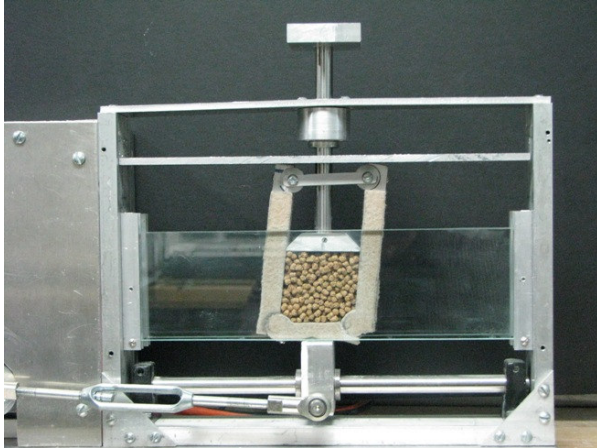


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## Attrition – Degradation

### Material Flow Solutions, Inc.

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***Attrition or Degradation.*** Attrition, also called degradation, describes particle breakage during processing. In general, particles within a piece of process equipment contact each other during shearing and impact events. These shear or impact events cause particles to break through one of three mechanisms: Fracture, Abrasion, or Fatigue.

***Fracture*** results when stress acting on particles during shear reaches the plastic limit, causing particle failure. Fracture is also the result of impact with brittle material.

***Abrasion*** occurs as normal and shear stresses between particles cause subsurface cracks, which result in small flakes of material peeling off the surface of the particle. Impact may also cause abrasion as a glancing blow knocks off corners of rough particles.

***Fatigue*** is time-sensitive and requires a series of impacts or contacts that generate a minimum repeated stress on the particles. Cracks propagate at a given rate prescribed by the stress applied during a shear or impact event. The local micro-structure of the particles greatly influences fatigue behavior. Often the rate of particle size degradation changes during processing due to fatigue events.

At Material Flow Solutions, Inc. we measure degradation of material using both stress/strain and impact testing methods. We can quantify the amount and type of particle breakage in your system.

***PRACTICAL APPLICATIONS*** of ***Attrition or Degradation*** testing data include, but are not limited to:

- ✱ Characterizes particle robustness
- ✱ Predicts breakage in pneumatic systems
- ✱ Predicts breakage in bins
- ✱ Predicts breakage in feeders
- ✱ Predicts milling operations
- ✱ Design robust particles
- ✱ Population balance model studies