

Powders: Flowability

Powder flow depends on several factors, some of which relate to the powder material and some to the actual manufacturing processes, its ability, for example, to flow from a container (hopper, funnel, cylinder, etc.) or its compressibility in forming a tablet. The Pharmacopoeias recommend three methods for testing powder flow:

1. Flow Through an Orifice

Measuring the ability and the time taken for a powder to flow through an orifice of known size is a useful method of quantifying powders. As the name suggests, this technique is only applicable to free-flowing powders, not cohesive materials. Methods vary but can be classified on the basis of three basic experimental variables:

- (a) Type of container employed (hopper, funnel, cylinder, etc.)
- (b) Size and shape of the orifice employed
- (c) Method of measuring powder flow rate

2. Angle of Repose

The Angle of Repose is the angle (relative to the horizontal base) of the conical pile produced when a granular material is poured onto a horizontal surface. It is related to the density, surface area and coefficient of friction of the material concerned and indicative of flow in accordance with the values shown in the table overleaf.



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Flow Properties & Angle of Repose	
Flow Property	Angle of Repose
Excellent	25 - 30
Good	31 - 35
Fair - aid not needed	36 - 40
Passable - may hang up	41 - 45
Poor - must agitate, vibrate	46 - 55
Very poor	56 - 65
Very, very poor	> 66

3. Shear Cell

Measures the force required to shear a circular disk through a prepared sample of bulk material.

It comprises 2 stages:

- Sample consolidation (bulk density measurement)
- Failure inducement (shear strength)

Shear Cell methodology widely used in the pharmaceutical industry to determine the flow properties of fine-grained powders and bulk solids and how they will behave in bins, hoppers, feeders and other handling equipment.

The ability of a powder to flow through such devices is dependent on the bulk density of the material concerned and its shear strength.

