Prediction of the effects of cone tip diameter on the cyclone performance

ABSTRACT

This technical note presents a computational fluid dynamics (CFD) calculation to predict and to evaluate the effects of cone tip diameter on the collection efficiency and pressure drop of gas cyclones. The simulation was realised using a Reynolds stress model (RSM) for turbulent modelling and discrete phase model (DPM) for particle trajectories calculation. A refined mesh on the cyclone cone was also applied to ensure a better prediction on the effect of cone tip diameter to the collection efficiency and pressure drop. It was found that CFD simulations excellently predict the collection efficiency and pressure drop of a cyclone of different cone dimensions with a maximum deviation of 5.5% from the presented experimental data. The physical mechanism for reduced cyclone tip diameter has also been successfully elucidated. The results obtained from the computer modelling exercise have demonstrated that CFD with the RSM turbulence is an effective method for modelling the effect of cyclone cone tip diameter on its performance.

Keyword: Cyclones; CFD; Pressure drop; Collection efficiency; Cone dimension