
Address the Effects of Blending and Segregation in Process Design

Material Flow Solutions, Inc.



Because segregation can occur due to any of several mechanisms, identifying the primary cause of segregation produced through handling is critical to *prevent de-mixing* of the final mixture during handling and packaging. Any property difference between materials can cause separation of critical material components. However, there are five common causes of segregation problems in typical handling systems: sifting, angle of repose differences, air entrainment, impact and percolation.

Blending is an important unit operation in many industries. However a systematic method of selecting the proper blending system for the mixing task at hand is not common knowledge. Thus, the selection of a blender is typically a trial and error process. In addition, scale-up of blending

operations requires knowledge of how material flow properties, blender geometry, and blender operation parameters influence blending quality. Segregation is the opposite of blending. Consider the case where two or more components segregate due to angle of repose differences as the mixture forms a pile. Some blenders mix by continually forming and reforming a pile. When this blending action also causes segregation, the efficiency (usefulness) of that blender depends on whether the velocity profiles in the blender are sufficient to overcome segregation that also occurs. Selection of the proper blender then depends on the type of segregation occurring in the material during blender operation.

At Material Flow Solutions we have developed a novel segregation test device (*SPECTester*) that uses spectral measurements to provide direct measurements of segregation tendencies. These measurements can identify the magnitude, cause and pattern of up to 6 components in complex mixtures as materials travel through processes. As a result we can predict segregation due to multiple mechanisms with complex mixtures of materials. The power of this approach allows us to optimize the segregation prevention – and we do it more quickly than with traditional sift-and-count methods. In as little as 20 minutes, the *SPECTester* reports the data of which primary (and secondary) segregation mechanism is present with your material in your process. This information is input into analysis software specifically developed to model segregation of powder, granular, and fine-cut fibrous products.

Knowing the segregation mechanism specific to a material, and how that material reacts within the process parameters – we make custom recommendations for process modification to mitigate or eliminate segregation. Eliminating segregation puts an operating plant back on-line, reducing costly waste.

PRACTICAL APPLICATIONS of *segregation data* include, but are not limited to:

- ❑ Maintaining product quality in processes
- ❑ Designing custom processes to meet specific product behavior parameters
- ❑ Achieving consumer acceptability
- ❑ Increasing the bottom line