

Prediction of Compressive Strength of Concrete from Early Age Test Result Using Design of Experiments (Rsm)

Authors : Salem Alsanusi, Loubna Bentaher

Abstract : Response Surface Methods (RSM) provide statistically validated predictive models that can then be manipulated for finding optimal process configurations. Variation transmitted to responses from poorly controlled process factors can be accounted for by the mathematical technique of propagation of error (POE), which facilitates 'finding the flats' on the surfaces generated by RSM. The dual response approach to RSM captures the standard deviation of the output as well as the average. It accounts for unknown sources of variation. Dual response plus propagation of error (POE) provides a more useful model of overall response variation. In our case, we implemented this technique in predicting compressive strength of concrete of 28 days in age. Since 28 days is quite time consuming, while it is important to ensure the quality control process. This paper investigates the potential of using design of experiments (DOE-RSM) to predict the compressive strength of concrete at 28th day. Data used for this study was carried out from experiment schemes at university of Benghazi, civil engineering department. A total of 114 sets of data were implemented. ACI mix design method was utilized for the mix design. No admixtures were used, only the main concrete mix constituents such as cement, coarse-aggregate, fine aggregate and water were utilized in all mixes. Different mix proportions of the ingredients and different water cement ratio were used. The proposed mathematical models are capable of predicting the required concrete compressive strength of concrete from early ages.

Keywords : mix proportioning, response surface methodology, compressive strength, optimal design

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