



The **Extru-Technician**

Celebrating five years of sharing extrusion expertise in 2012

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LEGACY FACILITY DESIGN, EQUIPMENT CHALLENGES

As in recent editions of *The Extru-Technician*, this issue continues a focus on food safety within extrusion-based manufacturing. In this issue we want to consolidate previously shared information to assist our readers, specifically those with existing petfood manufacturing facilities, in their efforts to deal with the legacy facility design and legacy equipment challenges and how they might be managed.

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LEGACY FACILITY DESIGN, EQUIPMENT CHALLENGES

Development of a food safety management system is facility specific and even more so when considering existing petfood manufacturing facilities. As with any complete food safety system or plan, such plans for existing manufacturing facilities will need – at a minimum – Good Manufacturing Practices; Standard Operating Procedures; Sanitation Standard Operating Procedures; Hazard Analysis and Critical Control Points; and, in most instances, a food safety certification scheme to meet certification criteria for specific clients, large retail outlets, etc.

Much like any food manufacturing process, the petfood industry has existing facilities and equipment that are design challenges, with no immediate budget or plan to redesign or replace those items. To address the challenges you must determine what the potential food safety hazards are and then identify the preventive measures that can be applied to control these hazards.

To identify the potential hazards, a food safety risk assessment should be completed to determine all potential biological, chemical or physical

Figure 1. Manufacturing food safety risk — potential causes

To identify the potential hazards, a food safety risk assessment should be completed to determine all potential biological, chemical or physical hazards to food safety that may be present.

Staff — most common cause	Facility design	Process Equipment
<ul style="list-style-type: none"> • Lack of training so they don't know they are the cause • Carelessness because of lack of motivation • Refusal to change behavior, have always done it that way in the past. 	<ul style="list-style-type: none"> • Not designed for intended/ current use • Areas difficult to access/ clean/sanitize/inspect • Legacy designs that allow collection of particles and liquids • No segregation of wet/dry areas • No segregation of equipment • No segregation work zones and traffic flows (staff, fork lifts, etc.) • Improper air filtration, air flows and work zone air pressurization that facilitate potential cross contamination • Improper temperature control that facilitate humidity and mold issues 	<ul style="list-style-type: none"> • Poor or delayed maintenance • Not designed for intended/ current use • Outlived its designed usefulness, needs replaced

hazards to food safety that may be present. Oftentimes this assessment is and should be conducted by those experienced in food safety management of petfood manufacturing facilities. The primary goals of the food safety risk assessment include, but are not limited to, identifying:

- 1.**Risks associated with employee tasks and practices such as personal hygiene, sanitation practices, etc.
- 2.**Areas within the facility that require physical separation, controlled airflow separation, workforce separation to reduce/eliminate risk of cross contaminations, such as with any raw ingredient cross-contamination routes to finished product.
- 3.**Risks associated with traffic patterns, including foot traffic, forklift traffic, etc., within the facility.
- 4.**Risks associated with performing demolition and installation of equipment.
- 5.**Risks associated with equipment, conveyance, storage and packaging design.

In summary, the risk assessment is an evaluation of the process operational behaviors, plant design and equipment to see how each contributes to the food safety programs. As risks are identified and documented you must determine how to manage them and how to validate and record that the plan to manage them is done as routine operational behavior.

In a previous issue of this publication, it was stated that the only responsible approach to ensuring food safety is

to assume that the vast collection of raw ingredients used to manufacture petfood may contain certain levels of intrinsic contamination. With that assumption it is imperative that appropriate food safety management systems are developed, implemented, validated and reevaluated to make sure they are effective and applicable.

HACCP PLANS

Assuming that most petfood manufacturing facilities today have GMPs, SOPs and SSOPs developed and implemented, we will move to HACCP plans. HACCP is a written plan that defines the procedures for maintaining control of potentially hazardous food at the critical control points of food preparation or processing. The HACCP focus is not specifically on the products, but rather on the plant and processes. Many petfood manufacturers are operating under HACCP, and soon all will be required to do so within their food safety management systems similar to that currently mandated for meat, poultry, seafood, dairy and juice operations.

When developing an effective petfood manufacturing HACCP plan, the most straight forward method to begin is to divide the plant into three zones: the pre-kill zone, the transition zone (containing the validated kill step) and the post-kill zone. Taking this simple approach, the pre-kill zone is every process, activity, conveyance, etc., upstream to the validated kill step that should then have food safety management steps and programs designed around the handling and segregation of raw ingredient process steps from the rest of the manufacturing process. Likewise, everything downstream of the

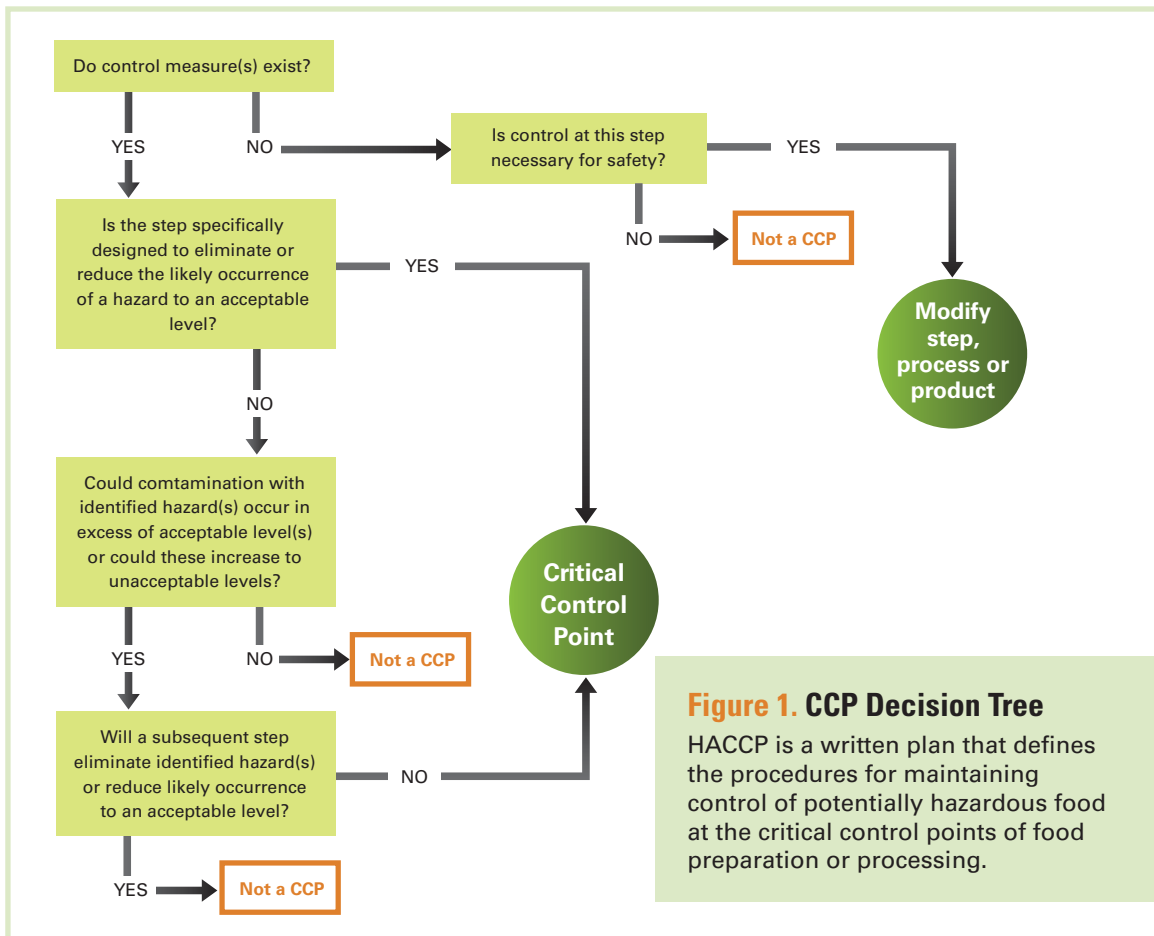


Figure 1. CCP Decision Tree
 HACCP is a written plan that defines the procedures for maintaining control of potentially hazardous food at the critical control points of food preparation or processing.

kill step should then have food safety management steps and programs that are designed around the handling and segregation of finished food so that it does not become adulterated by cross-contamination, unsanitary conveyance/handling, etc.

Most manufacturers quickly determine the transition zone (kill step) in an extrusion-based process architecture is at the extrudate discharge of the extruder barrel. It is at this point in the process that control can be applied to the raw state of ingredients to prevent or reduce to acceptable levels the biological food safety hazards that may be present. Therefore, this becomes the primary biological Critical Control Point of the HACCP plan. In

fact, a scientific validation study to validate the extruder kill step will be completed in 2012 by Extru-Tech Inc. on a dedicated production scale extruder to confirm that this process indeed reduces or eliminates specific biological hazards.

Again, realizing the extruder barrel discharge CCP, the focus on how to assess and incorporate into the food safety program the upstream (pre-kill zone) and downstream (post-kill zone) processes becomes more apparent. As stated earlier, when assessing risk of the pre-kill zone functions prior to this CCP; it can be assumed that any processes, material handling, etc., should be considered as working with raw ingredients. With

that understanding, then the extruder preconditioner and extruder barrel functions in the process up to and excluding the discharge point of the barrel would be on the raw ingredient side of the process and should be addressed accordingly in the SSOPs and HACCP developments. Any process, material handling, packaging, etc., downstream of the extrudate discharge is considered in the post-kill zone and should then be treated and handled as finished food.

Identifying CCPs such as this allows HACCP teams to focus on the most important equipment and conveyance devices. This results in a better understanding of these device functionalities, how to better schedule and perform maintenance, improved operating procedures, refinement of effective cleaning and sanitation tasks and scheduling and, in some cases, the need to modify or redesign the equipment.

To assist in your own food safety program development, use programs and documentation developed by experts in food safety. Also, turn to the process experts within your own operations to assist in your program development. These experts include those who perform the work and those who understand the sanitation needs for that process and equipment. After all, they will be the core of how well the food safety program is carried out on day-to-day operations. Don't hesitate to ask your equipment provider what they are doing to assist their clients with regards to SSOPs, etc., related to new and, more importantly, legacy equipment that currently is used in your manufacturing processes.

When designing and implementing a food safety management system for your operations it is important to keep in mind that this doesn't always mean sweeping facility modifications and equipment re-design/replacement is required. It may only require implementing the appropriate procedures, monitoring/recording and event-based action plans along with continual staff training and reinforcement needed to enhance operational behaviors to have the most effective food safety management system.

IN SUMMARY

- You must determine the food safety hazards and then identify the preventive measures the plant can apply to control these hazards. Potential hazards associated with a food could be biological, such as microbe; chemical; or they could be physical.
- You must establish a procedure to monitor the control points. Monitoring activities are necessary to ensure that the process is under control at each critical control point.
- You must establish corrective actions to be taken when monitoring indicates a deviation from a critical limit not being met. Corrective actions are intended to ensure that no produce injurious to health, or otherwise adulterated, enters commerce.
- You must verify that the food safety management system and operational behaviors are adequate. Verification procedures include ongoing, scheduled reviews of HACCP plans, CCP records, critical

limits and microbial sampling and analysis.

- You must validate the food safety management system, and that consists of two important segments – one, confirming that the plan and system is complete (in that it has satisfactorily covered and documented all required elements) and, two, that when implemented and the procedures and objectives are followed as routine operational behavior the plan and system will achieve food safety objectives.
- You must maintain the appropriate food safety program documentation and records. Final regulatory mandates will require that all plants maintain certain documents, including

hazard analysis and written HACCP plan, records, documenting and monitoring of critical control points, critical limits, verification activities and handling of processing deviations.

Most importantly, keep in mind that all of this planning and implementation is not effective unless it is carried out and followed in every aspect of the plant floor process. The staff that does the work on the plant floor is where food safety starts, succeeds or fails. In most facilities in the US, operational procedures, SSOPs, etc., are well laid out and documented when completed. However, normal practices and habits of managers, supervisors and employees during production or sanitation will not easily change with the stroke of a pen. It takes time, training and, in some cases, a culture change.

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