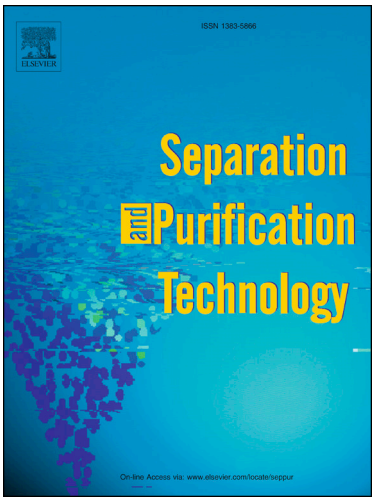

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An Experimental Investigation into the Particle Classification Capability of a Novel Cyclone Separator

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ABSTRACT

Cyclone separators are widely used for dedusting of particle-laden flows in many branches of industry. A new cyclone containing several collectors was designed in modular structure to investigate the capability of particle classification of the cyclone during particle separation process. The particulate air was supplied into the cyclone in a test bench operated in suction mode under ambient temperature and atmospheric pressure conditions. The flow rate and pressure drop were measured, and the particles accumulated in the dust collectors were weighed and analyzed for each test. The changes in the overall collection efficiency and pressure drop with the flow rate were obtained. In order to determine the classification characteristics of the cyclone, the experiments were repeated in different configurations obtained by changing the locations and number of the collectors. The mean particle diameter and particle size distribution of the dust collected in each collector were acquired. Analysis of the results shows that the designed cyclone is capable of classification incoming particles into 2, 3 or 4 classes in the cyclone according to particle size. Classification performance of the configurations and influences of flow rate on this performance were also investigated. A distinct and satisfactory classification was obtained in the configuration with three collectors.

KEYWORDS: Particle classifier, collection efficiency, Pressure drop, Cyclone separator

1. INTRODUCTION

Cyclone separators have been used as particle separators for particulate flows in many different areas, such as power generation plants, mines, textile, chemistry and medicine industries, recycling, and vacuum cleaners for over 100 years. The first scientific study on cyclones reported by Shepherd and Lapple who investigated cyclone pressure losses and particle collection efficiency, experimentally [1]. They also proposed a simple empirical model to predict the cyclone performance.