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## Controlling Product Density Through Proper Design

### Material Flow Solutions, Inc.

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One of the problems facing engineers handling bulk solids is *flow rate or density control*. The lack of this type of control can cause serious variations in a packing facility, especially if the packing equipment is based on volumetric control. There are two main causes of density variation. One cause is separation (segregation) of mixture components due to different particle densities. This type of density fluctuation is really due to segregation issues and our section on segregation control will provide some guidance. The other cause of density variation is differences in compaction caused by gas effects or compression effects. In this type of density control, the goal is generally achieving the right compaction pressure con-

sistently or maintaining the right residence time to allow consistent product de-aeration. Ideally one must control the amount of gas present in the solids voids. In these cases, it is essential to maintain mass flow and to provide a means of either increasing or decreasing the amount of entrained gas that is carried with the bulk solid during handling.

At Material Flow Solutions we approach these types of problems by, first, measuring the flow properties of the bulk material(s). This data gives information to allow design of a feed system that is compatible with mass flow. Using the flow properties and our proprietary computer software we can compute the expected gas entrained in the process equipment at your range of flow rates and process conditions. This allows us to predict when density fluctuation may be experienced in your system and provide a means of designing either the material or the process to mitigate erratic flow rates and allow uniform packing and consistent density control.

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

- Modification of particle size of spray dried clay particles to prevent surging
- Use of gas injection to control cement flow rates
- Use of de-aeration hoppers to control flow rates of pulverized limestone
- Use of compaction screws to control soap powder packing variations