Special issue!

EXTRU-TECH, INC.

The Extru-Technician

Celebrating five years of sharing extrusion expertise in 2012

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STRATEGIC CRITICAL CONTROL POINT SELECTION

"Remember, upon the conduct of each depends the fate of us all." Alexander the Great applied this philosophy to all disciplines of his life, whether in the execution of his military strategies and politics or in deliberation of the many challenges of his life. He knew that every problem, regardless of complexity, is influenced by multiple factors that each must be deliberated in terms of individual and collective synergy.

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STRATEGIC CRITICAL CONTROL POINT SELECTION

As we continue our deliberation of petfood safety's Gordian Knot, this issue will discuss the impact of selecting the extruder (specifically the discharge point or die) as the critical control point (CCP) for various microbiologicals (i.e., *Salmonella*). If we first consider the typical validation constraints of most validation studies, the destruction and survivability of bacteria within a process are measured against time and temperature. Considering these parameters, the extruder presents probably the best model as a microbiological CCP for a typical dry-expanded petfood process. This is due to the predictable, consistent and measurable nature of the extruder's retention time, as well as the typical cooking temperature required for the production of most grain-based petfoods.

Retention time

Because the extruder is essentially a high-pressure pump with sharp first in, first out (FIFO) characteristics, the retention time can be easily verified with a simple marker and sample capture scheme (dosing the inlet of the extruder with a colorant and recording time delays for color changes at the die). Typically, Extru-Tech will recommend that this be done while in production and at a steady state of operations. For a more scientific approach, the inoculation of a chemical marker followed by concentration analysis of a large sampling regiment is more than adequate.

The most prominent benefit to the extruder's residence time distribution profile, when compared to that of the symmetrical preconditioner, is its insulation from retention time fluctuations due to raw material changes (intentional or otherwise). Previous internal studies performed by Extru-Tech have proven, within the preconditioner, that when typical

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Gordian Knot

To read more about strategic selection of critical control points, see the March issue of *The Extru-Technician*.

processing additives are varied (i.e., steam, water, fat), the retention time also changes. The same influence can be seen in the extruder, but at a much lower magnitude.

Temperature

Reviewing the destruction of various microbiologicals, it is recognized that 172 degrees F (78 degrees C) provides for an almost instant control of most enterobacteria, including *Salmonella* (Fung 2008, "Synopsis of Food Microbiology"). Temperature control at this level in the extruder is almost guaranteed due to the mechanical and processing characteristics typically experienced with a dry-expanded petfood.

CCP event management

It is important to review all aspects of the process when considering CCP locations, especially the corrective actions required to recover from a CCP violation event (i.e., process parameter operating outside the criteria of a critical limit). Most likely, a CCP violation will require that all production within the time frame of said violation be quarantined from the process and destroyed. If we contemplate these actions with a plan that utilizes the preconditioner as the CCP for *Salmonella*, provisions would be required to allow for safe quarantine and containment of the finely ground, under-processed material. Needless to say, this is not a trivial design task and offers minimal risk mitigation of recontamination when compared to other options.

However, if we take a similar CCP violation event with a plan that has utilized the extruder as the CCP, the corrective actions design is quite different as the state of the material has most likely been formed into much larger kibbles that should quarantine much easier with a greatly reduced risk of cross-contamination.

The need for science

When evaluating the continuous cooking extruder system for validation of the CCP associated with the pathogen kill step, the extruder consistently produces the highest degree of reliability associated with the pathogen kill step CCP. Although this publication places much emphasis on simple methods to determine extruder barrel residence time and temperature, the most effective and acceptable method to reliably validate the pathogen kill step CCP is through

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continued

a controlled scientific validation study. These studies involve the intentional inoculation of formulas with the target naturally occurring pathogens (not surrogates) at highly defined elevated contamination levels and the application of the intervention under evaluation. The microbial reductions associated with the intervention are then calculated to validate that indeed the pathogen kill step did occur prior to discharge of extrudate from the extruder.

Having identified the petfood manufacturer's need to reduce risk through controlled scientific validation studies, Extru-Tech has established a Food Safety Validation Extrusion Lab dedicated specifically to perform these types of tests. So the question is, as a petfood manufacturer, what level of confidence do you need to ensure that you are indeed doing everything possible to consistently manufacture high quality and safe petfood at the lowest risk to your consumers and brand?