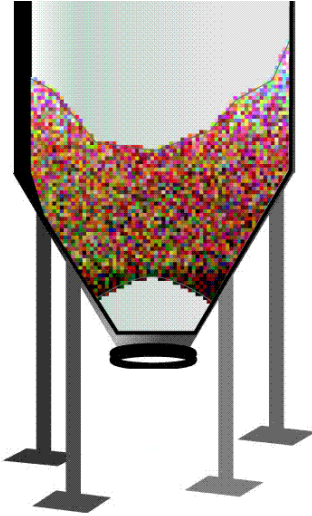


---

# Controlling Product Cohesive Properties to Avoid Process Hangup

## Material Flow Solutions, Inc.

---



**Cohesive flow problems** are one of the main reasons a plant handling a bulk material fails to operate. Often engineers wish to design the bulk material to mitigate these flow problems long before the pilot plant stage. This approach reduces the time to market and makes the company more profitable. The issue facing these engineers is that many models, flow correlations, and design methodologies currently exist to design a process for a given bulk material with a given set of flow properties. These procedures are well known and extensive help is already available in technical literature. The same cannot be said when designing bulk materials to **prevent cohesive flow problems**. Some of the questions to be answered are: What effect does particle size distribution have on bulk strength? Will the addition of moisture cause an increase or decrease in bulk cohesive flow problems? Will changing the particle shape help

or hurt? Can the addition of a flow aid reduce the material's cohesive flow properties sufficiently? The answers to these questions require three things: A working knowledge of basic particle scale flow properties, an understanding of bulk material flow properties, and the ability to relate particle scale properties to behavior of the bulk.

At Material Flow Solutions we routinely measure both particle scale and bulk scale properties and have developed mathematical relationships that describe how cohesive behavior adjusts to changes in basic particle scale properties. This methodology is founded on scientific principles and, therefore, can be extrapolated to many bulk solids and unit operations – making it a general approach. We measure basic particle scale properties then, with the aid of scale law modeling, predict bulk behavior. We compare the scale law model to known bulk scale properties test results and modify the model to increase predictive capability. Using this approach we have estimated cohesive flow properties using minimal testing and predicted bulk behavior over very wide process conditions and extensive unit operations.

**PRACTICAL APPLICATIONS** of **controlling product cohesive properties** include, but are not limited to:

- Selecting optimal flow aid type and concentration for pharmaceutical and other powder products
- Modifying particle size to reduce cohesive flow problems with food and other granular and powder mixtures
- Using liquid additives to optimize cohesion in tablets
- Relating humidity levels to cohesive flow problems in detergents and other powder mixtures