Correlating Permeability Values with Limiting Flow Rate

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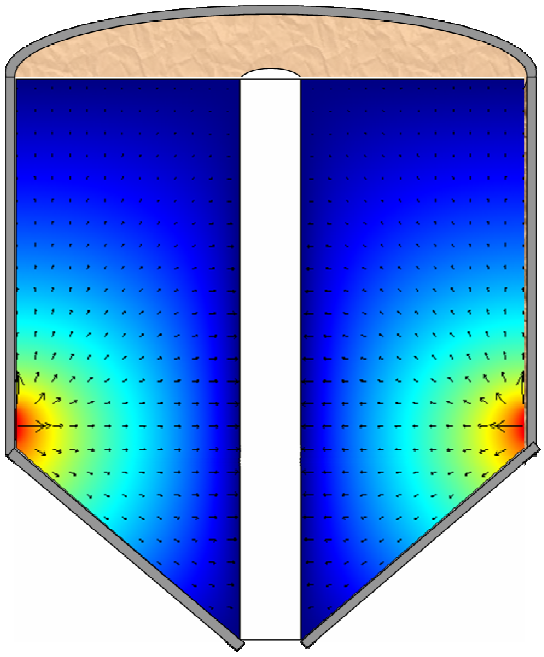

Defined as the superficial velocity of gas or fluid passing through a bulk material when the pressure drop across the material equals the weight density of the bulk solid, permeability data is used to determine the pressure drops in packed bed operation. Fine powders are often subject to significant limiting flow rates, holding onto entrained air for long periods of time, and demonstrating a significant tendency to cause flooding and flushing in bins and hoppers.

Permeability is often used to determine the limiting flow rates where the resistance to gas flow is the key limiting factor to solids flow. Predicting the influence of permeability on limiting rates (most easily by using a FEM analysis) is a first step toward solving limiting flow rates.

Limiting flow rates caused by permeability of fine powders is controlled through the judicious use of system air injection. Understanding the significance of gas permeability values, engineers can calculate the necessary de-aeration time and/or installation parameters of air-flow-aid devices in the equipment to achieve required process flow rate and/or break bridges and ratholes that are negatively affecting the system. Air injection systems will generally be needed to maintain consistent flow rate control of many fine powder materials.

PRACTICAL APPLICATIONS of ***controlling permeability*** of fine powders include, but are not limited to:

- Managing limiting flow rate of material from bins and hoppers
- Eliminating fluidization effects
- Designing for de-aeration times in equipment
- Forecasting segregation tendencies
- Containing briquette breakage

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