An Investigation into Energy Loss in Bends for Pneumatic Conveying of Fly Ash

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Abstract

An accurate estimation of the total pipeline pressure drop is of significant importance for the reliable design of a pneumatic conveying system. The present paper presents results from an investigation into the modelling of bend pressure drop for pneumatic conveying of fly ash. Seven existing bend models were used (in conjunction with solids friction models for straight pipes, verticals and initial acceleration losses) to predict the total pipeline pressure drop for conveying of fly ash (median particle diameter: 30 μm; particle density: 2300 kg/m^3; loose-poured bulk density: 700 kg/m^3) in three test rigs: 69 mm I.D. x 168 m long; 105 mm I.D. x 168 m long; 69 mm I.D. x 554 m long pipes. A comparison amongst the predicted pneumatic conveying characteristics (PCC) using all seven bend models (and the experimental plots) indicated that the values of predicted total pipeline PCC and trends significantly depend to the choice of bend models. While some models have provided trends confirming to the experimental plots, some other models resulted in prediction of higher bend pressure drop values in dense-phase than in dilute-phase. Pan (1992), Pan and Wypych (1998) and Chambers and Marcus (1986) models are found to be suitable to reliably predict the bend losses for fly ash conveying systems over a large range of air flows.

Keywords: Pneumatic conveying; fluidised dense-phase; bend; pressure drop; bend model