

The animal nutrition industry uses either a hammermill or a roller mill to grind the feed ingredients. Depending on time and student level of interest, you can include information on the process of grinding and how the two methods affect particle size and shape. Roller mill grinding of corn produces particles that are more uniform and round in shape compared to corn ground with a hammermill. As an example, compare the irregular shape of rocks (hammermill) to the more uniform, round shape of marbles (roller mill) in Activity 2.

The following websites provide additional information about feed mills, feed mixing, and the grinding process:

- feedmachinery.com^{3,4}
- [Kansas State University Grain Science & Industry](http://www.k-state.edu/extension/grain-science/)^{5,6}

Activity 2: Particle Size and Shape

- Have the students break into groups of 3 or 4. Provide each group with two plastic cups and enough fine sand and rocks (or marbles) to fill the cups. It doesn't matter if you use sand and rocks or sand and marbles, as both combinations show that smaller sized ingredients (sand) are more likely to pack together, creating a feed handling issue.
-
- Have each group build a cup-shaped castle with the dry (as is) sand and another castle with the rocks or marbles. Discuss how the sandcastle holds shape better than the rock or marble castle.
-
- If the groups want to explore the effect of particle shape, have them make castles with rocks and also with marbles. The rocks and marbles should be similar in size. The rocks stack together better than the marbles, due to the irregularity in their shapes (not all rocks are the same shape). Because of the uniformly round shape of the marbles, they don't pack together. Instead, they roll off each other.
-

The same principle applies to animal feed. The more uniform and round the ingredients, the less likely the feed will pack together. This decreases the chance of feed handling problems.

When making a feed that is fine (small) in particle size, it's better for the feed to have a more uniform, round shape. The tendency of the small particles to pack together (like sand) is offset by their uniform, round shape which causes the particles to not pack together and roll off each other (like marbles). This balance between size and shape reduces feed handling problems.

- Have the students add a small amount of water to the cup of sand and the cup of rocks or marbles and then make castles again. The water makes the sandcastle hold together even better, while the rocks or marbles still roll off each other. The sand with water is a perfect

example of what really fine grinding and added fat (moisture) will do in feed lines and feeders.

With their expert knowledge of particle size and shape and other properties of the feed ingredients, animal nutritionists formulate livestock diets that:

- Maximize animal health and performance;
- Prevent feed sorting; and
- Prevent feed handling problems.