In every industrial manufacturing environment, we should always put safety above all else. In this issue, we will be discussing petfood safety, not in terms of a safe work environment, but in terms of the production of uncontaminated, healthy food for our customers’ pets.

Better safe than sorry

Currently, the safety of petfood is not regulated. The driving forces with petfood safety are being developed through self-regulation and Food and Drug Administration (FDA) parallels. (Self-regulation is typically driven by market differentiation where individual producers wish to brand their products as produced with a food safety consciousness.)

The token descriptor for the process of continued on p. 4
Self-regulation is key to product safety

As manufacturers of extrusion equipment and solutions, our ultimate goal is to help clientele put forth their best products possible. A large part of ensuring top quality petfood is practicing safety measures during the production process.

However, without regulation by the appropriate agencies, petfood producers need to take it upon themselves to ensure the safety of their products. In this issue, we will discuss how through self-regulation you can combat contamination throughout the production process at critical areas of interest to make petfood safer for your customers and, ultimately, for consumers’ pets.

Although it is not a comprehensive review of petfood safety procedures, we hope this issue will provide you with a newfound focus on the safety of your products that will ultimately build a brand and product that consumers can trust and continue to use. Our thanks to Galen Rokey of Wenger Manufacturing for his help with this issue.

Your thoughts and comments are more than welcome, so please do not hesitate to send us feedback on the material found in this publication. I hope you find it informative, because your success is our success!

Sincerely,

R. Scott Krebs

R. Scott Krebs
Executive V.P., C.O.O.
Extru-Tech, Inc.
Extru-Tech Events

You can find Extru-Tech, Inc. experts and personnel at these upcoming events:

**Extru-Tech Extrusion Technology Seminar 2010.** August 11-12, 2010, Kansas State University, Manhattan, Kansas, USA. This premier seminar focuses on extrusion processing techniques from raw material preparation through the entire extrusion process, including packaging. Each seminar topic will be conducted by experts in their field of supply and service. Registration through Will Henry, willh@extru-techinc.com.

**World Immunological Nutrition and Feed Processing Technology Summit - Shanghai World Expo 2010.** July 16-18, 2010, Zhangjiang Advanced Technology Zone, Pudong, Shanghai, China. The goal of this summit is to discuss and understand recent developments in the area of immunological nutrition and feed processing technology. Will Henry of Extru-Tech, Inc. will be presenting Cutting-Edge Extrusion Technology for Feed Production. Contact Enzhi Michael Cheng, michaelc@extru-techinc.com.

**Feed and Pet Food Joint Industries Conference.** September 22-24, 2010, Marriott Downtown Magnificent Mile, Chicago, Illinois, USA. This is the first joint conference between the Pet Food Institute and National Grain and Feed Association. Please come visit the Extru-Tech, Inc. booth. Contact Norm Schmitt, norms@extru-techinc.com.

**Aqua Sur 2010.** October 20-23, 2010, Puerto Montt, Chile. One of the most important aquaculture meetings in the southern hemisphere. Contact Osvaldo Munoz, osvaldom@extru-techinc.com.
Identifying potential contamination
To identify potential points of contamination, the primary stance must be to leave no possibilities off the table and consider five critical areas of interest:

1. Raw materials and processing;
2. Plant and equipment;
3. Monitoring and data collection;
4. Final product efficacy;
5. Culture/environment.

For this discussion, we’ll cover the first three areas.

Raw materials and processing
The only responsible approach to ensuring safety is to assume that the vast collection of raw materials used to produce petfood contains a certain level of intrinsic contamination. This is by no fault of the producer, but simply a situation that must be dealt with as a part of the business.

Referring to the photo, we can begin to apply operational limitations/expectations of operational parameters of importance for this discussion that will help combat this problem.
By applying the kill temperatures of the various classes of microorganisms and representatives of contamination, we can develop this graph (Figure 1). With these sets of data, we can now begin to tailor a mechanical configuration to a corresponding product that will effectively promote safe petfood production.

For the preconditioner:
- Two to three minutes of retention time;
- 20-25% moisture;
- 170-195 °F;
- Atmospheric pressure.

For the extruder barrel:
- 7-30 seconds of retention time;
- 22-28% moisture;
- 248-275 °F;
- 350-700 pounds per square inch (PSI).


With the kill temperatures for various microorganisms, you can tailor a mechanical configuration to a corresponding product and help promote safety.

**Plant and equipment**

Figure 2 represents a typical petfood process layout, identifying the pasteurization zone within the extrusion model as well as the areas for potential recontamination. Our challenge is to apply a hygienic design and principles to the process layout, including considerations in equipment design and implementation. This will assist in the efforts to prevent or minimize the growth of *Salmonella* within the process.

This layout helps identify the pasteurization zone within the extrusion model and areas for potential recontamination.
These considerations will include but are not limited to:

- Plant layout;
- Isolation/segregation;
- Transitions.

Along with contamination and the review of a vertical versus horizontal layout, this process design must be analyzed in terms of processing efficiency (minimizing handling, electrical efficiency, maintenance, etc.). Benefits, in regard to margin analysis, can be gained when designing the conceptual layout and possibly with a combination of the two.

The segregation or isolation of pre-kill and post-kill zones has also become a prevalent design consideration for new and existing plant structures. Figure 3 overlays a common approach to the typical petfood process. However, the issue of handling the transitions between these isolation zones is all too often neglected.

An easy solution for the transitions would be to consider a sanitary pneumatic conveying system, which would include some of the following:

- HEPA filter air intake;
- Burn-out sanitizing mode;
- Temperature profile monitoring;
- Positive pressure areas.

Of these concerns, the most prominent likely falls on the supplication and management of airflows. This refers to the air used for transport and also recirculation and make-up air for the drying model. Both equipment and application technologies exist to facilitate great strides in managing this particular point of recontamination.

To apply a hygienic design and principles to a process, you should consider equipment design and implementation.

Figure 3: Isolating pre-kill and post-kill zones

An overlay on the typical petfood process shows a common approach that helps identify and segregate pre-kill and post-kill zones but neglects the transitions between the zones.
Monitoring and data collection

The final stand for petfood safety is the monitoring and collection of data. Current technologies provide a plethora of instrumentation that allows analysis for a multitude of product characteristics. But again, only proper implementation of this data will render qualified information and process security.

As you walk through the process, the assumption that Salmonella is present in the raw materials should be a given, so tests are needed for verification. Establish the appropriate, directly controlled, processing parameters as data for comparison. Typically, they would consist of the following:
- Heat;
- Shear;
- Pressure;
- Time.

Then monitor the parameters while in production and manage at various control points for a broader spectrum of data collection. This should allow for a more economically sensed set of standards that acquire the degree of energy required versus the cost of such operation. Document the aforementioned parameters and findings. And finally, capture samples to test and validate the effectiveness of the process.

An example of this can reviewed in the collection of product temperature within the extruder barrel. The photo below shows a cross-sectional view of the temperature probe orientation.

![Temperature Probe Orientation](image)

**Figure 4: Effect of temperature probe location**

<table>
<thead>
<tr>
<th>% Retracted*</th>
<th>Product temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>140</td>
</tr>
<tr>
<td>33.3</td>
<td>139</td>
</tr>
<tr>
<td>50</td>
<td>138</td>
</tr>
<tr>
<td>66.7</td>
<td>135</td>
</tr>
<tr>
<td>83.3</td>
<td>122</td>
</tr>
<tr>
<td>100</td>
<td>104</td>
</tr>
</tbody>
</table>

* 0% retracted = center of product flow; 100% retracted = flush with sidewall

The positioning of the temperature probe in the extruder barrel can affect the product temperature and, thus, validation of your safety process.

Using a temperature probe in the extruder barrel can help you test for possible Salmonella contamination during the extrusion process.
The way forward

This issue was not meant to be a definitive or final discussion on petfood safety or a source for infallible procedures. As equipment designers/providers, our primary focus is to assist our clients in their success. As the concept of petfood safety takes hold and becomes a market differentiator, or is possibly mandated by legislation, it behooves us to partner with our clients to develop and implement cost-effective and commonsense solutions.

The process must begin with pretreatment and traceability of raw materials, assisted by rapid analysis and containment of contaminated lots; next, the adoption of existing and new technologies to further prohibit recontamination and microbial growth; and finally, following up with comprehensive quality assurance and certification.

At Extru-Tech, Inc., we’re always on call to help you develop or improve your petfood safety process.
We’ve all heard it: Everything was fine until someone figuratively threw a wrench into the well-oiled machine. Unfortunately, we have also seen it happen much too often. The equipment/process appears to be running well, the production schedule is tight, and the thoughts go to, “It’ll be OK to delay addressing those pesky maintenance schedules and wear part rotations for a bit longer.” Well, the obvious reason to address the maintenance schedules is that soon the machine will stop running well and, in some cases, will not run at all.

Sign of the time (replacement time, that is)

Of all the processing issues that our service department encounters that begin with, “We have...” Why wait for the wrench to show up?

Previous issues of The Extru-Technician have discussed the need for flexibility in your extrusion process design, focusing primarily on conditioning, extrusion, waste management and ingredient processing. However, for a truly comprehensive extrusion program, your demanding processes must be complemented with an appropriate drying solution.

Lessons learned

All too often during the conceptual stage of process design, too much of the design focuses on the PC/extruder, while the drying solution is considered a “necessary evil” and not an integral component of a successful solution. Unfortunately, this dismissal frequently results in an expensive lesson that is learned late in the game.

Is flexibility key in drying, too?

In the last issue, we discussed some primary drying theories and efficiencies. This issue, we focus our attention on maintenance and the everyday issues of keeping a dryer running for optimal performance. In the competitive world of value-added extrusion/production, all too often we get bogged down with technical terms, theories, lab analysis, charts, graphs and dialogue riddled with complicated algorithms. However, we must not overlook the simple solutions and discussions that help fix problems our customers confront on a daily basis. So, we have decided to develop a series of articles that address these issues and ensure trouble-free and efficient operations.
Increase product volume beyond original capacity.
Add solid value to original investment.

“Extru-Tech® increased our capacity without high investment costs.”

The recent world economic situation has created challenges for all manufacturers. With all the uncertainty, many consumers purchasing extruded foods are shifting brands thus creating volume capacity challenges for the manufacturers. In turn, manufacturers are faced with the challenge of how to increase production volume while remaining within tight capital budgets.

At Extru-Tech®, we’ve focused solutions that deal directly with this challenge. Through the implementation of our Increased Capacity Solutions we can elevate current extrusion production rates up to 30%. All this while retaining the client’s original extrusion process architecture through the use of advanced technology upgrades and add-on components. Now that’s innovation driven by Extru-Tech.