**EFFECT OF VARIOUS BLENDS OF GLIDANTS ON FLOW PROPERTIES OF POWDER, GRANULES**

**AIM**

To evaluate the effect of Glidants on flow properties

**PRINCIPLE**

Flow properties of substances generally powders, granules play an important role in deciding the weight variation, content uniformity etc. The Glidants are the substances which are intended to reduce the frictional forces between the particles. The flow properties that are usually measured are Angle of repose, compressibility index, Hausner’s ratio, Tapped density and Bulk density.

**Angle of repose (θ)**

These are the simple and related techniques for measuring the resistance to particle moment. Angle of repose is defined as the maximum angle possible between the surface of a pile of powder and horizontal plane.

Tan θ = h/r

θ = tan-1 h/r

Where h =height of pile

r =radius of base of pile

θ =angle of repose

**Method:** A glass funnel is held in place with a clamp on a ring support over a tile. Approximately 100gms of powder is transferred into funnel through a mesh size number 20 keeping the orifice of the funnel blocked by the thumb.

When the powder is emptied from the funnel, the angle of the heap to the horizontal plane is measured with a scale. The height of the pile (h) and the radius at the base is measured with a ruler. The angle of repose is thus estimated

**RELATIONSHIP BETWEEN ANGLE OF REPOSE (θ) AND POWDER FLOW**

|  |  |
| --- | --- |
| ANGLE OF REPOSE(θ) DEGREES | FLOW |
| <25 | Excellent |
| 25-30 | Good |
| 30-40 | Passable |
| >40 | Very poor |

**Carr’s consolidation index**

It is defined as

This property is also known as compressibility. It is indirectly related to the relative flow rate, cohesiveness and particle size. It is simple, fast and popular method of predicting powder flow characteristics.

Fluff density is the ratio of mass of powder to the fluff volume. Fluff volume is the volume occupied by a certain mass, when gently poured into a measuring cylinder.

Tapped density is the ratio of mass of powder to the tapped volume. Tapped volume is the volume occupied by the same mass of powder after a standard tapping of a measure.

Compressibility index can be measure of the potential strength that a powder could build up in its arch in a hopper and also the ease with which such an arch could be broken.

**Method:** Using a suitable adhesive, the base of a 10 ml tarred measuring cylinder is fixed to the standard rubber bung at the top of the 250 ml cylinder. A powder sample (about 5.0 g) is transferred into the tarred 10 ml cylinder with the help of a funnel. The 250 ml measuring cylinder is placed on the tapping apparatus. The initial volume occupied by the powder is denoted as V0.

The contents are tapped in the following order, 2, 4, 6, 8, 10, 20, 30 and 50 taps. After completing the tappings, the volume is denoted as V2, V4 .................V50.

The powder is carefully collected from the cylinder and weighed (W).

Fluff density (ρb, minimum) = w/vo g/cc

Tapped sensity (ρb, maximum) = w/v50 g/cc

Consolidation index can be calculated using the equation

The nature of flow is inferred by comparing the data with the index given in the below table

|  |  |
| --- | --- |
| Consolidation index | Flow |
| 5-15 | Excellent |
| 12-16 | Good |
| 18-21 | Fair to passable |
| 23-35 | Poor |
| 33-38 | Very poor |
| >40 | Very very poor |

**Hausner ratio**

It is defined as the ratio of the tapped density to bulk density it can also be calculated by using the formula by using carr’s consolidation index

Where C is carr’s consolidation index value

The relationship of hausner ratio to that of flow property is as follows

| **Flow Character** | **Hausner Ratio** |
| --- | --- |
| Excellent | 1.00–1.11 |
| Good | 1.12–1.18 |
| Fair | 1.19–1.25 |
| Passable | 1.26–1.34 |
| Poor | 1.35–1.45 |
| Very poor | 1.46–1.59 |
| Very, very poor | >1.60 |

**PROCEDURE**

The powder 100gm was weighed and to that talc was added by passing through sieve # 120.

The talc was added in increasing proportions like 0.5%, 1%, 1.5%.

The flow properties like Angle of repose, Bulk density, Tapped density, Compressibility index, and Hausner’s ratio were calculated and it was compared to that of pure sample.

The same procedure was adopted for colloidal silica also

The flow properties were tabulated as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PARAMETER | PURE | 0.5% TALC | 1% TALC | 1.5% TALC |
| Angle of repose |  |  |  |  |
| Tapped density |  |  |  |  |
| Bulk density |  |  |  |  |
| Compressibility index |  |  |  |  |
| Hausner’s ratio |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PARAMETER | PURE | 0.5% CS | 1% CS | 1.5% CS |
| Angle of repose |  |  |  |  |
| Tapped density |  |  |  |  |
| Bulk density |  |  |  |  |
| Compressibility index |  |  |  |  |
| Hausner’s ratio |  |  |  |  |

**REPORT:**.