The necessity for regular decontamination practices

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Food processing has existed for centuries, but in the 19th and 20th century more modern food processing technologies were developed largely due to the need to supply militaries.

As the needs for food processing have grown during the 19th and 20th Centuries, so have the numerous problems with food contamination and foodborne illness. Food contamination is an issue that is increasing in concern because of the large costs involved with foodborne illnesses associated with food contamination.

Foodborne illnesses cost an estimated $152 billion each year in health related expenses. The CDC (2011) estimates that each year roughly one out of six Americans (or 48 million people) is affected, 128,000 are hospitalised, and 3,000 die from foodborne diseases. A factor that is contributing to the large amount of cases of foodborne illness each year is the increased consumption of minimally processed foods and fresh foods (fruits, vegetables, nuts).

Contamination points

There are many points where food has the potential to become contaminated as it travels from the environment to the consumer.

Some of these points include irrigation water, wash water, food preparation environment, infected seed, during production, harvesting, post-harvest handling, transport, distribution, storage, preparation, humans and from animals. A major issue is the amount of diverse pathogens involved in foodborne illnesses and food recalls. Of the 76 million cases that occur annually, only 14 million of these cases can be attributed to known pathogens.

Some of the major known pathogens that are involved in the contaminations, foodborne illness outbreaks and food recalls are E. coli O157:H7, Salmonella spp., Shigella spp., Listeria monocytogenes, Clostridium botulinum, Crytosporidium spp., Cyclospora spp., hepatitis A virus, and Norwalk-like viruses.

In recent years detection methods and

product tracking methods have improved resulting in the recall of products that have the potential of being contaminated. These recalls can be extremely costly for food industries.

In recent years some highly publicised and costly food contamination recalls occurred. For example, during the summer of 2010 there was a massive egg contamination in a factory in Iowa that resulted in 550 million eggs recalled that affected 13 retail brands that the egg factory packages. The egg shells were contaminated with salmonella and over 1,000 people became sick from these eggs.

Not only did this cost the factory a lot of money but it also caused egg prices to

increase dramatically resulting in an economic impact noticeable by consumers.

Another devastating recall that occurred last summer was the ground beef recall in California where one million pounds of ground beef were recalled due to an E. coli O157:H7 contamination.

This was the twelfth recall of the year, totalling 1,786,859lb of meat recalled by the end of the summer of 2010. Another recall that occurred right in time for Thanksgiving 2010, involved New Braunfels Smokehouse in Texas and they recalled nearly 3,000lb of turkey which was likely due to listeria contamination.

Cost of major recalls

A recall occurred in 2009 that involved at least 70 companies and over 3,900 specific products. This was due to salmonella contaminated peanuts at a Georgia manufacturing plant and the economic impact of this outbreak is estimated to be more than $US1.0 billion.

In 2008 there was a very large outbreak of Salmonella spp. contaminated tomatoes. After a great deal of investigation, the FDA ultimately found that the salmonella had originated in Mexican jalapeno and serrano peppers.

By that point, the tomato industry had lost an estimated $100m. In addition to the recalled product values, the direct hit to a facility will include (on average) a full quarter of profits for the recalled product, marketing to repair long term brand damage, spillover negativity that reduces sales of other products, product liability claims and the cost of restoring status within distribution channels.

Due to the impact that a food recall could have, many facilities have been increasing their sampling tactics to better detect contamination occurrences prior to their becoming major issues.

Once contamination is detected, however, actions need to occur which may include product recall. Because of the potential catastrophic consequences, many facilities are improving their contamination prevention activities (CPAs).

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More washdowns and surface cleanings can help, but only a gaseous decontamination can really get into all of the tight locations in a facility such as an egg processing plant, meat packing plant or a produce handling facility allowing for a complete kill of any contaminating pathogens.

Two effective methods

The only two effective methods for gaseous decontamination available are formaldehyde and chlorine dioxide. The residues left by formaldehyde and its carcinogenic properties make it an unattractive choice. Gaseous chlorine dioxide, on the other hand, has none of the drawbacks associated with residuals or carcinogenicity.

It can handle large areas, is compatible with components, equipment, and finishing most commonly associated with food production facilities. Like formaldehyde, it is a true gas at room temperature, thus is evenly distributed throughout the area being decontaminated by gaseous diffusion.

Often before a decontamination procedure there are washing procedures that take place. Gaseous chlorine dioxide can penetrate through water allowing for decontamination of the water and the surface the water is on, which is beneficial because this saves time from having to physically dry everything. It also has very quick cycle and aeration times allowing for the processing facilities to become fully functional and decontaminated in a shorter period of time saving money.

A decontamination of a facility can be completed in 1-3 days depending on a facility's size and complexity. The setup would consist of sealing all of the possible leaks in an area like windows, doors, vents, outlets, drains and holes.

Also, there would be a need for control or understanding of the building exhaust system or HVAC system in order to stop the chlorine dioxide gas from escaping and/or to exhaust the chlorine dioxide gas at the end of the decontamination cycle.

If biological indicators (BIs) are required to further document the effectiveness, then they are placed throughout the area wherever the customer may want them. Then quarter inch sample and injection lines are run to many different points throughout the area so there is even sampling and dispersion of the gas during the decontamination cycle. Once the cycle is done everything is cleaned up, tubing and tape is removed and the BIs are collected and properly evaluated. The area can then be turned back over to production for use.

Currently, some facilities are implementing procedures to execute fumigations of their facilities on a yearly, bi-yearly, quarterly or a more frequent basis.

This supplements the regular washdown procedures which are most commonly used now. When a washdown is executed the goal is to attempt to kill possible contaminating micro-organisms.

Whether this occurs in cold or hot temperatures and when different types of chemical washes or spray are used it is very tough to completely rid an area of micro-organisms.

Coping mechanisms

Several, micro-organisms are capable of surviving various challenging conditions due to mechanisms that they develop to cope with some sanitisers, cleaning agents and temperatures.

Ultimately because micro-organisms are not being completely removed they can slowly build up their population and spread over larger areas making the chances of a contamination and ultimately a recall much higher.

By using chlorine dioxide as a frequent method for decontaminating a facility before an issue arises, the chances of a contamination and/or a recall decline drastically.

This happens as a result of chlorine dioxide completely eradicating micro-organisms from areas where potential contamination may transpire. ■

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