ABSTRACT

Reverse flow cyclones are used most extensively in the chemical process industries for gas – solid separation. Cyclones are often employed to collect large particles (>5μm) that can be used not only as an air pollution control device, but also for recover particulate matter and size separation of particles. Common features found in locally designed cyclones are ineffective and crudely designed. Design of cyclone is more towards realizing a shape of the cyclone than the performance. Customized design approach gives a cyclone with greater collection efficiency, smaller in size or with lower pressure drop that would be found for a conventional standard design. Since the customized design procedure requires trial and error calculations, this research focused on the importance of the development of a computer package: "CycDesign".

Using this package, a pilot scale reverse flow cyclone is designed and fabricated. This unit was used to examine the suitability of abating the air pollution caused due to dust generated from the fluidized bed dryers in tea industries. Trials were also done for sawdust, cement, quarry dust, talc powder and silica sand. Inlet and outlet particle size distributions were measured. Above 90% Overall collection efficiencies were attained for all the types of dust tested. For tea dust 99.2% collected experimentally which was predicted as 100% by the computer package. Also the computer package can be used to predict performance and dimensionless parameters for a cyclone design. It predicts that a continual decrease of Stokes number based on cut diameter, with increasing Reynolds number *Re*, for cyclones having different height to diameter ratio *H/D*. According to predictions, collection efficiency increases with *H/D* ratio of the cyclone. The declining patterns of fractional efficiency can be visualized with decreasing pressure drop across the cyclone and particle density. A decrease in fractional efficiency can be observed with the increasing of gas flow rate, gas temperature, and gas density.