MODEL DEVELOPMENT FOR BOILER EFFICIENCY ALONG WITH THE DISCUSSION ON SAFETY AND WASTE RECYCLING AT CORI

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Abstract

Particle size analysis is a fundamental operation in chemical and process engineering, with sieve analysis being the most commonly employed method to characterise particle size distributions. Determination of size distribution parameters from cumulative sieve analysis data and the inter-conversion of distribution types are computationally intensive tasks that are prone to manual errors and require significant effort. This study presents three C++ programmes developed to automate these tasks. The Rosin-Rammler size distribution model was identified as the governing equation relating cumulative mass percentage retained to mesh opening, expressed as $\log \log(100/R) = b \log x - b \log x_1$, where R is the cumulative mass percentage retained, x is the mesh opening, and b and x_1 are the distribution and size parameters respectively. The first programme determines these two parameters from experimental cumulative sieve analysis data using linear regression via the least mean squares method. The second programme uses these parameters to generate cumulative analysis data for any set of given mesh openings. The third programme performs general inter-conversion between particle size distributions — including number, linear, surface, and mass fractions — based on the proportionality of each distribution type with particle size raised to an appropriate power. All programmes accept user inputs interactively and display results in formatted tabular outputs. The developed software eliminates the need for skilled manual calculation and significantly reduces time consumption in routine particle characterisation tasks.

Keywords: PSD; Rosin-Rammler; Cumulative Analysis; Sieve Analysis; C++; Linear Regression;