

ANALYSIS OF CYCLONE COLLECTION EFFICIENCY

Simona Lizica PARASCHIV, Spiru PARASCHIV**

*DUNAREA DE JOS UNIVERSITY, Galati, Romania.

Rezumat. Separatorul centrifugal (ciclona) se distinge prin simplitate constructivă, eficiență ridicată, siguranță în exploatare, cost redus de întreținere și funcționare fiind printre cele mai adecvate și utilizate separatoare de praf din aplicațiile industriale. Studiile științifice demonstrează faptul că eficiența ciclonației depinde de dimensiunea particulelor separate, viteza gazului la admisie și densitatea particulelor. Scopul acestei lucrări este de a analiza influența dimensiunii particulelor și a vitezei de intrare a gazului în ciclonație asupra eficienței colectării.

Cuvinte cheie: eficiența ciclonației, densitatea particulelor, diametrul limită al particulelor.

Abstract. Cyclones have been considered as one of the simplest type of separator and because of their high efficiency, adaptability, simple design and low maintenance, construction and operation costs, they are ideal for use in the various industrial applications. The literature indicates that the cyclone efficiency is dependent on the particle size, inlet air velocity and particle density. The objective of this paper is to demonstrate the influence of the particles size and the input velocity of the gas into the cyclone over the collection efficiency.

Keywords: cyclone collection efficiency, particle density, cut-off diameter.

1. INTRODUCTION

The separation of solid particles is required in many industrial processes because of growing concern for the environmental effects of particulate pollution.

Cyclone separators has a cutoff aerodynamic diameter greater than 5 to 10 μm and therefore it is often used as common devices for pre-cleaning gas in front of other high efficiency devices.

Selecting a particulate emissions control system is generally based on knowledge of four elements: particle concentration in the stream to be cleaned, particles size distribution, the flow gas rate and final allowable particulate emission rate.

Although cyclones were traditionally regarded as relatively low efficiency collectors at present they can achieve efficiencies of 90% for particles larger than 15 to 20 μm .

A cyclone separator is a device that separates particles from a gas stream using centrifugal force. By this method, it is possible to separate the larger particles from the gas.

The cyclones may be constructed of any material (metal or ceramic) that is capable of withstanding the abrasive particles, high temperatures and corrosive environments. It is necessary that the inner surface be smooth so that the collected particles can easily slip down the wall into the bunker. Cyclone has no moving parts so

the operation is generally simple and requires no maintenance.

Their low capital cost and free maintenance operation makes them ideal for use as pre-cleaners for more efficient final control devices such as electrostatic precipitators.

2. BASICS OF CYCLONE SEPARATORS

Cyclone separators are gas cleaning devices that use the centrifugal force of a gas stream. The gas flow due tangential entry is forced to follow the curved geometry of the cyclone while the inertia of particles in the flow causes them to move towards the outer wall, where they collide and collect.

In a cyclone the particles from the spinning gas stream move progressively closer to the outer wall and execute several complete rotations as they flow through the device.

This type of cyclone is used frequently as a pre-cleaner to remove fly ash and large particles and its main advantages are low pressure drop and high volumetric flow rates.

The cyclone separates solid particles from a gas, based on the principle of centrifugal force, which is much stronger than gravitational force. It works more efficiently at high gas flow rates, because a large velocity creates a swirling movement inside the column.

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