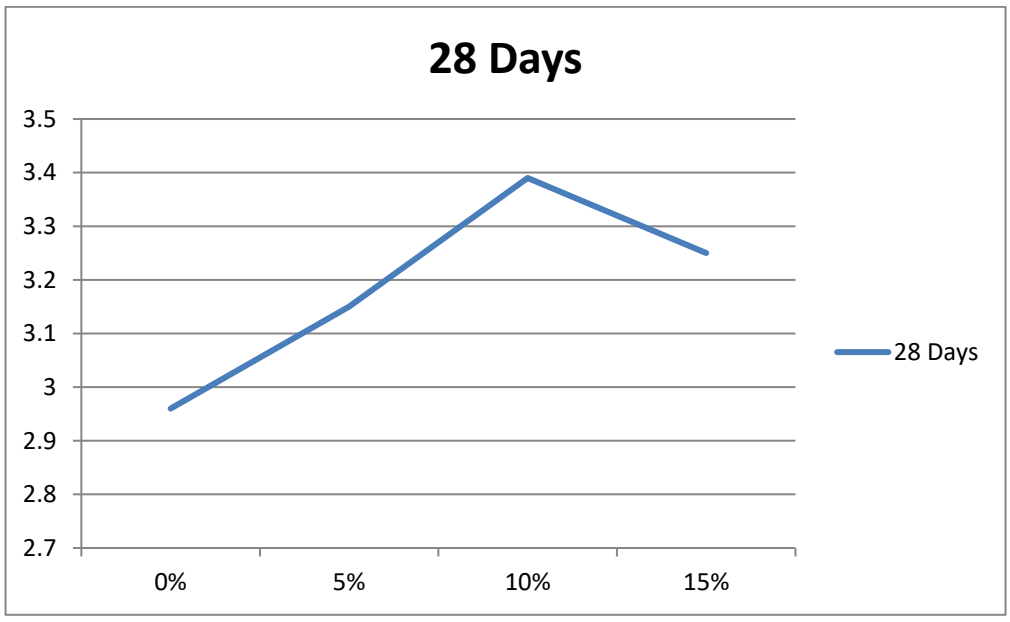

Figure 2:- Effect on split tensile strength.

6. Conclusion

From above results of compressive strength and tensile strength it was clear strength of concrete increased in all the samples containing welding waste slag. Samples with 10% replacement of welding waste slag on place of fine aggregates showed best values.

Reference

1. Arunachalam Ananthi, J.J.College of Engineering and Technology. Karthikeyan Jayakumar, National Institute of Technology, Tiruchirappalli India. Influence of weld slag aggregate in high-performance concrete. Waste and Resource Management Volume 169 Issue WR1. Page 14 – 22.

2. Sree Krishna perumal Thanga Ramesh, Rajan Gandhimathi, Puthiya Veetil Nidheesh, Shanmugam Rajakumar and Subramani Prateepkumar. Use of furnace slag and welding slag as replacement for sand in concrete. International journal of Energy and Environmental engineering.

3. Kulwant Singh, Sunil Pande, Department of Mechanical Engineering, Sant Longowal Institute of Engineering and Technology, Longowal, District Sangrur, Punjab State, India. Department of Mechanical Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India. Recycling of slag to act as a flux in submerged arc welding. Resources, Conservation and Recycling 53 (2009) 552–558.

4. K S Sangwan, Christoph Herrmann, Patricia Egede, Vikrant Bhakar, Jakob Singer, Department of Mechanical Engineering, Birla institute of technology and science, Pilani, Rajasthan, India. Institute for Machine Tools and Manufacturing Technology, Technical University of Braunschweig, Germany. Life Cycle Assessment of Arc Welding and Gas Welding Processes. Available online at www.sciencedirect.com Procedia CIRP 48 (2016) 62 – 67.

5. Arun Kumar Paul, Fiona 1602, Hiranandani Estate, Thane, India. Practical Realization of Scalar Optimization Function of Shielded Metal Arc Welding Process. Third International Conference on Advances in Control and Optimization of Dynamical Systems March 13-15, 2014. Kanpur, India. Page 684 – 692.

6. L. L. Maslennikova, I.A. Naginskii, A. N. Trosheva, a Emperor Alexander I St.Petersburg State Transport University. 190031, Saint Petersburg, 9 Moskovsky pr. Russia. Use of waste from aluminothermic welding of railroad tracks in structural materials science. Procedia Engineering 189 (2017) 94 – 98 Available online at www.sciencedirect.com.

7. Aditya Kumar, Sachin Maheshwari, Satish kumar Sharma, Assistant Professor, MPA Engg, Netaji Subhas Institute of Technology , Dwarka, New Delhi -110078, INDIA. Optimization of Vickers Hardness and Impact Strength of Silica based Fluxes for Submerged Arc Welding by Taguchi method. Materials Today: Proceedings 2 (2015) 1092 – 1101. Available online at www.sciencedirect.com.

8. Naveen Sheoran, Ravi Kumar, Student at Sddiet Panchkula, Assistant Professor in Sddiet Panchkula. Experimental Study on Waste Rubber as A Partial Replacement of Coarse Aggregates in Concrete. ISSN: 2394-7659 Impact Factor- 2.789 International Journal of Engineering Researches and Management Studies. Page- 51 to 57.

9. Sulagno Banerjee, Aritra Mandal, Dr. JessyRooby, Research scholar of Civil Engineerieng Department, Hindustan University, Padur, Chennai, Tamil Nadu, India, Research scholar of Civil Engineerieng Department, Hindustan University, Padur, Chennai, Tamil Nadu, India &Assistant Professor Department of Civil Engineering, Techno India - Batanagar, Kolkata-700141, West Bengal, INDIA. Studies on Mechanical

Properties of Tyre Rubber Concrete, SSRG International Journal of Civil Engineering (SSRG-IJCE) – volume 3 Issue 7 – July 2016. Page- 18 to 22.

10. Pranay S. Kshirsagar, Pritesh B. Pardeshi, Prasad L. Sadgule, Sonali G. Datir, Prof. Vrinda S. Bhalerao UG Student, Assistant Professor, Department of Civil Engineering, Guru Gobind Singh College of Engineering and Research Center, SPPU, Nashik, Maharashtra (India). Shredded Rubber Particals as Partial Replacement to Fine Aggregates in Concrete. Page- 306 to 316.