

## Ask Joe! Column

### When Things Go Wrong : How to Address a Solids Flow Problem

by Joseph Marinelli, Solids Handling Technologies



#### Introduction

As a consultant to the bulk solids handling industry for so many years, I have been involved in numerous approaches to solids handling problems. The process usually starts with a telephone conversation concerning a particular problem. This typically results in the submission of a proposal for material testing and conceptual design recommendations.

Some of the problems and their results that are frequently brought to my attention are as follows:

***“I can’t get my material out because it bridges and ratholes in my bin.”***

Material to your process stops flowing as a result of a flow obstruction such as a bridge or rathole. Your operator opens the gate or turns on the feeder expecting material to flow freely from the bin. All of sudden, material stops flowing and he is required to use a flow aid device such as a sledge-

hammer to initiate flow. Maybe you have designed your silo to store 100 tons of product and because of a stable rathole forming, only 10 tons of your product is actually live.

***“My process is upset due to erratic material flow.”*** Flow within your system is erratic such that processes (driers, kilns, packaging lines, etc.) have to turn off and on frequently to accommodate flow stoppages. Not only is the handling equipment affected by this erratic operation, but the upstream and downstream equipment is also affected by it.

***“Sometimes my fine powder floods from the bin all over the floor.”*** This is nasty problem in that fine powders can flow uncontrolled like a liquid and end up all over the floor. Perhaps you are filling packages and your product floods the process, overfilling bags and containers, or at the very least, creating a tremendous dust cloud.



***“The quality of my final product is affected by the fine and coarse particles of my material segregating.”*** Segregation can affect the quality of the end product you produce or make. It can also result in dissatisfied customers who are expecting material that is within a certain particle size range or density and receive off spec material. The coarse and fine particles have separated during handling. (see photo to left)

***“No matter how fast I turn my feeder, I can’t get my material to flow at a higher rate.”*** Fine materials can exhibit limiting discharge rate problems such that no matter how fast you turn your feeder, you may not be able to achieve the desired rate. The interaction

between solids and the air that surrounds the particles can actually hold them up, thus limiting your discharge rate. Turning the feeder speed up has no effect.

**“Help! My silo has collapsed!”** (see photo above) Asymmetric flow patterns caused by ratholes, preferential flow channels, etc. can cause silos to dent, buckle and even collapse. Collapsing ratholes and bridges can also lead to silo failure problems. Some things to remember when discussing flow problems:

### **Material Properties**

- What material(s) are you handling?
- What is their moisture content and how is it measured?
- What is their particle size?
- Are they exposed to temperature variations such as dried product entering a bin at 150°F and cooling to room temperature?
- How long does the material remain at rest in the silo? This is critical to determine the effect storage at rest on the cohesive strength of the product.
- What is the bulk density?
- What discharge rate do you require from the silo or bin?

### **Silo Geometry**

- What is the current bin diameter or capacity requirements for a new bin?
- What is the shape of the existing hopper?
- What is the size of the opening?
- How is it filled?
- What is the silo or bin fabricated from, lined or coated with?
- What type of feeder is used to control discharge rate?
- What equipment is upstream and downstream of the bin or silo?

This list is just the beginning of the information one needs to collect to evaluate a flow problem or design a new bin or silo. Other information such as drawings or sketches of the existing equipment is always necessary. Segregation problems typically require a site visit in order to fully understand the cause of the segregation problem and provide reliable solutions to those problems.

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**Welcome to Ask Joe!**, a monthly column by our resident materials handling guru, Joe Marinelli of Solids Handling Technologies. Joe addresses the issues that bug you the most. And Joe knows!! Formerly with Jenike & Johanson, Solids Flow and Peabody TecTank, Joe is an expert on materials handling.

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Guest articles for the **Ask Joe!** Column are always welcome, for more information please contact Joe Marinelli directly at his email address: [joe@solidshandlingtech.com](mailto:joe@solidshandlingtech.com).