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Powder Flow Analysis of Brown Gravy Mix

Understanding the powder flow characteristics of brown gravy mix is essential for optimizing its handling, storage, and processing efficiency.

Test Equipment:

- **Instrument**: Brookfield Powder Flow Tester (PFT)
- **Trough**: 230 cc, 6-inch diameter (Standard Volume)
- **Lid Type**: Vane Lid, 33cc, 6-inch diameter
- **Type of Test**: Flow Function Test
- **Conditions**: Room Temperature (70-72°F), Humidity: 48%

Method:

A PFT equipped with Powder Flow Pro software was utilized to assess the brown gravy mix. The procedure involved the following steps:

Flow Function Test Duration: 25 minutes

1. Scooping the gravy mix into the trough.
2. Evenly distribute the powder with a scraping tool to prepare the sample.
3. Recording the sample weight and entering the data into the software.
4. Conducting a standard Flow Function test.

Parameters Measured:

- **Flowability**: Cohesive to Very Cohesive
- **Bulk Density**: 447 kg/m³ (fill density) to 706 kg/m³

Analysis:

- **Hopper Shape**: Conical
- **Critical Arching Dimension**: 0.218 m
- **Rat-Hole Diameter**: 1.379 m

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Results:

Flow Function:

Figure 1 illustrates the flowability of the brown gravy mix under different levels of consolidating stress. The mix remains generally cohesive to very cohesive across the stress range, indicating potential challenges in flow.

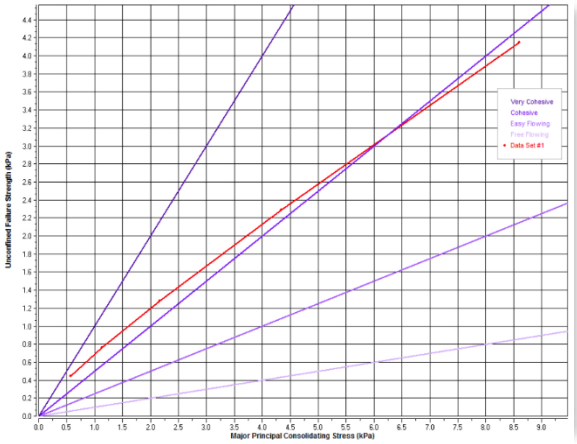

Figure 1: Brown Gravy Mix Flow Function Graph

Arching and Rat-Holing:

Figure 2 provides the critical arching dimension and rat-hole diameter for a standard bin diameter of 2 meters and a bin height of 8 meters. To prevent arching, a hopper opening of at least 0.218 meters is required. To prevent rat-holing, the hopper opening must be larger than 1.379 meters.

Data Set #	Arching Dimension (m)	Rat-hole Diameter (m)
1	0.218	1.379

Figure 2: Brown Gravy Mix Arching Dimension and Rat-hole Diameter

Bulk Density:

Figure 3 depicts the bulk density changes of the gravy mix at different consolidating stress levels. The gravy mix shows a significant increase in bulk density from 447 kg/m³ (loose fill) to 706 kg/m³ at 8.6 kPa of consolidating stress. This large increase indicates poor flowability, as cohesive powders typically exhibit substantial bulk density changes.

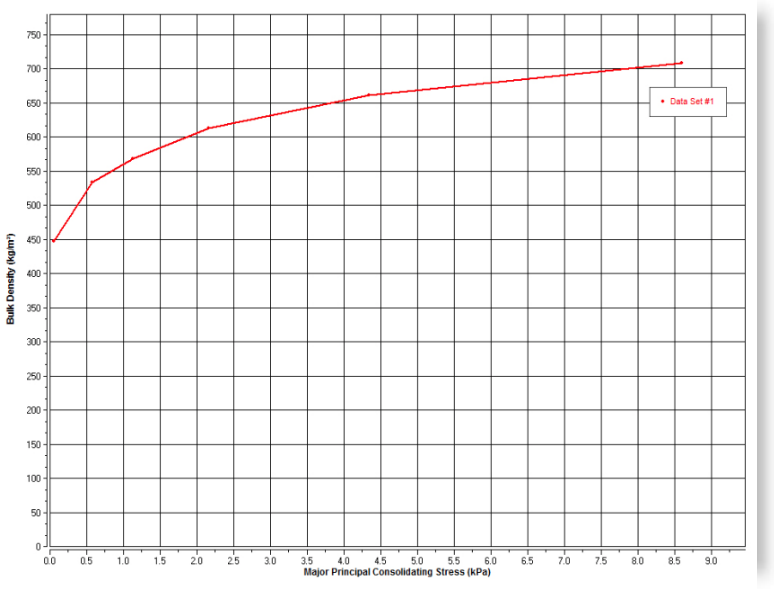

Figure 3: Brown Gravy Mix Density Graph

Conclusion:

The brown gravy mix exhibits cohesive to very cohesive behavior across all levels of consolidation stress, suggesting potential flowability issues. Problems such as arching (formation of a cohesive bridge over the outlet) and rat-holing (material flows only from the center, leaving static powder against the walls) are likely. Mitigating these issues may involve introducing flow aids to improve flow characteristics or adding equipment such as vibratory systems to promote consistent flow.