

Particle Size Distribution (PSD) is often considered a critical parameter in the manufacture of products and here are 8 areas where the right PSD can significantly influence your product:

- Stability in Suspension
- Efficacy
- Handling & Flowability
- Packing density
- Reactivity or dissolution
- Appearance
- Viscosity
- Health & Safety

### Stability in Suspension

Suspensions are heterogeneous mixtures containing solid particles which in time will settle out, such as sand in water. Suspensions and dispersions are seen in many applications such as liquid abrasive cleaners, pigment dispersion in surface coatings, paints, inks and polymer systems. The interaction between the particles and the solution affect how long the solid stays in suspension and in many cases decreasing the particle size will increase the stability (reduce the rate of sedimentation).

### Reactivity or dissolution

Catalysts are substances that speed chemical reactions without being consumed by the reaction. They are used in the manufacture of many industrial chemicals and products. The particle size of catalyst on a solid surface is a potential influence on the speed of reaction and therefore adjusting the particle size can influence the reaction rate.

### Efficacy

Efficacy is defined as “the quality of being successful in producing the intended result; effectiveness”. (Collins English Dictionary) This is often used to describe the effectiveness of a Crop Protection product and higher efficacy often means that less product can be used. Smaller, even particles distribution increases coverage of Crop Protection products such as herbicides allowing increased absorption by the plant.

### Appearance

Particle size can influence the appearance. Typically when particle size is smaller, less light is absorbed so resulting in less colour. Increased surface area as particle size decreases leads to increased light scattering (reflection). In the paint and pigment industries particle size is used to influence appearance including gloss and tensional strength. In the case of

cocoa, particle size can impact the colour and flavour of chocolate.

### Handling & Flowability

Products, especially waxy products, are often milled or granulated to make handling easier. Granules are well known for their improved flow properties and typically larger particle sizes have better flow characteristics. However, toner used in ink cartridges is generally very fine but has excellent flow properties. Other factors which influence flow properties include size, shape, angularity, surface properties, porosity and hardness along with external factors such as humidity. Small particle sizes can also have a propensity to form dust, which can make handling product more difficult.

### Viscosity

Viscosity is a term used to describe resistance to flow and can be considered as a measurement of a liquids thickness. Viscosity is an effect of interactions between molecules and viscosity tends to be greater with smaller particles. Particle size and distribution can be used to develop products with specific viscosity requirements.

### Packing density and Porosity

There are correlations between the particle size distribution and shape and the packing density of a powder. The Porosity is a measure of the holes found on a solid. For example, soil porosity typically decreases when particle size decreases. This is particularly important in ceramics processing.

### Health & Safety

Particle size distribution can be a major factor in hazard assessments and health and safety considerations. Finer particles can cause dust clouds, inhalation risks and in some cases be an explosion risk. Larger particle sizes can help reduce these risks.