Pet food challenges – new ingredients versus equipment capability

By: Dr George Collings

Product opportunities in the pet food/treat market worldwide are intriguing and challenging. It is seldom 'brown and round' dog food as it was in decades past. Today, the humanized look and feel of a food brings many new ingredients to the formulation. These new ingredients have brought significant new challenges to the overall process and equipment capabilities.

How much meat can be used in an extruded food and still provide sufficient cook of the starches?

How low in starch can you go and still make an extruded product hold together?
How can you add heat-sensitive ingredients?
How do these new ingredients impact rancidity and microbial control?
This article does not discuss the issues of palatability, digestion or nutritional concerns of new ingredients, but instead will focus on the impact upon processing (specifically extrusion) to meet the market concept or claim. Similar issues may be found in canning, baking, forming and moulding.

Starch

New pet foods avoid common grains like corn, wheat or rice for marketing reasons. Available grains like rye, oats and barley or vegetable flours like potato, pea, tapioca and sweet potato are options. Starch is necessary to make an extruded product stick together. Switching from one starch to another in a formula is not interchangeable. As an example, potato starch is an extrusion challenge (stickiness, reduced throughput and poor product structure). Oats and barley tend to lead to loose stools in dogs because a higher level of beta-glucans. Starches that have rarely been used in extrusion (e.g. millet, quinoa, tubers) create new challenges in grinding, bin storage and mixing, and overall particle expansion.

Many new 'grain free' products with high meat inclusion severely reduce the starch content in the formula while reducing the friction in the extruder barrel. Newer equipment and ingredient blends are coming forward that will allow for meat inclusion over 75% of the formula. Some grain free formulas with high meats advertise as 'starch free' while using gelatine as an agent to hold the product all together. As the push towards high meat formulas becomes more main stream, product structure and integrity becomes an issue. Very high fat and high protein diets are possible with limited starch inclusion through other equipment modifications.

Meats

The use of meats (chicken, lamb, fish, beef, et cetera) in a slurried format has become very

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common over the last twenty years. Most plants have built their own freezer and meat preparation systems to minimize microbial contamination with proper controls. Meat is injected into the dry meal inside the conditioner. This mixture creates a higher water and fat content leading to more difficult extrusion conditions. The higher the meat inclusion, the more challenging it becomes. The extruder operator must not be a novice and be highly aware of the condition of the particle dough. Market pressures are increasing meat inclusion for palatability and consumer appeal. The addition of meat in a dry production plant also increases the need for microbial controls in the meat preparation area through the pumping of meats throughout the process.

Fruits and vegetables

The humanization of pet foods has expanded the use of many fruits (blueberries, melon, cranberries, apples, et cetera) along with many vegetables (potatoes, peas, spinach, carrots and sweet potato). Despite the higher cost of these ingredients, most are used for their consumer appeal for providing antioxidants and vitamins. The high heat and pressure of extrusion can quickly destroy these along with their natural colouration. Stabilization systems are critical.

Ingredients added in small amounts like fruits and vegetables are generally hand-added because a typical pet food plant will not have an unlimited supply of micro-bins. Because of this, blended premixes of these minor ingredients are created for production simplicity so a single larger amount can be delivered to the mixer.

Natural colours

The use of artificial colours is still widely used in the marketplace especially in cat foods. Natural colours (e.g. annatto, beet juice, turmeric, red radish, et cetera) provide an expensive alternative. At higher concentrations, many of these still provide a reasonable colour, however the stability of that colour over time is a concern. Injection of these colours later in the extrusion process increases the stability of these.

Health ingredients

The growth of nutraceuticals in the human supplement market has created the desire to add many of these to pet foods. Unfortunately, the pet food manufacturing process is not ideal for addition of these due to destruction by heat, pressure, moisture, acid or light involved in the process. Extrusion brings high heat, pressure and friction followed by more heat in the dryer followed by the addition of fat, acid containing digests and potentially dry meat powders enrobing. The addition of enzymes and probiotics (beneficial bacteria) must be blended with other ingredients and applied to the surface to maintain their viability rather than being blended in the dry mix prior to extrusion. Even with these actions, the water activity of the product severely reduces the efficacy. Encapsulating sensitive ingredients has not always been successful until recently. In many cases, these ingredients now add to the complexity of production in that they must be premixed into liquids or dry powders that are enrobed post-drying.

Microbial challenges

With the enactment of new regulations like the Food Modernization Safety Act will come a higher degree of scrutiny on microbial control in an industry that has had a very good track record over the years. Each ingredient has its own microbial variation and only research will tell how best to control these. Intuitively, the equipment and the process flow will be critical to the best outcome. Those with more robust and flexible processes will be able to use a variety of natural anti-microbials more freely.

The expansion of new ingredients in a humanized pet food portfolio leads to many other processing and operational issues. We should not forget that the challenges involved in ingredient procurement, delivery and turnover requiring a much more sophisticated warehousing system allowing for a variety of containers (bags, totes, bulk, cardboard, tanks). Beyond these production issues are food science issues of shelf life, flavour and product texture.

As with any new expansion of products comes an opportunity for new processing and production change that require innovative and open-minded solutions. ■