



Food Processing & Packaging

White Paper

Reducing Foreign Object Contamination



Metal shards are the last things you'd want to encounter when biting down into a burger or sipping a cold glass of milk. Unfortunately for the Food Processing, Packaging, and Conveyance Industry, foreign object contamination can be a major setback to producing high-quality, healthful, and safe products for consumers. Between 2012 and 2015, the United States Department of Agriculture Food Safety and Inspection Service (FSIS) recalled over 2 million pounds of food for containing "extraneous material".¹ For food manufacturers (and those working in the processing, conveyance, and packaging systems), the repercussions of these types of contamination incidents are multifaceted, including consumer sickness and loss of confidence, negative public sentiment, and decreased profitability.

Reducing Metal Contaminants

Exploring the benefits of advanced engineered thermoplastics in the food processing, packaging and conveyance industry.

Metal Contamination – The Costly, The Bad, & The Ugly

While food recalls due to disease-causing contaminants such as E. Coli, Salmonella, and Listeria often get maximum media coverage, foreign object contaminations can be just as damaging—and disturbing. Due to the mass industrialization of our food manufacturing, processing, conveyance, and packaging systems, objects such as glass, metal chips, plastic, bone, wood, or small rocks can sometimes find their way into food products. With more and more automation of US food manufacturing systems, higher line speeds result in things slipping through the cracks (sometimes literally). While food safety standards have been put in place regulating employee behavior, equipment is frequently the culprit behind such mishaps.

Food processing, conveyance, and packaging requires a lot of moving parts—scrapers, paddles, pistons, valves, spools, grippers, sliding bearings, plates, screws and more. Metal parts sliding up against each other for prolonged periods of time causes friction and wear, increasing the likelihood of bits of metal being incorporated into food. Due to the aggressive chemicals in Clean-In-Place (CIP) and SIP (Sterilization-In-Place) procedures, metal can become corroded and brittle—more prone to flake off. Grease or other lubricants are often required in order to ensure that metal pieces move seamlessly, providing yet another potential contaminant. With stricter regulations on water consumption for processing and lubrication due to environmental concerns (coupled with an ongoing focus on hygiene and contamination), selecting, applying, and disposing of food manufacturing lubricants is becoming more of a liability. Breakage and wear of metal-on-metal equipment creates metal particulate, flakes, and dust that can ultimately end up on or mixed into the food product, a very real concern for manufacturers.



¹http://www.fsis.usda.gov/wps/portal/food/food_safety/topics/recalls-and-public-health-alerts/recall-summaries

Besides the obvious (consumers becoming ill or injured), foreign object and extraneous material contaminations are bad news for business. According to the FDA² and other major news sources, Kraft Foods' recent voluntary recall of 6.5 million boxes of Mac & Cheese cost the company between \$6-10.8 million dollars in retail revenue cost alone.³ Media coverage of the recall (caused by the possibility that some boxes may contain small pieces of metal) caused a drop in company stock prices and an overall loss of customer confidence. What parent is going to pick up a box of Mac & Cheese at the grocery store after seeing a news report about even the potential of metal pieces inside?

More recently, ConAgra Foods expanded a voluntary recall of P.F. Chang's Home Menu Brand products due to the potential presence of small metal fragments (2-9mm) in the sugar used in the sauce.⁴ According to ConAgra's press release, "Food borne foreign objects that are not hard and sharp and less than or equal to 7mm in length may cause minor injuries such as temporary reflexive choking and irritation of the gastrointestinal system." The expanded recall now totals over 195 thousand pounds of chicken and beef that have potentially been contaminated with metal fragments that range in size from 2-9 millimeters.⁵ The Class I recall (meaning that there is "reasonable probability" that consuming these products is a serious health hazard) has been covered by major news sources including Fortune, U.S. News & World Report, NBC and ABC News, among other outlets. The negative press alone for such a mishap could decimate a smaller company, putting them out of business altogether.

"Kraft Foods' recent voluntary recall of 6.5 million boxes of Mac & Cheese cost the company between \$6-10.8 million dollars in retail revenue..."



A Safer Solution

In 2011, the FDA Food Safety Modernization Act (FSMA) was signed into law as the most sweeping reform of US food safety laws in over 70 years. The act updated existing Good Manufacturing Practices in regards to manufacturing, processing, packaging, and holding of human foods, shifting the focus from responding to contamination to preventing it. The mandate requires food manufacturers to implement written preventative control plans, monitor, and maintain routine records in order to ensure that consumers have confidence in the food they buy and serve to their families. However, the United States is not the only country striving to increase safety and efficiency in the Food Processing, Packaging, & Conveyance Industry. The Asia/Pacific region is projected to see the largest gains in demand for food processing machinery, with drivers including developing countries such as India and Africa having access to processed foods (motivating food manufacturers to increase both production and capacity).

When foreign materials are found in foods, they are a concern not only in terms of customer complaints and financial damages, but also as factors impacting the effectiveness of the company's overall food safety program (their Hazard Analysis Critical Control (HACCP) system). There are a number of food safety techniques that food manufacturers can build into their preventative control plans. Good food plant personal hygiene policies, practices, and Standard Sanitation Operating Procedures (SSOPs) can provide an excellent foundation for eliminating foreign objects.

²<http://www.fda.gov/Safety/Recalls/ucm438700.htm>

³<http://www.cbsnews.com/news/kraft-macaroni-cheese-recalled-due-to-metal-fragments/>

⁴<http://www.conagrafoods.com/news-room/news-ConAgra-Foods-Expands-Recall-of-PF-Chang%E2%80%99s-Home-Menu-Brand-Meals-Available-in-Grocery-Retailers-Due-to-Potential-Presence-of-Foreign-Material-2185959>

⁵<http://www.foodsafetynews.com/2016/07/conagra-expands-recall-of-chicken-and-beef-over-metal-fragments/#.V6DCV442tjU>

“These changes have created a growing demand for polymer materials as replacements for metal parts...”



Separation and detection strategies can be used to identify and remove contaminants from product streams, including sieving, screening, filtration, float tanks, and magnetic separation. Many companies have redesigned their production lines entirely, in order to minimize the number of metal-to-metal moving parts. Additionally, drive motors are now sealed completely or located apart from food locations so that food cannot be “trapped” in gaps or voids. These changes have created a growing demand for polymer materials as replacements for metal parts and new and improved metal detectable plastics. Engineers can also select easy-to-clean parts (such as conveyor belts) that provide better overall sanitation and are easier to disassemble. Another tactic is the use of metal or x-ray detectors to check raw materials or packaged, ready-to-ship products. Measuring density, X-ray machines (when coupled with computer analysis) can find dense, sharp-edged contaminants including glass, stone, bone, and plastic.⁶ However, employees responsible for this type of equipment operation must be educated and trained properly.

The Mitsubishi Chemical Advanced Materials Advantage

Mitsubishi Chemical Advanced Materials advanced engineering plastics not only reduce the risk of foreign object contamination, but also provide the additional benefit of improving food manufacturing productivity. Plastic-on-plastic components (or even plastic-on-metal components) can outlast metal-on-metal with less debris, noise, wear, lubrication, and using less energy, providing an overall increase in efficiencies and product/manufacturing integrity. With a complete line of metal and x-ray detectable polymers,⁷ Mitsubishi Chemical Advanced Materials is able to offer manufacturers in the Food Processing, Packaging, and Conveyance Industry the comfort of knowing that even if stray plastic debris finds its way into the product, it will be caught by standard detection equipment.



Mitsubishi Chemical Advanced Materials FDA and EU compliant⁸ self-lubricating polymers are designed to replace metal wear components in even the most aggressive applications, including areas of high temperature and aggressive cleaning chemical environments.⁹ These advanced plastics (such as TIVAR[®] HPV) offer high strength to weight ratios and are designed to run against mating components without lubrication, often significantly increasing component life. Self-lubricating polymers also help food manufacturers adhere to regulations regarding mandatory

wash downs—lubricant that is washed into existing water systems can cause damage to the environment, in addition to damage costs like loss of productivity, fines, and negative public relations. Mitsubishi Chemical Advanced Materials

⁶<http://www.foodsafetymagazine.com/magazine-archive1/augustseptember-2009/food-safety-insider-testing-solutions/x-ray-contaminant-detection/>

⁷http://media.quadrantplastics.com/fileadmin/quadrant/documents/QEPP/EU/Brochures_PDF/Food/Food_MD_Products_Br_E_0311.pdf

⁸https://en.wikipedia.org/wiki/Food_contact_materials

⁹<http://www.quadrantplastics.com/na-en/support/chemical-resistance-information.html>

polymer materials offer improved impact resistance resulting in less breakage of highly stressed plastic parts in production and processing equipment. Increasing the mean time between repairs (MTBR) results in less downtime with more efficient production and product integrity. With 25% of production costs related to maintenance, that's no small savings. The trend of legacy brands consolidating under fewer large umbrella companies shows no signs of slowing, and is expected to increase from 11.3% to 16.5%. Food manufacturers must perform at optimal levels in order to continue to turn a profit.

When considering the risks of metal contamination — consumer sickness and loss of confidence, negative public sentiment, and decreased profitability, among others — it makes sense to consider advanced engineering plastic solutions.

Mitsubishi Chemical Advanced Materials supplies stock shape materials as well as finished parts solutions for global clients in the Food Processing, Packaging & Conveyance Industry, with a portfolio including TIVAR® MD UHMW-PE, TIVAR® HPV, Acetron® MD POM-C, and Ketron® MD PEEK. If you need assistance selecting the plastic alternative to match your application, reach out to Mitsubishi Chemical Advanced Materials Technical Service Team today. It could end up saving you or your customers a few million bucks and a lot of bad press.



Resource Center

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