

## **Effects of Particle Collisions on the Scaling of Fluidized Beds**

**M. Swanson, M. Detamore, and C. Hrenya**  
**Department of Chemical Engineering**  
**University of Colorado**

The scale-up of high-velocity gas-solid systems is an important industrial practice, though it remains a challenging task. Several scaling laws have been proposed in the literature; they are designed to ensure that hydrodynamic similitude will exist in systems of different sizes if the dimensionless parameters of both systems have the same value. The most complete sets have a large number of dimensionless parameters that require matching, whereas “reduced” sets are obtained using assumptions that result in a smaller number of parameters. Previous measurements of the axial pressure profile appear to indicate that a reduced set displays similar hydrodynamic behavior. Continuum gas-solid models based on the kinetic theory, however, indicate that *detailed* similarity (i.e., similarity of radial profiles of flow variables) is not achieved for the reduced sets. Such behavior is linked to the effects of particle-particle interactions, which are neglected in the derivation of the existing scaling laws.