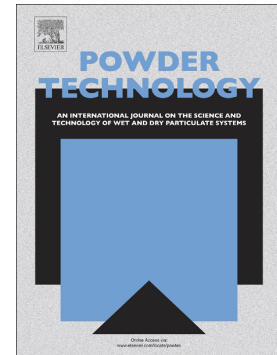


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# Estimation of powder mass flow rate in a screw feeder using acoustic emissions

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## Abstract

Screw feeders are widely used in powder processes to provide an accurate and consistent flow rate of particles. However this flow rate is rarely measured or controlled. This investigation explores the use of generalised norms and moments from structural-borne acoustic emission (AE) measurements as key statistical indicators for the estimation of powder mass flow rate in a screw feeder.

Experimental work was carried out acquiring AE measurements from an industrial screw feeder working with four different types of material at different dispensation rates. Signal enveloping was used in the first place to eliminate high frequency components while retaining essential information such as peaks or bursts caused by particle impacts. Secondly a set of generalised norms and moments was extracted from the signal, and their correlation with mass flow rate was studied and assessed. Finally a general model able to estimate mass flow rate for the four different types of powders tested was developed.

**Keywords:** powder flow; acoustic emission; screw feeder; process monitoring; signal analysis

## 1. Introduction

Screw feeders are widely used in industries such as mining, metallurgy, food processing, pharmaceutical and consumer goods to draw bulk materials from storage containers and transfer them over a short distance [1]. In most cases it is critical to feed powders consistently and accurately into subsequent unit operations of the process line, as feeding is typically the first unit operation [2]. Real time process and product quality control is nowadays essential in

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