



Technical Article

Evolution of Bulk Solids Technology Since 1974

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Cooperation of process engineers concerned with flow of bulk solids in bins, and civil engineers designing bins in terms of mechanical strength has improved but is not yet optimal. Angles of wall friction determined by shear testers can be used for process technological design of hoppers as well as for structural design of bin walls. It has to be remembered that for the first application the maximum measured angle of wall friction is relevant and for the second application the minimum value is used. Measurements show that for identical bulk solid/wall combinations the extrema can vary by more than 10° . Based on shear tests bins can be designed in such a way that even cohesive bulk solids can be discharged without problems. If flow difficulties are eliminated, the design of a silo can be carried out in the same way as for cohesion-less materials.

1. Introduction

At the 1st European Symposium' Storage and Flow of Particulate Solids" that took place at Erlangen in 1974 it was commented [2]:

"The meeting showed that contrary to former years the fundamental work of Jenike on flow of bulk, solids in bins nowadays forms the basis for bin design in Germany as well. In contrast, the mutual, knowledge of process engineers taking effort to obtain flow in bins and of civil engineers being concerned with

conservative structural design seems to be small. Certainly some problems could be solved by better cooperation".

Since Erlangen there have been more than 500 publications on the subject of bulk solids technology [2,3]. Only a fraction of those contributed to the development of bulk solids technology. Notwithstanding this, regard cannot be paid to all of the interesting papers in this introduction. Therefore, only a few aspects will be pointed out in order to show how the two complexes design based on the Jenike method and cooperation and common problems of process and civil engineers have developed.