

Pet Food Mixing - Master Mixing

Meeting the seven basic challenges of pet food mixing

By Stan Myers, Readco Kurimoto, Inc.

The mixing field continues to evolve. Industries from food to automobiles have benefited from advances in mixing technology. The pet food industry is no exception. It too searches for ways to cut costs and increase efficiency while paying attention to the intricacies that separate pet food manufacturers from other manufacturing processes.

Mixing 101

Mixing is the process where two or more ingredients are blended together until the substance is uniform in consistency. Shear is the process of one material separating into small particles and dispersing throughout another. Shearing requires the input of energy to separate and mix the components. Because the shearing times for particles in a mixture are not the same, their temperatures become inconsistent. Therefore, particles that were sheared early in the mixing cycle have higher temperatures than those sheared at the end of the cycle. The longer a product is mixed, the more pronounced its heat/shear history will be. An extreme shear/heat history can be detrimental to heat-sensitive ingredients, but is appropriate if your product required a long reaction time.

Seven challenges

Any mixing discussion in the pet food industry centers around seven basic challenges:

- Combining ingredients with fillers that provide flavor and nutritional value;
- Feeding irregularly-shaped products (meats, vegetable bits, rice, corn and soy products);
- Uniformly coating or "wetting" all the filler material for proper consistency;
- Preserving the physical properties of filler materials;
- Producing a consistent product;
- Providing ease of handling; and
- Generating economies of floor space, production labor and simplicity.

The two most common ways of meeting these challenges are batch mixing or continuous mixing.



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Batch mixing

Batch mixing is similar to making cookies at home. You prepare a predetermined amount of mixture in a container, use it for your batch of cookies, clean the container and then prepare another batch if you want more cookies.

Batch mixing is the traditional mindset when evaluating mixing processes and can be advantageous for some industries. It can be applied to many different production rates. It is easy to install and implement. The process is often sufficient for small production quantities.

There are three areas of concern that can arise from the longer production process associated with batch mixing;

- A pronounced shear/heat history can be a detriment to heat-sensitive products;



This photo shows a continuous processor running a pet food product to assure that continuous processing was an effective alternative for a prospective client.

- Treating large volumes of product within a reasonable time is sometimes difficult, as it takes a long time to turn over the entire volume; and
- Longer mix cycles often degrade the size and shape of the filler materials, forcing companies to either trash the batch or remove the damaged filler materials and replace them.

Other batch mixing challenges include batch-to-batch variations and extensive cleanup when changing to a different product color or type. These can translate into higher labor and handling costs.

Continuous Mixing

Continuous mixing is not as widely known as batch mixing. The continuous process consists of a mixer being fed by dry powder feeders and by liquids from appropriate pumps. The formulation of ingredients has been predetermined, and the pumps and feeders are set to dispense the required amounts of each. Continuous mixers are appropriate for products with viscosities from 20,000 centipoises to 50 million centipoises. Three basic steps are accomplished within the mixer and complete the mini-production process:

- Blending/homogenization – blending occurs so quickly that the mixture is homogenized in seconds;
- Shearing with temperature control – once the product is homogenized, the shear/heat history is short and uniform. The mixture passes through a set of paddles for shearing. The configuration of the adjustable paddles is specifically designed to obtain the final product's unique characteristics. As materials pass through the paddles, its temperature is regulated by multiple temperature controls located on the outside surface of the mixer. The rapid heating and cooling significantly reduce processing time; and
- Extruding/grinding – this final step in the continuous mixing process provides the product's final output. Once the product's desired physical attributes are obtained, it can be formed into bars, rods, strands, pellets, or it can be ground. A contoured extrusion die plate at the discharge end of the mixer can be customized to produce any size or shape.



This lab-size continuous processor is used during the testing of pet food products. It is mainly used for researching and formulating new and improved versions of pet food.

Calibration and monitoring of feeding equipment are essential for a consistent product. Where possible, ingredients are combined to reduce the number of desired feeders and pumps in the continuous process. If additional ingredients are needed, other entry points are available by adding new feed lines.

Once the ingredient selection, mixing time and intensity and the sequence of ingredient additions are established, the process can run nearly unattended, but not unmonitored.

One of the major problems facing pet food manufacturers is the uniform and consistent feeding of irregularly-shaped products, such as meats, vegetable bits, rice, corn and soy products. This challenge can be solved in continuous processing by determining the correct combination of feeders that will achieve a consistent product. Continuous processing may not be a good fit if your product requires long periods of stagnation to achieve its desired composition. Also, product changes may require significant cleaning of lines, mixers and feeder pumps.

Selecting a mixing process is both mechanical and psychological. The other major challenge for a company to adopt continuous mixing is changing their mindset and overcoming the skepticism of doing things differently.

Testing your mixer choices

In many product development or improve scenarios, mixing is an afterthought. However, it is important for manufacturers to consider the effects a mixer can have on their product formula. Mixer testing is essential to determine the feasibility of production, and to uncover the distinctive aspects of the product's properties. Tests may be completed in one or two days, and a mixer supplier can assist by providing facilities and equipment.



In a recent test, lab manager Tom Eyster, checks the temperature of product being processed by a continuous processor at Readco Kurimoto, Inc.

The bottom line

Manufacturing processes are not simple anymore. New methods must be found to keep up with a changing world. Manufacturers can, and should, find the right combinations of mixers and mixing processes that will satisfy the exacting requirements of their products. Pet food manufacturers need to cost-efficiently produce a consistent product in large volumes. Batch mixing may or may not offer the consistency or the volume needed for most firms, but it has other advantages. Continuous mixing historically provides a uniform product while cutting costs and creating a more efficient manufacturing environment.

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For more information contact Readco Kurimoto at 717-848-2801.