

# Analysis of a linear and non-linear model for diffusion–dispersion phenomena of pulp washing by using quintic Hermite interpolation polynomials

Published: 05 February 2021

Volume 32, pages 997–1019, (2021) Cite this article



Afrika Matematika

Aims and scope

Submit manuscript

Satinder Pal Kaur , Ajay Kumar Mittal, V. K. Kukreja, Archana Kaundal, N. Parumasur & P. Singh 140 Accesses  1 Citation [Explore all metrics](#) →

## Abstract

Pulp washing is a prime activity in the process industry that involves diffusion–dispersion phenomena. A huge amount of cost, time, and ecological issues are entailed in waste–water management. To reduce this environmental load and to achieve higher efficiency, the mathematical models are developed and solved with different techniques by the various researchers. In the present study, quintic Hermite interpolating polynomials are used to approximate the trial function for solving the mathematical model of diffusion–dispersion phenomena. The purpose behind this study is to derive an accurate result with less CPU time and effect for some important parameters such as Peclet number, cake thickness, and interstitial velocity of the pulp washing process. Two problems, first with the constant coefficient and second with the variable coefficient are worked out by the proposed scheme. After getting the desired results for the linear model, the method is applied to the nonlinear model. The results indicate that the Peclet number plays a leading role in the pulp washing process whereas, the cake thickness and interstitial velocity both are having a lesser effect. The efficiency, accuracy, and applicability of the method is derived using  $\|L\|_2$  norm,  $\|L\|_\infty$  norms, and rate of convergence. The suitability of the proposed technique is well weighed up when compared with the earlier published results and displays a wider scope of industrial applicability.