

## **Relationship Between Segregation and Powder Handling System Design**

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### **ABSTRACT**

Powder uniformity is key to achieving consistent quality in manufactured parts and reliable operation in powder metallurgy (PM) processes. Maintaining a uniform blend throughout the process can be challenging if the powder handling system has not been designed to minimize segregation. Segregation in PM processes is a function of particle size distribution and other physical properties of the powder, as well as the type of handling equipment used. It is also a function of the entire process flowsheet. Depending on the properties and equipment design, the mechanism of segregation can be different. In this paper, primary mechanisms of segregation observed in PM processes will be discussed, as well as the relationship between equipment design and segregation tendency of powders. This relationship will be illustrated by looking at a case study of a double cone blender used for steel powder pre-mixes before being packaged to be shipped off to manufacturers.

### **INTRODUCTION**

Powder Metallurgy (PM) has matured into a reliable and impactful technology in manufacturing. As the PM industry attempts to expand in market share across manufacturing segments, the demands for high quality and scale of part production have increased and diversified<sup>1</sup>. Several trends have intensified the need for reliability and tight tolerances, including the shift towards additive manufacturing beyond the prototype stage, as well as interests in medical and aerospace applications<sup>2,3</sup>. Likewise, these trends and the ambitions of the industry are driving a need for increased production capacity and reduced part rejection rate. Furthermore, expanded application scope for PM manufacturing has led to the use of new and exotic materials with varying characteristics. In all cases, the PM process involves powder handling as a critical aspect<sup>4,5</sup>.