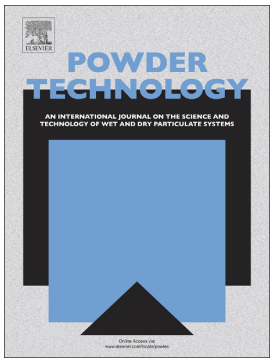

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On Developing Improved Modelling for Particle Velocity and Solids Friction for Fluidized Dense-Phase Pneumatic Transport Systems

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Abstract

Pneumatic transport of fine powders in fluidized dense-phase pneumatic conveying of powders has become popular in several industries because it offers various advantages, such as reduced air flow and gas velocity, reduced pipeline sizing and wear rate, reduced size requirement of gas-solid separator unit etc. For the reliable design of a pneumatic conveying system precise estimation of the solids friction factor through horizontal straight pipes is essential, but it is a challenging task till date because of the highly concentrated, turbulent, and complex nature of the gas–solids mixture. In the present work, power station fly ash (median particle diameter: 22 μm; particle density: 2370 kg/m^3; loose-poured bulk density: 660 kg/m^3) and cement (median particle diameter: 19 μm; particle density: 2910 kg/m^3; loose-poured bulk density: 1080 kg/m^3) were conveyed through different pipeline configurations (i.e., 65-mm inner diameter × 254-m-long and 80/105-mm inner diameter × 407-m-long step-up pipeline). For the fluidized dense-phase flow in pneumatic conveying system, governing equations were developed and the same were