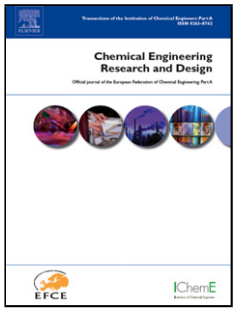

Title: Improved fine particle removal from gas streams using a new helical-duct dust concentrator

Author: Sana Jamshidifard Mansour Shirvani Norollah Kasiri Salman Movahedirad

PII: S0263-8762(16)30282-9
DOI: http://dx.doi.org/doi:10.1016/j.cherd.2016.08.031
Reference: CHERD 2383

To appear in:

Received date: 17-4-2016
Revised date: 24-8-2016
Accepted date: 29-8-2016

Please cite this article as: Jamshidifard, Sana, Shirvani, Mansour, Kasiri, Norollah, Movahedirad, Salman, Improved fine particle removal from gas streams using a new helical-duct dust concentrator.Chemical Engineering Research and Design http://dx.doi.org/10.1016/j.cherd.2016.08.031

Improved fine particle removal from gas streams using a new helical-duct dust concentrator

Sana Jamshidifard[1], Mansour Shirvani[*2], Norollah Kasiri[1], Salman Movahedirad[2]

[1]CAPE Lab, School of Chemical Engineering, Iran University of Science and Technology, Tehran, I.R. Iran

[2]School of Chemical Engineering, Iran University of Science and Technology, Tehran, I.R. Iran

Highlights

- A new helical-duct dust concentrator, to be coupled with a cyclone, is introduced.
- Increasing the value of split ratio increases the efficiency of the concentrator.
- Superior high efficiency is achievable for fine particle separation with high split ratio.

Abstract

A dust concentrator coupled with a dust collector can be used to improve the overall dust collection efficiency in a dust removal process. A new dust concentrator is studied in terms of its efficiency and pressure drop. The objective of the work is to investigate the effects of four independent variables including air flow rate, solid mass fraction, split ratio of the concentrated stream and particle diameter on the separation performance. The results show that the efficiency and pressure drop were mainly affected by particle size and air flow rate. Moreover, the split ratio of concentrated stream has a deep effect on efficiency. For an increase in split ratio from 20 to 60% the efficiency increases from 58 to 83.1% in separation of 11 <mml:math><mml:mrow><mml:mi>μ</mml:mi><mml:mi>m</mml:mi></mml:mrow></mml:math> particles, with 130 m^3/hr of air flow rate. The split ratio can serve as an adjusting parameter for obtaining a required efficiency during the design of the equipment.

Keywords: Helical-duct; Dust concentrator; Separation efficiency; Pressure drop.

1. Introduction

Improving the dust collection efficiency of cyclones is an important issue both from environmental and industrial viewpoints. In this regard, numerous efforts have been made to propose appropriate modifications in the design of cyclones with the view of improving its performances[1]. From an industrial point of view, it is important that a proposed modification