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Utilization of Industrial Waste Slag as Aggregate in Concrete Applications by Adopting Taguchi' s Approach for Optimization

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ABSTRACT

This paper presents result of an experimental investigation carried out to evaluate effects of replacing aggregates (coarse & fine) with that of Slag (Crystallized & Granular) which is an industrial waste by-product on concrete strength properties by using Taguchi' s approach of optimization. Whole study was done in three phases, in the first phase natural coarse aggregate was replaced by crystallized slag coarse aggregate keeping fine aggregate (natural sand) common in all the mixes, in the second phase fine aggregate (natural sand) was replaced by granular slag keeping natural coarse aggregate common in all the mixes and in the third phase both the aggregates were replaced by crystallized & granular aggregates. The study concluded that compressive strength of concrete improved almost all the % replacements of normal crushed coarse aggregate with crystallized slag by 5% to 7%. In case of replacements of fine aggregate and both type of aggregates, the strength improvements were notably noticed at 30% to 50% replacement level. It could also be said that full substitution of slag aggregate with normal crushed coarse aggregate improved the flexure and split tensile strength by 6% to 8% at all replacements and in case of replacing fine aggregate & both the aggregates(Fine & coarse) with slag, the strength improvement was at 30% to 50% replacements. It is evident from the investigation that Taguchi approach for optimization helped in indentifying the factors affecting the final outcomes. Based on the overall observations, it could be recommended that Slag could be effectively utilized as coarse & fine aggregates in all concrete applications.

KEYWORDS

Compressive; Flexure and Split Tensile Strength; Slag Aggregate; Taguchi' S Approach

Cite this paper

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References

- [1] M. Z. Chen, M. K. Zhou and S. P. Wu, " Optimization of Blended Mortars Using Steel Slag Sand," *Journal of Wuhan University of Technology, Mater. Sci. Ed.*, Vol. 3, 2007, pp. 741-744.
- [2] I. Yuksel, O. Ozkan and T. Bilir, " Use of Granulated Blast Furnace Slag in Concrete as Fine Aggregate," *ACI Materials Journal*, 2006, pp. 203-208.
- [3] J. M. Manso, J. J. Gonzalez and J. A. Polanco, " Electric Arc Furnace Slag in Concrete," *ASCE Journal of Materials in Civil Engineering*, Vol. 16, No. 6, 2004, pp. 639- 645. Hdoi:10.1061/(ASCE)0899-1561(2004)16:6(639)
- [4] K. H. Yang, J. K. Song and J.-S. Lee, " Properties of Alkali Activated Mortar and Concrete Using Lightweight Aggregates," *Materials and Structures*, Vol. 43, No. 3, 2010, pp. 403-416. Hdoi:10.1617/s11527-009-9499-6
- [5] Y.-F. Li, Y. Yao and L. Wang, " Recycling of Industrial Waste and Performance of Steel Slag Green Concrete," *J Cent. South University Technology*, Vol. 16, 2009, pp. 768-773. Hdoi:10.1007/s11771-009-0128-x

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- [6] Y. X. Lun, M. K. Zhou, X. Cai and F. Xu, " Methods For Improving Volume Stability Of Steel Slag As Fine Aggregate," *Journal of Wuhan University of Technology, Mater. Sci. Ed.*, Vol. 3, 2008, pp. 737-742.
- [7] L. Zeghichi, " The Effect of Replacement of Naturals Aggregates By Slag Products On The Strength Of Concrete," *Asian Journal of Civil Engineering (Building and Housing)*, Vol. 7, 2006, pp. 27-35.
- [8] S. Al-Otaibi, " Recycling Steel Mill Scale as Fine Aggregate in Cement Mortars," *European Journal of Scientific Research*, Vol. 24, No. 3, 2008, pp. 332-338.