Implementing HACCP Plans in Bakeries

We do not think of baked goods as particularly hazardous to people, but bakers do need to think about having a Hazard Analysis Critical Control Point (HACCP) plan under the recent Food Safety Modernization Act signed into law earlier this year. Low-acid canned foods, juices, and seafoods have been required to have HACCP plans in place, and FDA has issued guidances about such plans that suggest what hazards should be addressed and what critical control points should be established. No such guidance yet exists for baking. Baking encompasses a wide range of processes and products including bread, snack cakes, tortillas, pretzels, salty snacks, pastries, pies, and full-size cakes. These have in common that they are usually composed of wheat flour and baked in an oven. The products may differ in final moisture content, degree and type of leavening, and use of other ingredients such as fruit, icing, filling, salt, and coatings.

Principles of HACCP
A HACCP plan includes the following seven principles.
• Conduct hazard analysis
• Identify critical control points
• Establish critical limits
• Establish monitoring procedures
• Establish corrective actions
• Establish verification procedures
• Establish effective record keeping

Hazard analysis typically begins with a simple flow sheet illustrating the process. For baking, such a flow sheet might show the steps of mixing, forming, proofing, baking, cooling, and make-up. For each step, potential physical, chemical, and biological hazards to human health are identified. Physical hazards might include foreign matter such as wood, metal, or glass. Chemical hazards could include cleaning materials, pesticides, and misformulation. (Some bakers have suffered recalls because of unlabeled allergens in products.) Biological hazards include spores of Clostridium botulinum, vegetative cells of pathogens such as Salmonella, Listeria, and Staphylococcus, and some yeasts and molds.

Risk analysis involves evaluating both the severity and probability of a hazard occurring. For example, some misformulations might cause an unpleasant taste, but pose no real health hazard. On one
occasion, a bag of potassium chloride was substituted for a bag of sugar in mixing some cake batter. The result was an inadvertent experiment in public response to a defect. The exact number of defective snack cakes was known. The number of complaints from consumers represented only about 2% of that total. There is no way of knowing how many consumers were permanently lost to the brand, of course, but the experience illustrates the usual discrepancy between defects and complaints, so long as the defects are not health threatening.

Other misformulations could be more serious. Some commonly used preservatives can cause illness if used beyond permitted levels, usually about 0.1%. One good precaution is to use premixes prepared by firms that specialize in that task. Otherwise, a baker must rely on busy operators to carefully follow a batch sheet. With a premix, the operator has only one measurement instead of several. Premixes may contain leavening agents as well as preservatives and other minor ingredients, such as yeast foods, minerals, and vitamins.

Flour, sugar, salt, and other bulk raw materials are usually screened regularly calibrated with test cards containing metal pieces of known size and material. Such calibration must be documented as part of the HACCP plan’s record keeping. Further, rejected product should be examined, and the possible source of metal identified. A common issue in bread baking is breaking of the saw blades used to slice loaves of bread.

**Other Hazards and Precautions**

Bulk flour is often delivered in rail cars or specialized trucks. Flour can be assumed to be infested with insect pests. Often, flour is fumigated in transit and toxic fumes must be exhausted before people are exposed to the flour. Usually, flour passes through a pin mill as it is transported to a storage silo to break up and kill any insect eggs. Silos are normally emptied and cleaned at least once every month, which requires careful scheduling.

Sugar, salt, shortenings, and syrups are also received in bulk and stored in tanks or silos. Syrups can develop mold on their surface if condensation occurs in the headspace and small pockets of dilution are created. Some syrup tanks have ultraviolet lights in the headspace to prevent mold growth. Proper ventilation of the headspace also helps.

**Breads, cakes, cookies, and crackers have relatively low water activity and are subjected to high temperatures in baking so they do not normally support growth of pathogens.**

Bread does support surface mold growth, but these are not normally toxic. Mold spores are common in the environment of bakeries, especially if corn meal is an ingredient, as in making English muffins. Good dust collection near bag dump stations is a useful practice.

Baked goods with creamed or fruit fillings may have higher water activity. Fruit fillings are often...
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Cooked, but creamed fillings are simply emulsions of fat, sugar, and water.

In general, one critical control point could be proper formulation of a given recipe. This is often achieved with a paper or computerized batch sheet, which requires an operator to check off each addition. Some automated systems link scales, meters, and feeders to computer control to reduce the human element. Preventing addition of an unlabeled ingredient, especially one that is a potential allergen, is a critical element of proper formulation.

Wheat itself is an allergen for some people, but so are eggs, soy, tree nuts, peanuts, milk, and some seafoods. Baked goods may contain several potential allergens and should be appropriately labeled.

Mix times, bake times, and oven temperatures are clearly critical to quality but do not usually qualify as critical control points in a HACCP plan because they do not directly impact human health. It is important to have only those critical control points that could affect a consumer’s health. Too many CCPs make the plan difficult to use.

Corrective actions in baking often involve rejection of defective product. When product is rejected, there should be a documented investigation into why that happened and steps taken to prevent a recurrence.

Prerequisite Programs
There are three prerequisite programs that support a HACCP plan:
• Good Manufacturing Practices (GMP)
• Standard Operating Procedures (SOP)
• Sanitation Standard Operating Procedures (SSOP)

The Food and Drug Administration (FDA) has published GMP for some industry segments, such as low-acid canned foods and acidified foods, but not specifically for baking. However, GMPs for food manufacturing are general enough to be applied in most areas of the food industry. For example, employees in food contact service should wear hair nets, take off jewelry (except plain wedding bands), not carry anything in pockets above the waist, and not eat, smoke, or drink in the food contact areas. Raw materials should be separated from finished goods.

GMP also affects facility design including such provisions as no standing water, easy-to-clean walls and floors, no dust accumulation, and proper pest control programs. One important good practice advises, “If it is dry, keep it dry.” Wet areas can be curved and should slope to drains. Process drains should be separate from sanitary drains until they join outside the building.

Standard Operating Procedures refer to the instructions for making the products. These must be documented, and employees must be properly trained in their use. On-the-job training is acceptable and common, but must be documented. Bakeries may not be accustomed to keeping the paperwork that food safety regulations require. Bakers are properly proud of their expertise and craft. Their experienced touch is more sensitive than any instrument in judging fresh dough. Such sensory evaluation is fine, but it needs to be documented as follows, for example: “Dough is evaluated by the operator before a batch is released.”

Sanitation Standard Operating Procedures refer to how the equipment and facility is cleaned and prepared for use. Only approved cleaning materials should be used, and the SSOP should include complete instructions. Chemicals must be stored away from production areas except when in use. Empty chemical containers should not be reused for trash or other materials. An employee must be designated as responsible for sanitation.

Bakeries have both dry and wet areas, which are typically cleaned differently. Water can create microbial hazards in dry areas, so these are typically cleaned with brushes, vacuum, and compressed air. Care should be taken with compressed air because it can scatter dust in the air, but for some situations, it is the only reasonable tool. Areas cleaned with water must drain properly and be able to dry before being used again.

Baking has an admirable record of safe operation, but will need to adopt some new practices, especially in record keeping and documentation. Most of the precautions and corrective actions are likely in place; they just need to be recognized, documented, and possibly reinforced. FT

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