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SECTION II
CONTINUOUS HANDLING

FEM
2 112

CONTINUOUS FEEDING OF BULK MATERIALS

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1 - FIELD OF APPLICATION AND PURPOSE OF THIS DOCUMENT

The aim of this document is to describe the principles of different feeding systems for the continuous feeding of bulk materials. It should help the planning engineer and user to select a suitable system.

This document forms part of document FEM 2 581 "Characteristics of bulk products" and is associated with document 2 582 "General properties of bulk materials and their symbolization".

2 - GENERAL

The term "feeding of bulk materials" refers to several operations within an industrial process in which their flow is controlled and measured.

Feeding can be done as a continuous or batch process. A typical example of a batch process is the filling of boxes, big bags, containers etc. involving the conveying, identification and determination of a given mass or volume within a specified range of tolerance.

If the process requires an even and accurate flow of the material within the limits of a specified range of tolerance then continuous feeding should be chosen. A detailed description of continuous feeding is given below.

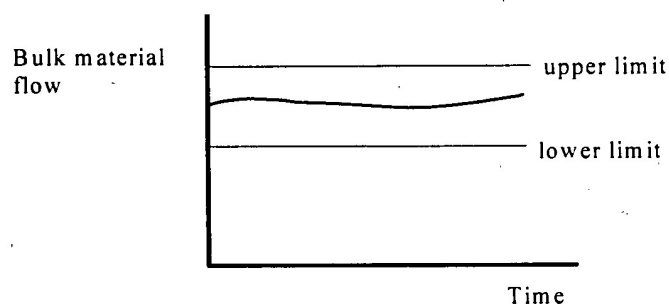


Fig. 1: Batch feeding

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Continuous feeding can be volumetric (constant volume flow) or gravimetric (constant mass flow). It should be noted however that accurate volumetric feeding does not necessarily entail accurate gravimetric feeding, because variations in the bulk density result in an uneven mass flow.

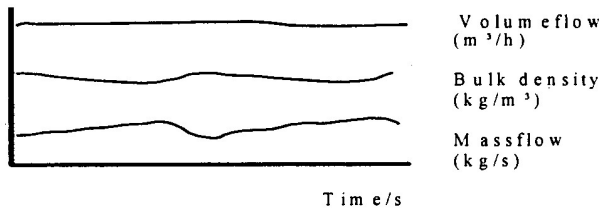


Fig. 2 : Volumetric feeding

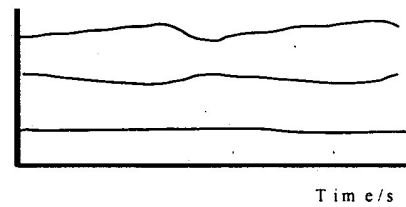


Fig. 3 : Gravimetric feeding

Factors influencing the bulk density are among others:

- flow profil in the bin
- changes in the properties of the bulk material due to :
 - grain size
 - surface shape
 - moisture content
- operating mode of the bin (filling, discharging).

Gravimetric feeding is to be preferred in cases when the bulk density cannot be maintained within the required tolerances or when a signal acknowledgement procedure for the actual feed rate is necessary. For this reason gravimetric feeding is generally preferred for applications requiring a higher degree of accuracy.

A gravimetric feeding system can be designed in such a manner that conveying of the bulk material and measurement of the flow rate are done in a single unit. This principle is called integrated feeding system and a typical example is a weighfeeder.

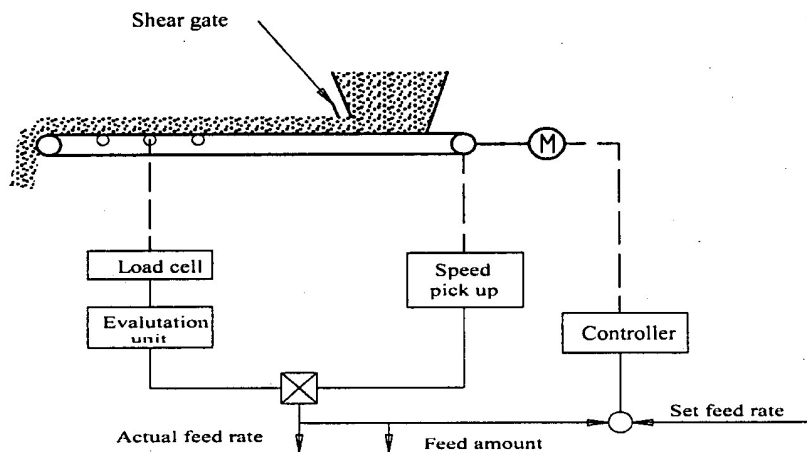


Fig. 4 : Integrated feeding system

An alternative to this is to perform these two operations (i.e. conveying of the bulk material and measuring) in separate units. In this case the feeding system consists of an adjustable prefeeder, such as a rotary feeder for example, and the unit to measure the massflow.

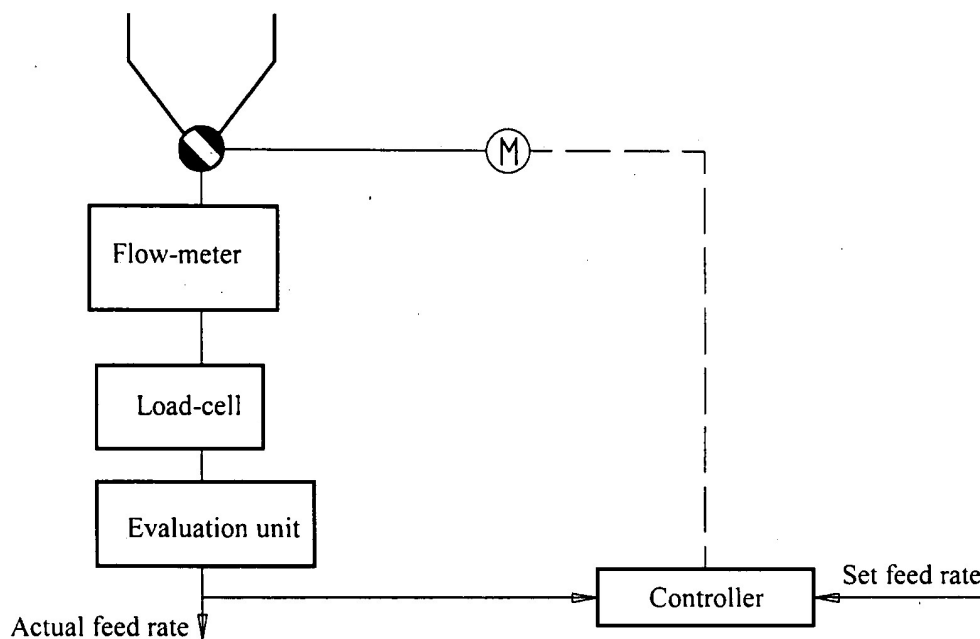


Fig. 5 : Feeding system with prefeeder and massflow meter

3 - BULK MATERIAL MASSFLOW MEASURING DEVICE

3.1 Belt scale

The belt scale is the most often used principle for the continuous weighing of bulk materials. It is fitted into a transport belt instead of at least one idler.

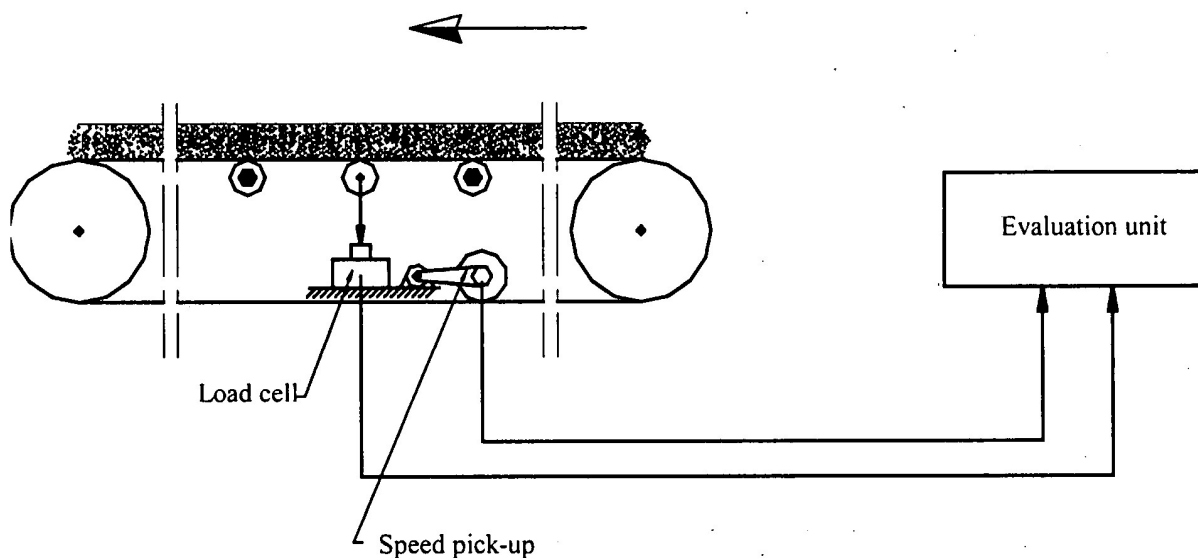


Fig. 6 : Belt scale and speed transducer