Sanitation in a Modern Bakery*

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The public health hazards attributable to food products from bakeries are minor. The maintenance of essential cleanliness is the major problem. The fact that prolonged and bacteria-destroying heat is applied to most bakery products is at once a potent safeguard to the baker and to the public, and a sedative to the traditional baker who is inclined to think of the baking process in the same way some earlier milk dealers considered pasteurization—a means of making dirty milk unobjectionable or safe.

Baking, being an art with an ancient tradition which has undergone relatively little change through the centuries, tends to conservatism in equipment and methods. Machinery for mixing and processing doughs, fillings and icings, persists in the model T stage. With the dependence on the baker's oven for a safe product, most bakeries are deficient in washing facilities, from the ordinary sink to the specialized washing machines required for cleaning pans and other containers.

In recent years, however, the tremendously increased public acceptance of bakery bread, biscuits, and cakes has necessitated new and enlarged plant structures, new machinery (such as the band oven) adapted to mass production, and a revised concept of bakery sanitation. This latter has been stimulated not so much by health authorities as by the federal food regulatory agency which does not have to justify its functions on the ground of danger to health but proceeds directly against conditions of so-called "filth" through enforcement of increasingly higher standards of quality and cleanliness in both ingredients and plants.

INSECTS

Grain, and its derivative, flour, being the main ingredients of baked goods and the favorite food of a multitude of insects, the miller and the baker have been plagued by their ravages for centuries, yet not too concerned about them either until modern laboratory methods have made their detection in the finished product possible. Under pressure of this type of control and the increasing sensitivity of the public to insect contamination, the baking industry is discovering that insects can be controlled by treatment of grains by fumigation, by better cleaning in mills and bakeries, and by improved storage facilities, machinery, and containers.

Sanitation in a modern bakery, so far as flour insects are concerned, is coming to have the following essentials. The wheat in elevator storage must be turned at intervals to reduce moisture and temperature and to permit the application of a fumigant such as chloropicrin, to destroy or retard the development of grain weevils. After these insects develop and may remain, after being killed, in the grain kernels, they cannot readily be removed by cleaning before milling and are, therefore, ground up with the flour to form insect fragments microscopic in size and detectable only by the flotation test developed in the Food and Drug Administration laboratories. Their removal, as a part of the wheat cleaning at the point of milling, is of prime importance.

* Presented at the Thirty-fourth Annual Meeting of the International Association of Milk and Food Sanitarians, October 17, 1947.
National Biscuit Company was the first to make use of a new method of removal by adapting the entoleter (previously used only as a killing device) to shattering the insect-invaded and weakened grain kernels and then subjecting this wheat stream to a selective separation into dust, tips, and sound wheat by a battery of aspirators. A high percentage of the insects is contained in the dust which can be wasted. This process, in combination with other control measures, has made it possible to meet the informal and unexpressed tolerances for insect fragments in flour even when using a high-moisture, soft wheat.

In the mill, general fumigations two or three times a year are usually necessary, using methyl bromide where the mill structure can be made sufficiently tight. This must be supplemented at particular points of infestation by frequent removal of stagnant flour and by spot fumigations, using such chemicals as ethylene dichloride, ethylene dibromide and acrylonitrile.

Residual insecticides such as DDT may be used in some mill areas and the frequent and thorough removal of flour dust is essential to interrupt insect multiplication. For cleaning both mill machinery and structure, a fixed vacuum piping system is most effective.

The transportation of flour presents a major problem as to containers and as to condition of freight cars. The railroads under present circumstances assume little responsibility for the condition of their cars, many of them containing carry-over insect infestations and various soiling and odor-imparting materials from previous cargoes. DDT treatment of cars is frequently necessary. Such treatment should become routine practice by the railroads whenever weather conditions favor insect growth.

Multiple-use flour bags of cotton cloth have served long and economically in the milling industry but are now becoming out-moded by the single service, multiple-walled paper bag. Only the production capacity of the paper industry limits the conversion to this container. Several states (Oklahoma and Minnesota) have already prohibited the re-use of flour bags, and New York and Georgia are considering a similar restriction.

In the bakery, it is necessary to avoid over-stocking and long storage of flour and to maintain rotation of stocks. Storage areas must be kept clean, stocks piled out from the walls to permit inspection and cleaning, and residual insecticidal treatment practiced on adjacent wall and floor surfaces. All flour, including that used for dusting, needs rebolting at the point of consumption. Dumps, conveyors, elevators, bolters, bins, and scale hoppers become insect breeding places unless given thorough routine cleaning and fumigation. Access must be provided for cleaning, and reasonably tight closure for fumigation. If the fumigation is effective, in terms of approximately 100 percent kill, it may be done at monthly intervals using ethylene dibromide or acrylonitrile, the latter having the advantage of being much faster-acting and applied in smaller quantities.

**Housekeeping**

Housekeeping in bakeries is not essentially different from practices in any other food establishment. Washing facilities, while too often inadequate, should include two-compartment sinks, large enough to accommodate the largest trays and pans for both washing and rinsing. Mechanical washers are being developed which make possible frequent routine cleaning of the many pans, tins, trays, and ingredient containers used. However, manufacturers of such machines frequently fail to provide them with the accessory equipment necessary for their proper functioning. These items include indicating thermometers, float-controlled make-up valves, detergent feeding devices, insulation on drying sections, etc. Too often disappointing results from such machines are due not to the basic
unit itself but to lack of essential controls and operating devices.

In bread bakeries, equipment for soaking bread pans in a special detergent is essential. This includes a tank with two compartments (one for long soaking and the other for brief rinsing), baskets and hoist for handling. Without such equipment, grease incrustations build up and eventually come off as carbon spots on the bread crust. A new chemical coating for bread pans is now being used experimentally which is designed to make greasing unnecessary.

A chronic problem in many bakeries is the chilling of doughs for mixing. Where ice is used for this purpose by adding cracked ice to the mix, foreign substance contamination is likely to result. Natural or artificial ice may carry adhering or entrained dirt and the handling and breaking of the ice within the bakery is usually a crude operation. Modern refrigerating units are desirable for cooling water to recirculate in mixer coils and to be used for ingredient water. Splinter ice, manufactured at the point of mixing, is beginning to be used, the equipment being similar to that in some large milk bottling operations.

In cleaning of food contact surfaces in bakeries for the prevention of mold and in hand packing operations where fingers are soiled or made sticky, the use of quaternary ammonium chloride compounds is desirable, to supplement the chlorine compounds. Bacterial accumulation in the water used for rinsing rags or for wetting fingers and the transfer of such bacteria to the products may be significantly reduced by use of a germicidal solution provided the solution is non-toxic, without odor, stable, and not irritating to the skin.

Flooring

One perplexing feature of bakeries is the construction and maintenance of floors. The areas where wet operations are carried on require almost continuous cleaning with mops and squeegees. This results in eventual rotting of wood flooring, or the disintegration of cement surfaces and of mortar between bricks or tile. If cement is used, it requires wet curing and special surface treatment to make it tough and impervious. Where brick is used, the best appears to be the acid brick manufactured of Ohio clay with a special process for exhausting air to make the brick dense. The most important feature, however, is the use of narrow mortar joints, 1/8" to 1/16". The wide joints quickly disintegrate and are then difficult to renew. Poured sulphur compound joints can be used or a special Portland cement containing iron filings to produce an expanded dense mortar. Care must be exercised to prevent any void spaces under the brick or in the joints. Floor drains and an adequate pitch to them must be provided. For wet areas, quarry tile may also be used with the same thin joints. Asphalt, if used, should be confined to runways since it requires exercise to keep it from becoming hard and brittle.

For smooth, attractive and comfortable floor surfaces in the major dry areas, hard maple wood is unsurpassed. The development of efficient floor maintenance machines, such as the Tennant, simplify this job and provide easily cleanable surfaces.

Vermin

Rodent control has top priority in a bakery sanitation program. The first element of rodent control is making the structure tight to prevent their entrance by any channel other than through necessarily opened doors. Any other means of control is largely wasted energy until rat-stoppage or rat-proofing has been accomplished. However, it must be combined with the elimination of inside harborage to the greatest extent possible. If this work is well done, and followed by a quick, complete extermination of the existing population, the rat problem is largely eliminated, provided stoppage is maintained.
For the control of mice, skillful and persistent trapping seems to be the best method. This means daily attention to the placement and baiting of traps, based upon careful inspection to determine the presence and location of mouse activity. An effective program, including elimination of harborage, should prevent any multiplication of mice within the bakery.

Assuming that grain and flour insects are being controlled in a bakery, there remains the problem of infestation by miscellaneous pests such as flies, cockroaches, silverfish, ants, etc. DDT constitutes the principal post-war weapon and is effective for residual treatment if properly used. However, where heavy infestations exist, they should be reduced by means of a contact spray having a quick knock-down and kill such as pyrethrum, piperonyl butoxide, or cyclohexanone. For routine residual spraying to control slight infestations, one of the contact sprays in concentrated form may be added to the 5 percent DDT solution. While it cannot be stated just what interval between residual sprayings is proper, it appears that one month is a practicable period, except for places where washing, vapors, or dust coatings may destroy or insulate the residual in much less time.

Fly control can, of course, be accomplished using straight 5 percent DDT at about two months intervals during the fly season. It is probable that other residual type insecticides will prove to have some advantages over DDT but it is not yet clear that they possess over-all superiority. Certainly, experience now indicates that DDT can be used generally throughout a bakery with the exercise of ordinary care in avoiding direct application to food or food-contact surfaces.

Responsibility of Management
All of the above factors in a sanitation program and many others do not produce results unless management makes provision for their implementation, and too often bakery management offer little more than good intentions and dissipated responsibility. Sanitation functions require study, organization, balanced application, and persistent follow-up. These elements of a program cannot be scattered and added to the duties of a number of employees, no matter how effective such individuals may be in discharging their primary jobs. The sanitation job in a plant must be centered in one individual having both responsibility and authority stemming from his immediate superior—the manager or owner. Such a sanitation supervisor, of course, requires training and continuing contact with sources of information and guidance. In larger companies, this may come from an executive sanitation department and, in smaller bakeries, it may have to be supplied in part by the local health department.

Sanitation cannot be maintained and kept in balance in a bakery without thorough and frequent investigations by the sanitation supervisor and occasional check inspections by superiors or outside food control officials. Incidentally, no inspection can be thorough or effective unless it has the benefit of a good, sharp-beamed flashlight in the hands of the inspector.

Since it has been demonstrated that a sanitation program can be carried on successfully only under responsible and undivided authority, health departments and other food regulatory agencies might well devote more of their energies to the encouragement of sanitation departments or sanitation supervisor positions in bakeries and other food processing plants. By such means, the outside official can accomplish far more in terms of a consistently high level of food plant sanitation than through any practicable number of outside inspections. To this end, the food plant sanitation program and its administering personnel require the sympathetic understanding, support and help of the official food inspection agencies.