

# **Analysis of Dust Distribution in Silo During Axial Filling Using Computational Fluid Dynamics: Assessment on Dust Explosion Likelihood**

**S.I. Rani<sup>12</sup>, B.A. Aziz<sup>2</sup>, J. Gimbut<sup>23</sup>**

<sup>1</sup>Faculty of Chemical Engineering Technology, TATI University College, Teluk Kalong, 24000 Kemaman, Terengganu, Malaysia

<sup>2</sup>Faculty of Chemical Engineering & Natural Resources Engineering, Universiti Malaysia Pahang, Tun Razak Highway, 26300 Gambang, Pahang, Malaysia

<sup>3</sup>Center of Excellence for Advanced Research in Fluid Flow (CARIFF), Universiti Malaysia Pahang, Tun Razak Highway, 26300 Gambang, Pahang, Malaysia

## **ABSTRACT**

In this study, the dust distribution in a silo during axial filling was modelled using a commercial computational fluid dynamics (CFD) code. The work focused on the dust concentration distribution in the silo, for evaluating the likelihood of a dust explosion in the silo. The simulation was conducted using a combination of renormalized (RNG) k-epsilon and discrete phase models, with standard pressure interpolation and a second order upwind scheme. The predicted dust concentration distribution showed a good agreement with experimental data adopted from the literature. It was found that the dust concentration distribution was influenced by mean velocity and turbulence flow. The simulation results suggest that the cornstarch concentration inside the silo was always above the lower explosion limit (LEL), hence requiring a mitigating action or a control system to reduce the explosion risk.

**KEYWORDS:** CFD; Dust explosion; Dust concentration; Gas–solid flow; Silo

**DOI:** [10.1016/j.psep.2015.04.003](https://doi.org/10.1016/j.psep.2015.04.003)