

# The Extru-Technician



## Safety First

BY WILL HENRY AND GALEN ROKEY

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.)

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# 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*

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## 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](mailto: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](mailto: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](mailto: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](mailto:osvaldom@extru-techinc.com).

## On the cover

Petfood safety means not just a safe manufacturing environment but ultimately uncontaminated, healthy food for our customers' pets.

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contamination is adulteration. Petfoods, and practically all foods, are considered adulterated if they contain *Salmonella*. It is "the manufacturers' responsibility to produce *Salmonella*-free feed," according to FDA, so as providers of manufacturing solutions, our task is as follows:

- Assist producers in identifying critical areas of interest;
- Assist producers with the development of equipment-level solutions;
- Innovate and enhance the sound extrusion principles to further arm our clients for validations and certifications.

This issue of *The Extrusion Technician* will focus on helping you identify critical areas for contamination and recontamination.

## 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.

Referencing the photo, we can begin to apply operational limitations/expectations of the operational parameters of importance for this discussion that will help combat this problem.

Looking at your raw materials, preconditioner and extruder, you can begin to apply operational expectations of importance to help combat contamination.



#### For the preconditioner:

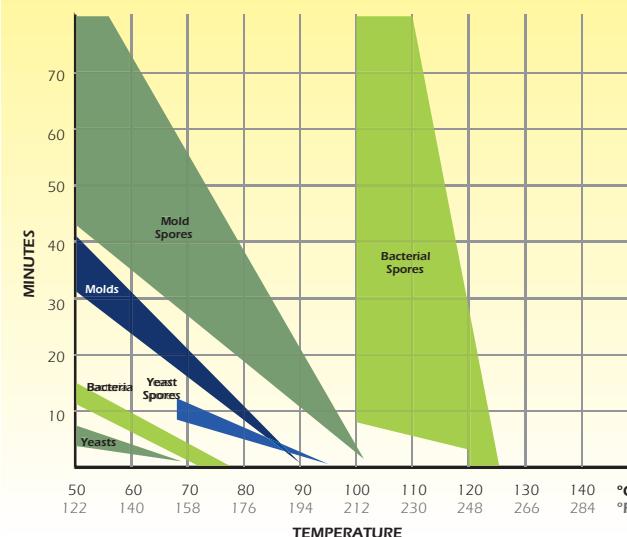
- Two to three minutes of retention time;
- 20-25% moisture;
- 170-195 °F;
- Atmospheric pressure.

#### For the extruder barrel:

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

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. ■

**Figure 1: Kill temperatures of potential contaminants**



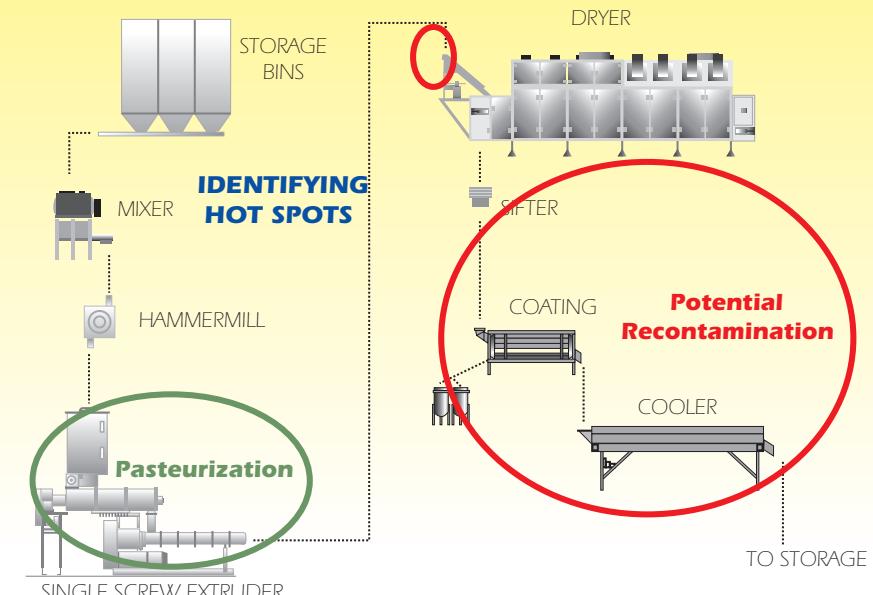
With the kill temperatures for various microorganisms, you can tailor a mechanical configuration to a corresponding product and help promote safety.

I. Dr. Daniel Fung, "Synopsis of Food Microbiology," January 2008 seminar.

## 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.

**Figure 2: Typical petfood processing**



This layout helps identify the pasteurization zone within the extrusion model and areas for potential recontamination.

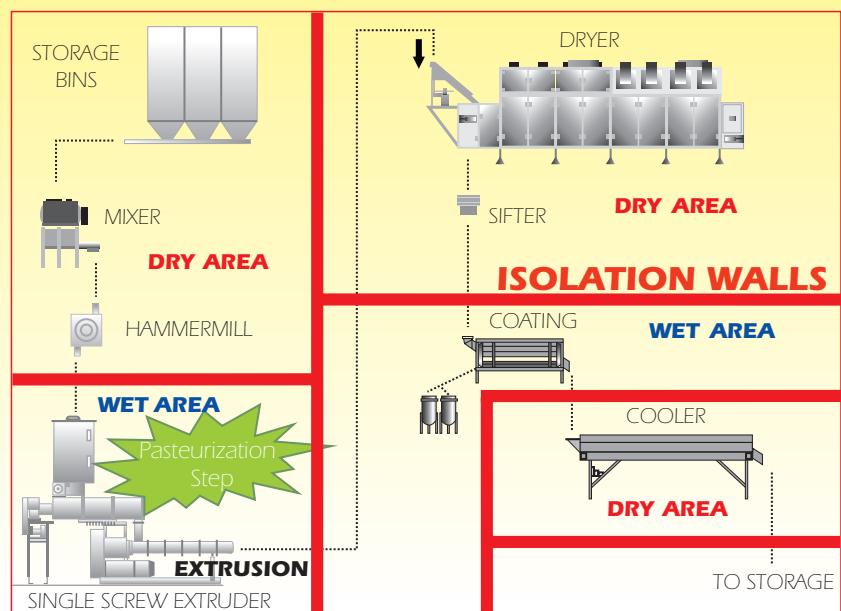


These considerations will include but are not limited to:

- Plant layout;
- Isolation/segregation;
- Transitions.
- Airflow control;
- Traffic management;

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

**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.

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.

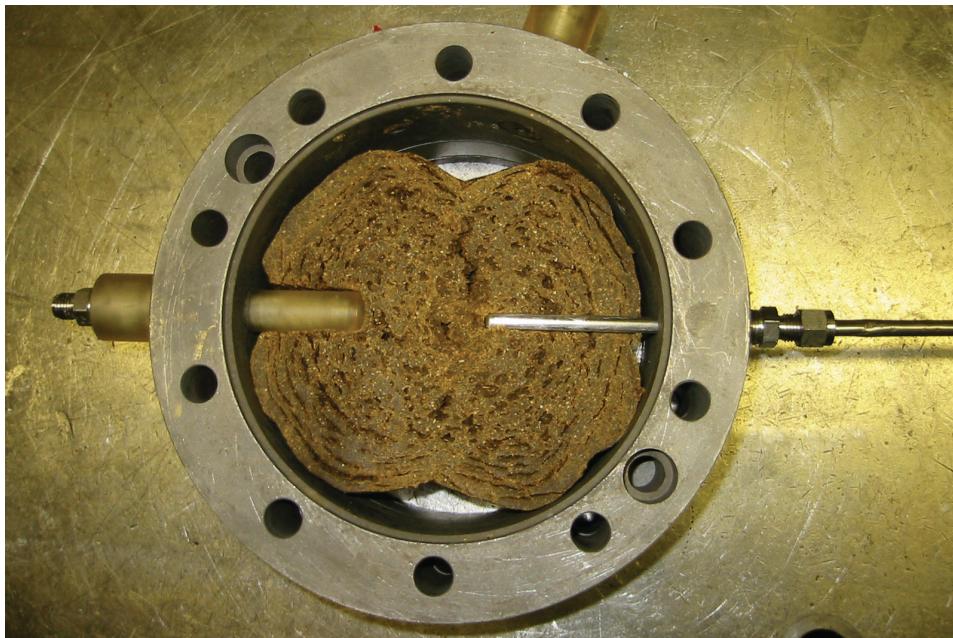
Of these concerns, the most prominent likely falls on the supplication and management of airflows. This refers to the air used for transport and also recirculation and make-up air for the drying model. Both equipment and application technologies exist to facilitate great strides in managing this particular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



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



## Monitoring and data collection



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

The final stand for petfood safety is the monitoring and collection of data. Current technologies provide for 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 be reviewed in the collection of product temperature within the extruder barrel. The photo below shows a cross-sectional view of the temperature probe orientation.

Figure 4 depicts temperature collection based on the position of the probe. As the location of the probe is modified, the recorded product temperature also changes, which would then portray a drastic effect on product validations. ■

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

% Retracted*	Product temperature (C)
0	140
33.3	139
50	138
66.7	135
83.3	122
100	104

\* 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.



## 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. ■



**Safety First continues**  
in the next issue of

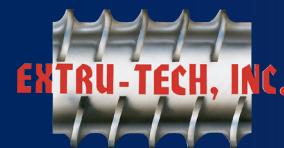
**The Extru-Technician**

with valuable information on:

- Final product efficacy and
- Culture/environment.

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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.

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