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Numerical analysis of heat transfer in an unventilated granular silo featuring different storage capacities

Yahia Abdelhamid Lakhdari*, Lyes Nasser, Djamel Eddine Ameziani, Rayane Lakroune

LTPMP Laboratory, Faculty of Mechanical and Process Engineering, Université des Sciences et de la Technologie Houari Boumediene (USTHB), B.P. 32, El Alia, Bab-Ezzouar, Algiers 16111, Algeria, E-mail: yahia.lakhdari@usthb.edu.dz

A B S T R A C T

In the world of industry and agriculture, efficient storage solutions are really important. Among these, storage silos stand out as significant symbols of effective storage management. They are essentially large cylinders built to store a variety of items, from grains to cement. They play a vital role in safeguarding materials and simplifying logistical tasks. Yet, they are more than just oversized containers. Silos also keep things in good condition by protecting them from factors such as moisture and pests. This study seeks to explore how external climatic conditions, as represented by the Biot number at the top of the silo, affect the behaviour of grains within. Two types of silos with different aspect ratios are analysed to identify any noticeable trends or distinctions. The governing equations, along with their boundary conditions, are solved using the finite volume method. In the results section, the thermal and dynamic performance of the silo is discussed and documented.

Keywords: Darcy model; Granular silo; Heat transfer; Porous medium; Unventilated silo

*Corresponding author