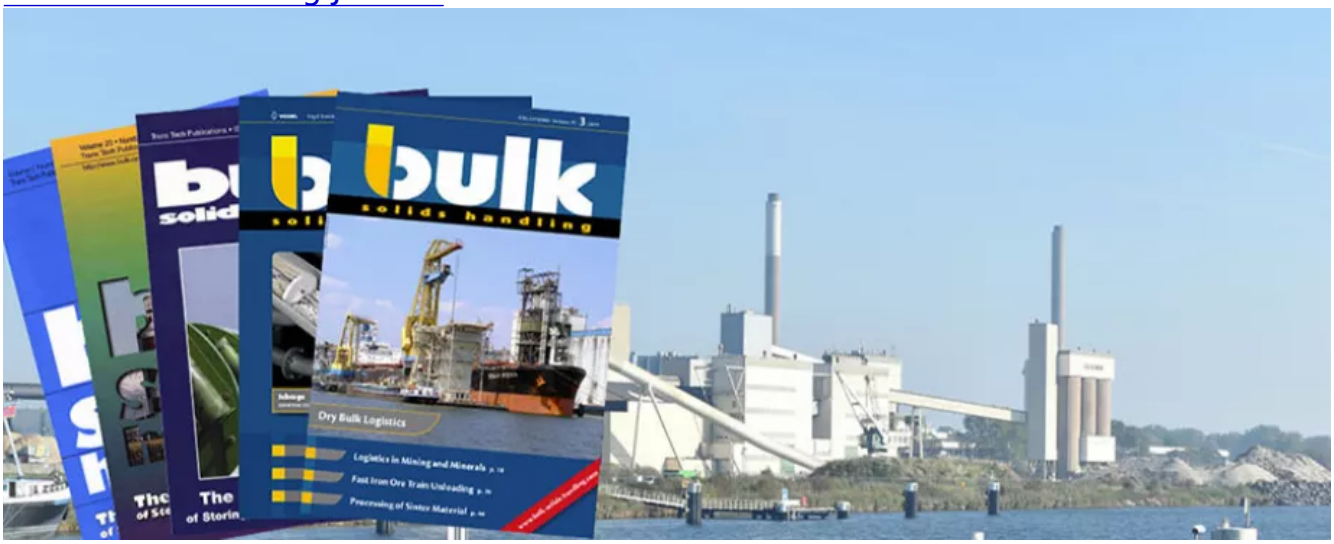
bulk solids handling Journal



Fachartikel

The Design of Storage Bins for Bulk Solids Handling

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In recent years significant advances have been made in the study of the storage and flow characteristics of bulk solids As a result there are now well established materials testing and associated design procedures to enable storage bins and discharge equipment to be designed to provide reliable and predictable flow The purpose of this paper is to outline the philosophy of bin design and to highlight some of the modern developments concerning the theory of bulk solids storage and flow An overview is given of the determination of bin geometry and. for the purposes of structural design and analysis, an indication is given of the wall pressures acting in mass and funnel flow bins under static and dynamic conditions The essential design features of feeders to give uniform flow control are presented and the general procedure for the calculation of feeder loads is reviewed The determination of flow rates for both coarse and fine bulk solids is discussed.

Introduction

The handling of materials in bulk form is a major activity of a vast number and variety of industries throughout the world. In particular, the various mining and associated process industries rely heavily on bulk handling operations So too do

the agricultural, food processing, pharmaceutical and manufacturing industries. The costs of handling operations are very substantial indeed and for this reason it is of the utmost importance that all bulk handling and storage facilities be designed and operated with a view to obtaining both maximum reliability and efficiency coupled with maximum economy. In view of the magnitude of the costs involved in handling bulk materials, even small incremental gains in efficiency can lead to substantial cost savings.

In the past the design and operation of handling systems for bulk solids has, all too often, been treated very empirically. This applies particularly to storage bins, silos and surface storage facilities such as stockpiles and gravity fed reclaim systems. There have been many instances of costly flow interruptions such as those caused by the bulk solid forming stable cohesive arches over the openings in the bottoms of storage bins or holding-up against the bin walls without discharge taking place. In most cases such flow interruptions are directly attributable to incorrect design with little or no regard to the flow properties of the material being handled. On other occasions catastrophic structure failures of bins and silos have occurred due to a lack of appreciation, at the design stage, of the magnitudes of the dynamic wall pressures that occur during discharge...