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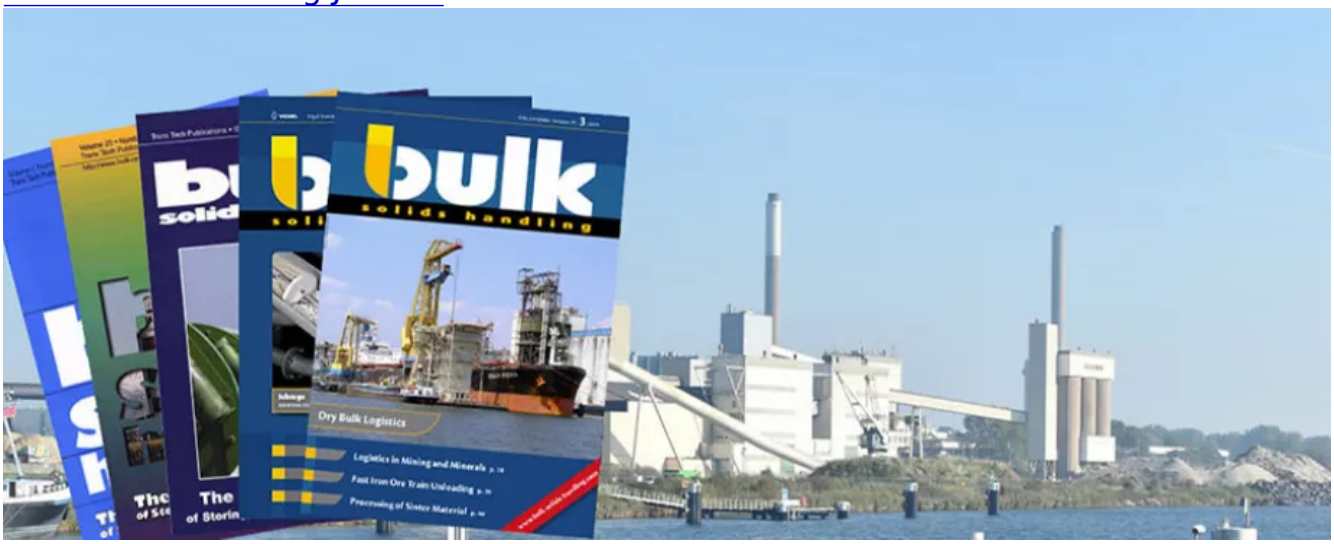

Technical Article

Determination of the Mechanical Properties of Cohesive and Non-Cohesive Powdered Materials

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Knowledge of the mechanical characteristics of materials contained in silos is fundamental for computation of the stresses exerted on silo walls or on construction members of various material handling installations. We know how to determine experimentally the value of the angle of natural slope of pulverulent materials, and thanks to triaxial testing equipment, also the value of the principal stresses which allow the determination of the angle of internal friction by using the traditional Mohr circle method. But it has never been possible until now to establish the relationship between the angle of natural slope and the angle of internal friction. This relationship is the subject of this report It allows a) the direct computation of the angle of internal friction and the angle of minimum internal friction without applying the Mohr circle method and b) the control of measurement results and the correction of their possible spread.

At the International Conference on the Design of Silos for Strength and Flow held at the University of Lancaster, England, in September 1980, these authors emphasized the relevance and importance of accurate knowledge of the structural anisotropy of powdered solid materials, whether cohesive or non-cohesive and the accurate determination of various physical and mechanical parameters. At another conference [6] these authors also indicated that there are several important ratios and functional relationships between the parameters β,

ϕ, ϕ0, and the principal stresses σ1 and σ3 appertaining to the properties of powdered materials which can be determined using triaxial tests. Concerning the study of structural anisotropy of a pulverulent medium, these authors were able to demonstrate clearly the functional relationship between the apparent cohesion and the minimum cohesion [7]...