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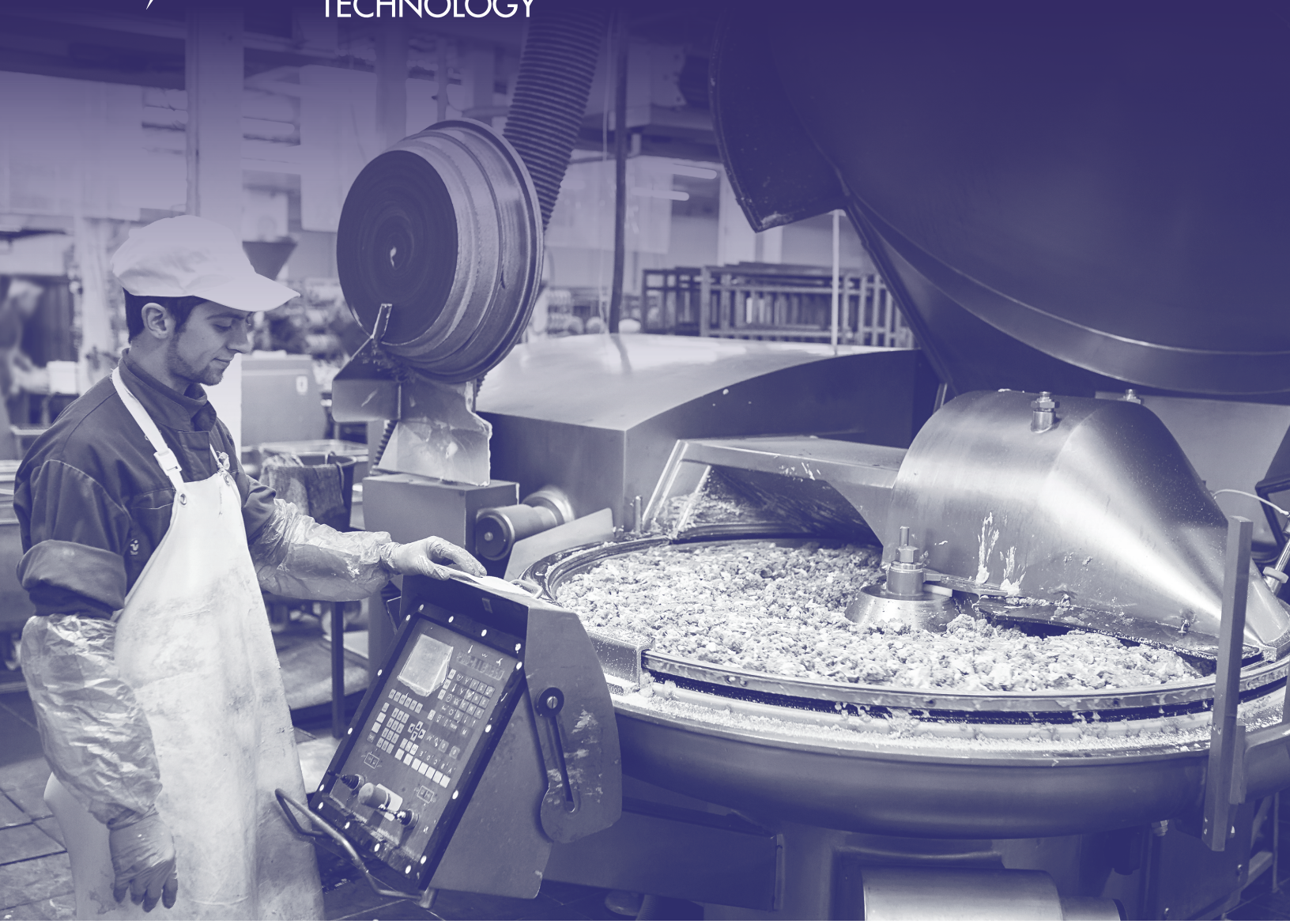


ENSURING MEAT SAFETY: STRATEGIES FOR MANAGING EVOLVING CONTAMINANT RISKS

Fortress Technology explores the most common and frequently overlooked food safety hazards on meat and poultry processing lines, presenting insightful suggestions for implementing effective control measures.

By **Eric Garr**, Regional Sales Manager and food safety, checkweighing and contaminant detection specialist, Fortress Technology Inc.

1.0 PROTECTING PROCESSORS

Worldwide meat production increased nearly 5 times in the second half of the 20th century, and the amount eaten per person doubled. By 2050 meat consumption could increase by as much as another 160%, potentially reaching 570 million tons.

The need to equip meat and poultry processing lines with effective contaminant control measures is more pressing than ever. Alongside the pressure on crop and water resources, the future of food safety is changing. With heightened consumer awareness, technological developments, and tighter food safety regulations, meat and poultry processors must be strategic when selecting their Critical Control Points. This not only ensures that food is safe to consume, but also that it is not wasted.

1.1 HIGH FOOD SAFETY STAKES

The United States is the world's second largest meat producer. It is also the biggest consumer of land animal meat, with Americans now the top per capita meat consumers in the world. According to the USDA, the average US resident consumes approximately 225 pounds of meat per year[1] - 59 pounds of beef, 51 pounds of pork and 115 pounds of poultry.[2]

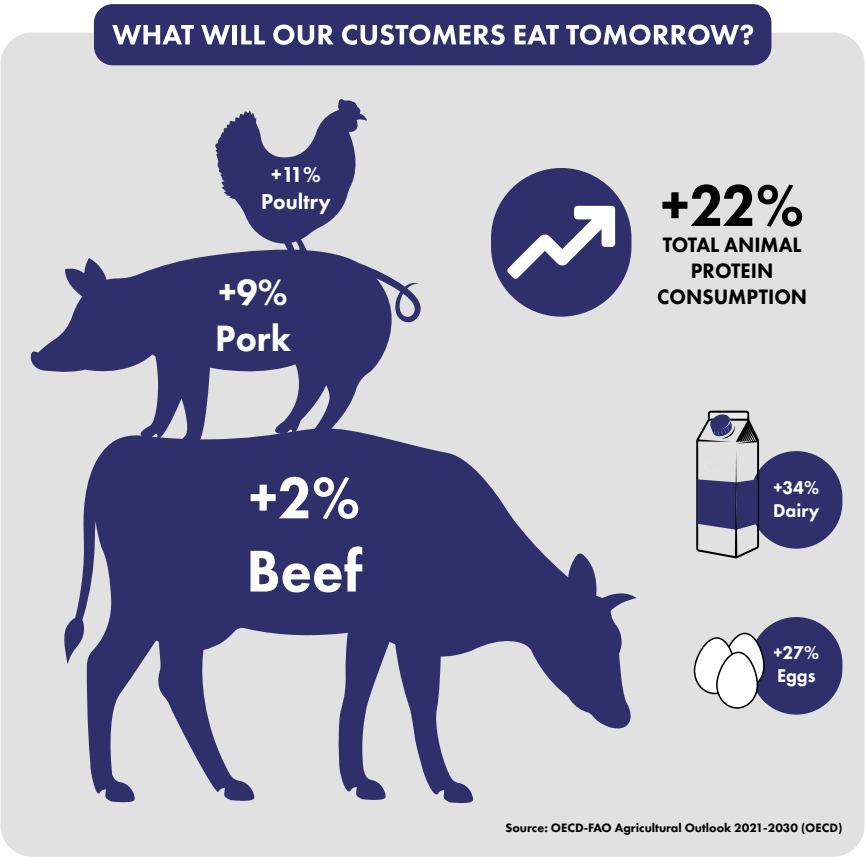
Highly regarded for its advanced production methods and efficient processing facilities, US beef consumption reached a record high in 2021. Statista reports that consumption reached 30 billion pounds.[3]

THE BIG FOUR

Overall, the OECD predicts that livestock-based protein and meat consumption globally will increase by another 22% by 2030.[5] However, despite population growth being a key driver for this rise, consumption won't change equally in all countries and regions. In addition, it will not be equal across all of the Big Four livestock categories – chickens, cows, pigs and sheep.

In the world today there are estimated to be:

- 26.5 billion chickens
- 940 million cows
- 784 million pigs
- 1.3 billion sheep



[1]https://www.theworldcounts.com/challenges/foods-and-beverages/world-consumption-of-meat
[2]https://sentientmedia.org/meat-consumption-in-the-us/#:~:text=How%20Much%20Meat%20Is%20Consumed,broilers%20and%20turkey%20—%20every%20year.
[3]https://www.farmprogress.com/commentary/meat-demand-up-in-2022-despite-higher-prices
[4]https://www.statista.com/statistics/542890/beef-consumption-us/#:~:text=Beef%20consumption%20in%20the%20U.S.,2002%2D2022&text=Beef%20consumption%20in%20the%20United,during%20the%20period%20under%20consideration.
[5]https://www.oecd-ilibrary.org/sites/cf68bf79-en/index.html?itemId=/content/component/cf68bf79-en

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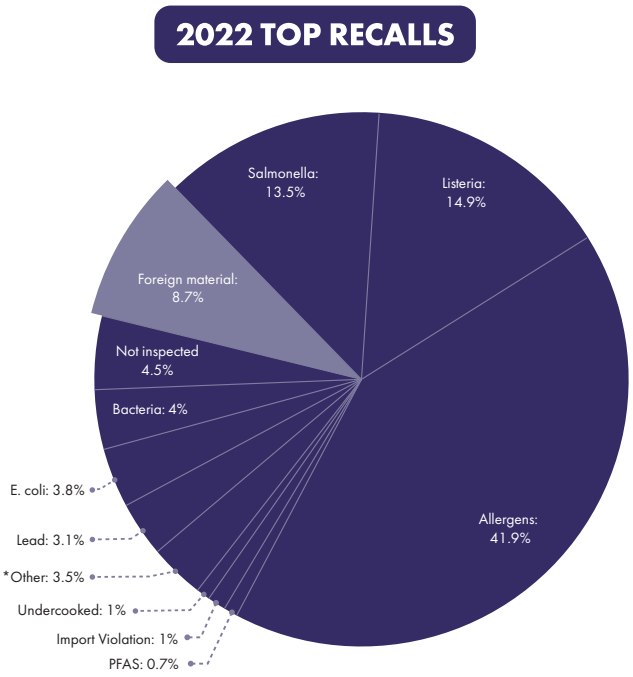

CONSUMPTION CHANGES

The global shift from red to white meat can be attributed to several factors. Economically, chickens convert feed to meat more efficiently than pigs and cattle. This makes them cheaper to buy. In today's cost of living crisis, consumers are understandably choosing the more affordable alternative. Diet trends also greatly impact consumer spending habits. Globally, we have seen an increase in health-conscious consumerism, with diet advice stressing the importance of protein consumption. Poultry is generally perceived as a healthier option than beef and produces a much smaller carbon footprint.

1.2 RISE OF THE RISKS

This rapid expansion in how much meat and poultry people are buying and consuming has naturally increased the amount of product passing through a single processing facility. As a result, the risk of food safety hazards contaminating meat and poultry produce rises incrementally. Recalls and food safety threats multiply, prompting more strict regulatory standards.

Beef, pork, lamb, chicken and turkey - all in-demand food products - are defined as perishable foods and rely on adequate environmental conditions to mitigate microbial growth. These microorganisms can be pathogenic and, depending on the number and concentration of the bacteria, can pose a serious threat to consumer health if ingested. Additionally, meat and poultry products are exposed to several other food safety hazards during farming, slaughtering and processing, from metal flaking off machinery to the introduction of pathogens through improper facility design and layout.

The competitive landscape among companies frequently hinges on the quality of meat, where products that are ethically sourced, grass-fed, and organic, especially in the case of meat and poultry, are highly preferred. Given that these are regarded as premium products, food safety is essentially implied. Yet, metal remains one of the most likely physical contaminants in food production.

In 2022, Listeria, Salmonella and foreign material such as metal and plastic in processed meats were the top culprits for US public health and safety alerts and recalls. With an increasing demand for the production of safe, organic and affordable meat, producers are feeling even more pressure to deliver contaminant-free products and prevent irreparable brand-damaging recalls.

1.3 SOARING FARMGATE COSTS

Additionally, farmgate input costs have reached unprecedented levels. Price increases for animal feed and medicine, fuel and power, and fertilizers are projected to rise by 36%, 43% and 134%, respectively.[7] For meat and poultry processors, it can be hard to justify the loss of valuable, expensive product if contaminants could have been caught and addressed earlier in the production process.

These issues can be safeguarded by being strategic when selecting high-contaminant-risk checkpoints and inspection equipment. Establishing your biggest contaminant risks and most effective Critical Control Points (CCPs) and inspection solutions all help to ensure a robust HACCP-compliant food safety strategy.

[6] https://pirg.org/edfund/resources/food-for-thought-an-analysis-of-food-recalls-for-2022/#:~:text=However%2C%20recalls%20and%20alerts%20involving,and%20420%20deaths%20a%20year.
[7] https://www.fwi.co.uk/business/markets-and-trends/input-prices/cost-of-farm-inputs-soars-34-in-a-year#:~:text=Animal%20feed%20and%20medicine%2C%20fuel,including%20depreciation)%20climbed%2025%25.

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2.0 PROCESS STEPS, POTENTIAL HAZARDS AND FREQUENTLY USED CONTROLS

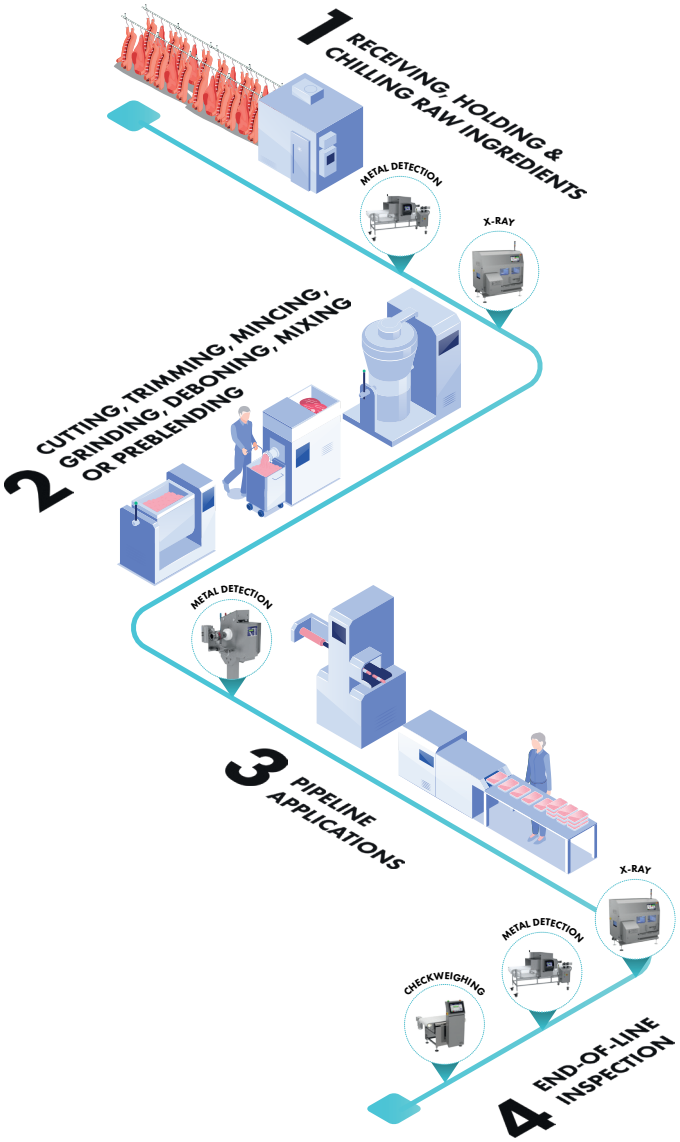
The meat and poultry production chain involves a variety of steps, each introducing a wide range of food safety hazards. The USDA Food Safety and Inspection Service are the regulatory body that ensures meat and poultry products are safe to consume. They require all US meat and poultry processors to follow HACCP (Hazard Analysis and Critical Control Point) principles when creating a food safety management system. This includes prerequisite programs - good manufacturing practices that help to ensure the mitigation of food safety hazards, and Critical Control Points - a step at which control should be applied and is essential to prevent, eliminate or reduce a food safety hazard to an acceptable level.

Fortress Technology's whitepaper Writing a Food Safety Plan explores the main differences between these two hazard control measures and the role that they both play in ensuring food safety compliance.

Below is a visual of the most common contaminant risks at each stage of meat and poultry processing, with examples of the most effective controls to mitigate them.

2.1 THE WHOLE CONTAMINANT PICTURE

	RISKS	CONTROL
1	Foreign material	Bulk inspection systems such as metal detectors or X-rays can quality-check incoming raw meat and poultry. Large, undetected contaminants can damage processing equipment or contaminate the entire batch.
	Biological pathogens	Prevent pathogens by establishing chilling parameters in the HACCP plan, monitoring meat temperature when shipment is received and establishing food safety controls with supplier purchasing programs and certifications.
2	Poor maintenance can lead to metal or other contaminants in products, risking equipment damage and metal shard contamination in production	Provide comprehensive staff training on equipment maintenance and care. Ensure equipment is regularly inspected for wear and tear. Regular auditing can help to highlight any non-conforming equipment.
3	Biological pathogens and physical contaminants	Inspect pipelines in meat processing to reduce pathogen risks, design for minimal residue and bacteria, and perform high-pressure washdowns after each changeover to prevent cross-contamination.
4	Meat and poultry processors must prioritize safety, requiring end-of-line inspection if no other controls for physical contaminants are in place	Maintain food safety, adhere to Code of Practice requirements and protect consumers and brand image by inspecting products after packaging using metal detection and X-ray.



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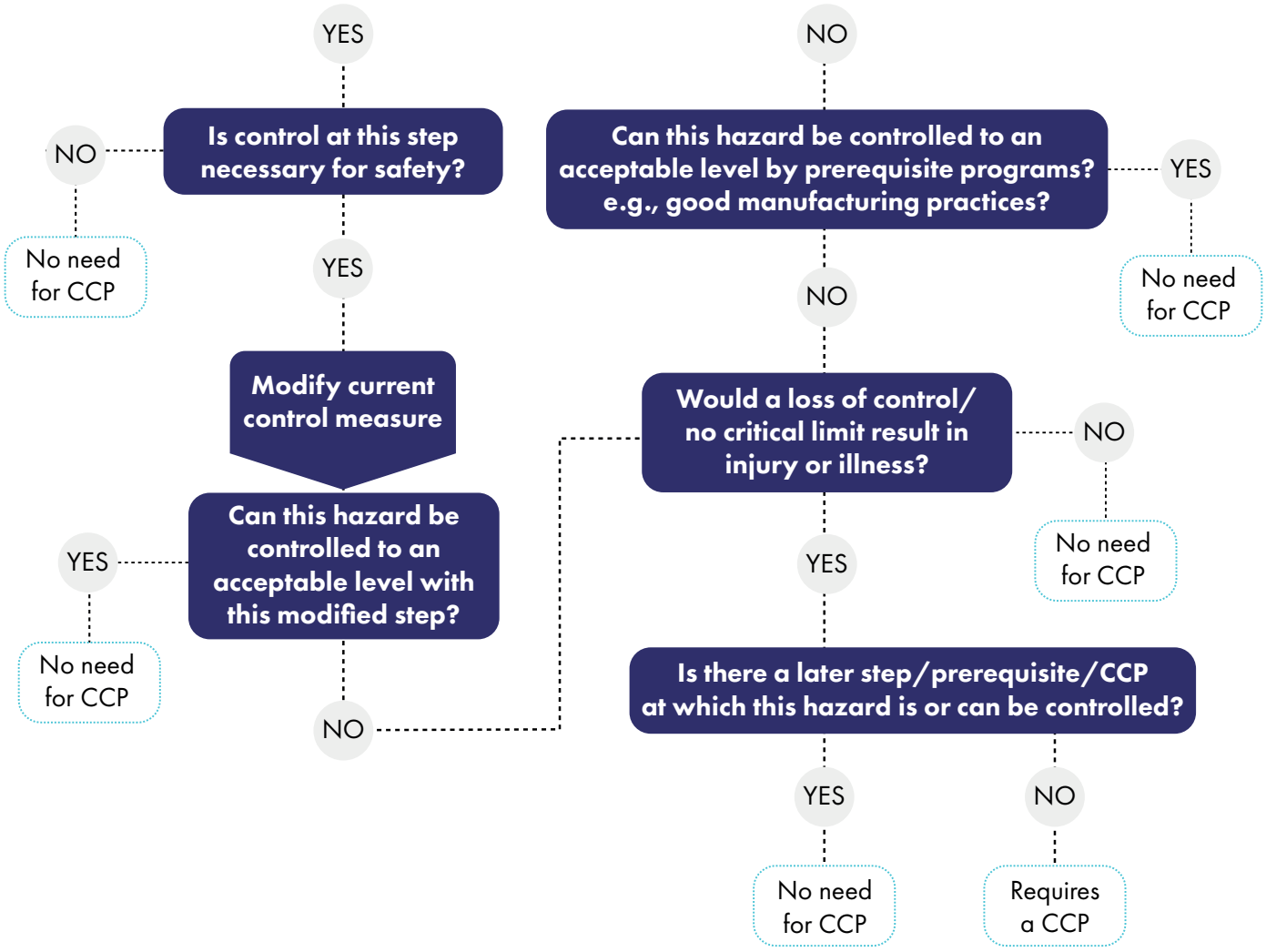
3.0 WHICH CONTROL MEASURE TO USE?

HACCP, sanitary design and good manufacturing practices remain the cornerstone of a robust food safety program adopted by meat and poultry processors. Prerequisite control measures provide the basic operational and environmental conditions required for safe food production. Their main objective is to establish a hygienic, safe environment to help prevent the introduction of food safety hazards.

Hazards that cannot be controlled through prerequisite programs must be prevented, eliminated or reduced to an acceptable level using Critical Control Points. A CCP decision-tree can be utilized to determine what food safety hazards require which control measure.

ARE CONTROL MEASURES CURRENTLY IN PLACE TO MANAGE THIS HAZARD?



Implementing a CCP early in the production process serves as a proactive measure to intercept large metal contaminants before they undergo further processing stages like cutting, trimming, mincing, grinding or deboning. Should they continue on to these processes, the contaminants risk getting fragmented into numerous smaller shards that are much more difficult to detect downstream.

Inspecting product upon arrival at the processing facility is critical to prevent this from occurring. This approach not only enhances detection accuracy but also streamlines subsequent inspection procedures, enhancing overall food safety measures.

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4.0 FIELD TO PLATE: KEY CONTAMINATION CHALLENGES

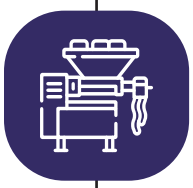
In an abattoir, carcasses undergo evisceration, splitting, and butchering to yield various products like chicken thighs, ribs, beef loin, pork belly, etc. Viscera release numerous microorganisms, including gram-positive bacteria like Listeria, and gram-negative bacteria like E. coli, Salmonella, and Campylobacter. These pathogens can spread and adhere to other parts of the carcass.

Re-butchering inspection occurs to identify and remove any meat that is deemed unfit for human consumption. Contamination risks stem from various surfaces in the abattoir, such as gloves, unclean knives and equipment. Regular sanitation and maintenance of machinery and utensils are crucial. Employees must adhere to HACCP principles and maintain personal hygiene to ensure food safety compliance.

Incoming raw product may contain foreign matter, particularly metal. Due to the slaughtering process, animals often arrive at manufacturing plants already contaminated. Bulk inspection systems like metal detectors or X-rays can detect large foreign bodies at this stage, preventing their dispersion or damage to processing equipment.

After post-mortem inspection and butchering, meat processors must be diligent in detecting and addressing pathogens. Transient pathogens may survive on raw materials during processing, while resident pathogens from within the plant may also pose a threat. Implementing rigorous sanitation and manufacturing practices aligned with HACCP principles is crucial to controlling these food safety risks.

Environmental contamination poses an equal threat to meat consumers as contamination during slaughter. To prevent the spread of biological contaminants in processing facilities, processors must create hygienic zones with room separations, such as separating raw areas from ready-to-eat sections. Equipment should be fit for purpose and constructed from food-grade materials for easy access, cleaning and sanitation.



Other processes such as cutting, trimming, deboning and grinding can introduce contaminants. Undetected bones and metal shards from machinery contact pose risks. Inadequate equipment maintenance increases the chance of metal parts contaminating products.

Inspecting for physical contaminants at this stage allows for rejected product, once the contaminant is removed, to be reintroduced. X-ray equipment is particularly useful for detecting non-metallic foreign matter, especially in boneless products.

https://multimedia.3m.com/mws/media/1837779O/3m-fsd-managing-food-safety-contamination-risks-in-meat-processing.pdf

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CASE STUDY | INSPECTION EQUIPMENT REDUCED COSTS BY 50% FOR HALAL MEAT PROCESSOR

Solmaz Foods, a leading Halal meat processor in Canada, emphasizes the critical role of food safety by incorporating essential metal detection systems into their processes. The company's recent addition of a Fortress Stealth Meat Pump pipeline metal detector enhances inspection before the meat undergoes further processing and packaging. This, coupled with existing conveyor detection systems, bolsters Solmaz's commitment to food safety and gives them a competitive edge by ensuring contaminant detection. Moreover, the new system has cut costs by 50%, suggests Solmaz Foods' President Mehmet, who attributes the savings to reduced waste, labor and risk, citing the inline detector's immediate and reliable response to identifying and rejecting products with metal contaminants.

5.0 THE FINAL CCP

For a GFSI-certified business adopting a continuous-improvement mindset, adhering to best food safety practices is of utmost importance. The number-one requirement for all food manufacturers is to ensure products are safe for consumption. Inspecting products after packaging using an end-of-line metal detection and X-ray system is the most important CCP. It is also a retailer COP requirement.

The most common high-risk contamination culprit in food processing is metal. However, X-ray machines, including X-ray Pipelines may be advisable if there are specific risks, for example potential contaminants like bones that won't be detected using a metal detector.

Where there might appear to be a need for multiple machines to manage increased upstream output, Fortress recommends closely examining available options and speaking with their inspection system provider about the best system for their application. They can offer insights into various inspection systems and provide guidance on maximizing system benefits, such as saving factory floor space, cutting operational costs and enhancing process efficiency.

"Both X-ray and metal detection systems offer distinct advantages. A meat processor always needs to factor in their biggest contaminant risks. It's equally critical to understand that product effect for each type of meat – minced, large joints, cooked, frozen, etc. – can vary and behave differently with either technology."

Eric Garr

6.0 STAYING STRATEGIC

There are countless areas within meat and poultry processing facilities where non-compliance with food safety regulations and HACCP principles may occur. However, the recurring theme that can lead to contamination is, unsurprisingly, cutting corners on food safety.

It is imperative for the future of food safety, and your business, to have the correct CCPs and prerequisite programs in place. Rather than looking for patterns, examine potential HACCP-holes, especially if any processes have changed. With the expanding meat and poultry industry, processors must remain strategic when selecting their control measures. An annual HACCP assessment – a requirement for all meat and poultry facilities – will help to ensure that all essential inspection points are effectively managed and, most importantly, that they are retail and food-service compliant.

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Fortress Technology is a global leader in the design, manufacturing and sales of metal detectors, checkweighing systems, combination systems and X-ray systems, engineered with an exclusive Never Obsolete guarantee. From food to consumer goods; pharmaceutical to bulk product inspection; Fortress machines are designed to catch contaminants, reduce waste, spot product defects, comply with weight legislation and reduce production downtime – ensuring product safety and brand protection. Thousands of food processors of all sizes globally trust our technology and team. What do they have in common?

They all value our core principles:

Simple Operation.
Outstanding Reliability.
Exceptional Performance.

INSPECTION PROTECTION

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