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Data Article

Dataset on predictive compressive strength model for self-compacting concrete

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ABSTRACT

The determination of compressive strength is affected by many variables such as the water cement (WC) ratio, the superplasticizer (SP), the aggregate combination, and the binder combination. In this dataset article, 7, 28, and 90-day compressive strength models are derived using statistical analysis. The response surface methodology is used toinvestigate the effect of the parameters: Varying percentages of ash, cement, WC, and SP on hardened properties-compressive strengthat 7,28 and 90 days. Thelevels of independent parameters are determinedbased on preliminary experiments. The experimental values for compressive strengthat 7, 28 and 90 days and modulus of elasticity underdifferent treatment conditions are also discussed and presented.These dataset can effectively be used for modelling and prediction in concrete production settings.

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Specifications Table

Subject area	*Civil Engineering*
More specific subject area	*Production of concrete and strength properties*
Type of data	*Table, graph.*
How data was acquired	*Laboratory experiment via response surface methodology*
Data format	*Raw and Analysed*
Experimental factors	*Modelling and concrete strength*

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Experimental features	*Compressive strength and self-compacting concrete*
Data source location	*Experimental and laboratory*, Nigeria
Data accessibility	*Within this article.*

Value of the data

- The present data can be used to predict the strength of auto-compacting concrete at varying days.
- The dataset can be used to determine the trend of strength associate with concrete.
- The dataset can be used to detect the effect of SP.
- The dataset can be used to determine the nature of concrete, and the corresponding degree of hydration.
- The dataset can serve as an experimental framework for the analysis of other basic properties of concrete.
- The dataset can help in developing experimental programme for the evaluation of model accuracy and precision.

1. Data, and experimental design

Strength data presented here are from seventy-two (72) different POFA concrete samples fabricated to compare with normal concrete without ash. We make reference to [1–8] for related views such as forecasting and prediction. In this dataset article, a 7-day, 28-day, and 90-day compressive strength models were derived by statistical analysis and the proposed models results and description as contained in Tables 1–3, and Figs. 1–5 are as follows.

1.1. Sample preparation methods

In this investigation, concrete samples were prepared using Palm Oil Fuel Ash (POFA) at varying percentages, with ordinary Portland cement. The POFA was replaced at 5%, 10%, 15%, 20%, 25%, and 30% with cement and superplasticer at 2%.

2. Materials and methods

2.1. Quadratic equation generated from the model

Besides the statistical software used in the data analysis, is a predictive quadratic model defined as follows:

$$f(x)=C_0+\frac{C_1(x-x_0)}{1!\left(5^1\right)}+\frac{C_2(x-x_0)(x-x_1)}{2!\left(5^2\right)}+\frac{C_3(x-x_0)(x-x_1)(x-x_2)}{3!\left(5^3\right)}+\frac{C_4(x-x_0)(x-x_1)(x-x_2)(x-x_3)}{4!\left(5^4\right)}$$
$$+\frac{C_5(x-x_0)(x-x_1)(x-x_2)(x-x_3)(x-x_4)}{5!\left(5^5\right)}+\frac{C_6(x-x_0)(x-x_1)(x-x_2)(x-x_3)(x-x_4)(x-x_5)}{6!\left(5^6\right)} \quad (1)$$

where x and C_i, $i \geq 0$ denote varying percentages of POFA and compressive strength respectively.

2.2. Data analysis

For x the varying percentages of POFA with zero (0) as the control, and$y$ the average compressive strength, we present in Tables 1–6 the relationship between $x$and$y$ at varying intervals in days.

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