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Non-Confidential Description - PSU No. 1674
"Shear Cell for Direct Determination of Yield Locus of Particulate Materials"

Keywords:

Shear cell, yield locus, particulates, food industry

Links:

Inventor website

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Inventors:

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Background

Many applications involve the handling, flow and storage of bulk solids – such as tableting, pelletizing, particle size reduction, mixing, packaging and quality control – requiring bulk solids handling systems designed to precise engineering specifications. Designing a reliable system using rational principles requires characterizing the flow properties of the bulk solids. This is especially important within the food industry, which ships bulk solids worldwide. Efficient distribution methods save time and money.

Invention Description

The disclosed invention is a shear tester for powders that allows for the successful determination of a yield locus from single tests. The principle of this invention is that yield states can be maintained in a test cell over a range of normal and shear stresses in the same test, leading directly to a yield locus. The invention minimizes the effects of operator error by allowing consistent consolidation, without the need for trial-and-error in determining the required number of twists for consolidation of powder mass in Jenike-type shear tests. It also eliminates error introduced by ring-to-ring contact during shearing by maintaining any specific gap between upper and lower rings or cell walls. The amount of time and material needed to generate a yield locus is also greatly reduced.

Because of its flexible design, this invention can also be used as a Jenike shear cell, yield locus tester (YLT) or a direct shear cell. In the Jenike procedure, the initial yield point from separate samples is used to establish each discrete data point on the yield locus, while in the YLT, the yield locus is a dynamic set of post yield stress states in the same sample. Therefore, if shear stress values change significantly after the initial yield point for a given normal stress, then the Jenike and YLT yield loci are expected to be different.

Advantages/Applications

- Reduced time and material need for testing, eliminates the need for trial and error
- Flexible, versatile design allows for function as Jenike shear cell, yield locus tester, or direct shear cell

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