education and research, convenes to consider establishing uniform and definitive designations for professional positions in dairy science and technology.

Food science and technology has an important role to play and it should be assisted in every way in its development, as has been done at Cornell University. I do not believe that this assistance should be done at the total expense of dairy science and technology education. Both disciplines are too valuable to society for one to dissolve the other.

It may be that relatively fewer Dairy Departments or Institutes are now required in developed countries, but those that persist should be better qualified and provide more challenging programs of service. Under such an environment and philosophy more students are likely to be attracted. We must not fail to recognize that until such time as milk is no longer required by the human, there will be a real need for good dairy science and technology education.

REFERENCES

SANITATION IN PLANTS FABRICATING PLASTICS, PAPER, PAPERBOARD, OR MOLDED PULP FOR SINGLE-SERVICE MILK AND MILK PRODUCTS CONTAINERS1

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The first detailed reference to sanitation requirements for the manufacturing of single-service milk containers was published in the 1939 Edition of the Milk Ordinance and Code, Recommended by the U. S. Public Health Service (4). Physical requirements for plant and equipment, sanitization with paraffin at various temperatures, and detailed bacterial plate standards were described.

Moss, Thomas and Havens (2) reviewed the satisfactory bactericidal effect of paraffin in 1941. When the 1953 Milk Ordinance and Code, Recommended by the U. S. Public Health Service (5) was published, it stated that the "Manual of Sanitation Standards for Certain Products of Paper, Paperboard and Molded Pulp" (1) be used as a guide in the production of single-service containers for milk and milk products.

The author also discussed sanitation standards for preformed milk containers in 1956 (6), and developed an inspection form to be used, both by industry and health agencies.

All the requirements and recommendations were based on the fact that some type of bactericidal treatment was used after the container had been formed.

In the last few years, wax-coated containers have declined to only a small percentage of the total used. In 1962, over 155 million pounds of polyethylene were used to coat milk cartons, and by 1964, it is estimated by one of the leading producers that waxed containers for milk will no longer be produced.

Concurrent with this change in the dairy and food industries, has been the development of vacuum formed and blow molded plastic containers, plastic bags, and extruded and fabricated sheets. All of these combined have created certain environmental sanitation problems which are not adequately covered in the present Milk Ordinance and Code. The formed containers no longer receive bactericidal treatment, either at the dairy plant or the point where the container is preformed. Bactericidal treatment is accomplished at the point where the board is laminated, the blank formed, or in the case of all plastic containers, where the container is manufactured in part or in its entirety.

It becomes obvious then, that it is necessary to apply public health safeguards at the point of production and distribution.

There are tremendous variations in the required necessary techniques of sanitation, depending upon the type of container, the material used in fabricating, the temperature attained during fabrication, the methods of handling, packaging and transporting.

The containers must arrive at the dairy plant with an extremely low bacterial count and be formed, filled, and sealed in a manner that will alleviate any contamination.

1Presented at 50th Annual Meeting of International Association of Milk and Food Sanitarians, Inc., at Toronto, Ontario, Canada, October 24, 1963.
2Copies available from author on request.
Throughout the country, federal, state, and local milk sanitation agencies have enforced ordinances and codes relative to handling and packaging the container in the dairy plant. Very few have included surveillance of facilities for manufacturing these containers as part of their normal routine. The Milk Ordinance and Code, 1953 Recommendations of the Public Health Service, states:

“(7) Single-Service Articles – The manufacture, packaging, transportation, and handling of single-service containers, closures, caps, gaskets, and similar articles must comply with the requirements listed below. Inspections and tests cited may be made by the health officer or by any agency authorized by him.”

The Public Health Service has recognized the dangers that exist in production of potentially unsafe conditions, and has issued a “Sanitation Guidelines and Inspection Sheet for Plastic, Paper, Paperboard, or Molded Pulp Manufacturers of Single-Service Containers for Milk and Milk Products.” This, however, has not served to awaken any great interest on the part of local enforcement agencies.

In some communities, this is due to laxity; in others, to a feeling that since only a small part of the production from a plant in a specific area is sold in the local community, the inspection function belongs to a federal agency. In one metropolitan community, there are at least 60 manufacturers of plastic-coated and plastic containers, and according to Dairy Industries Catalog (3), there are over 180 sources of containers of this type for the dairy industry.

To a great extent, however, the apathy stems from a lack of understanding of the techniques involved and the inherent hazards in fabricating food containers under basically insanitary conditions. Perhaps a complacency has developed as a result of many years of production of safe single-service containers that were required to be waxed for at least 20 seconds at 180 F, or 35 seconds at 175 F.

The sanitation deficiencies that exist in many of these plants are unique, in that they have had no counterpart in other fields of milk sanitation. Furthermore, the plant operators have never had to comply with any public health standards.

The items in the guidelines for the physical plant – building, rooms, floors, walls, ceilings, openings, lighting, ventilation, toilet facilities, water supply, plumbing, and handwashing facilities – are identical to those of the Milk Ordinance and Code. Beyond that, specific requirements are necessary.

**Toxicity and Contaminants**

All compounds must be formulated to be in compliance with the Food Additives Amendment to the Federal Food, Drug and Cosmetic Act. Only “food grade” materials should be manufactured in the plant. Grinders, hoppers, extruders, etc., should not be used for materials other than food grade on which toxicity data is not available.

There is a considerable amount of regrind necessary in the manufacturing of some types of plastic containers, and the material can accumulate from a number of sources. It is normal to operate the equipment for a short time to check gauge, temperatures and efficiency, and until the system has reached maximum performance, all finished products must be reground.

Continuous trimming, cutting, or stamping of the sheet, web or container may be required, and this material used in processing. If there is a breakdown of equipment during operation, it is normal for all partially finished containers also to be reground.

This is all considered virgin material, reground, and used in the process, provided it is returned to the grinder in a sanitary manner. It must be stored in clean, protected containers, used for that purpose only, and not allowed to be mixed with other materials. Sweepings and dirty materials must always be discarded and never returned to the grinder or hopper used for food grade materials.

**Fabricating, Preforming, and Production Equipment**

Machines, mandrels, and other surfaces that have contact with the interior of containers, should be cleaned and sanitized daily. Plastic containers and plastic laminated paper containers are sanitized units and do not receive further treatment by heat, coating, or other methods. Therefore, this equipment must be given an approved bactericidal treatment, either on a daily basis or during periods of shutdown or changeover.

In all areas where the contact surface of the container is exposed to contamination, the container shall be effectively shielded from contamination. Normally, blow molded and vacuum formed plastic container equipment uses temperatures for molding or forming that are well above sanitizing temperatures and controls are necessary to insure the maintenance of minimum required temperatures.

In some cases, plastic-coated blanks are exposed to a variety of surfaces in their manufacturing process. This may include printing presses and cutting heads. It is important that this equipment be thoroughly cleaned and treated with a sanitizing solution on a daily basis. Since these surfaces may easily corrode in the presence of water, a bactericidal solvent is normally used as a sanitizer.

After the container leaves the production equipment, it travels on a conveyor belt to sorting tables, printers, and preforming equipment. These belts
must be made of an easy-to-clean material, and untreated cloth belts have not been found satisfactory for this purpose.

Handling of Containers

There is a tremendous amount of unnecessary handling of the contact surfaces of blanks and containers. To a great extent, this can be eliminated by indoctrination of employees with good sanitation habits. Where it is essential that the container be handled, employees should wear gloves, and these gloves dipped in a sanitizing solution throughout the day.

If pallets are used to transport containers from one operation to another, the pallets should be manufactured of cleanable material, and the containers covered when they must be exposed for long periods of time.

Adhesives

Adhesives, when employed in fabricating containers or their component parts, must not impart odor to the product, nor contaminate the product with microorganisms. It is best to prevent adhesives from extruding onto the contact surfaces of containers.

Storage

Appropriate clean, dry, storage facilities should be provided which will protect the containers, blanks, and wrapping materials from flies, dust, and other contaminants. All single-service containers and their components should be stored on pallets at least four inches above the floor and twelve inches from any wall, to facilitate cleaning.

For transportation, single-service containers and blanks must be packaged in cartons, or wrapped so as to protect the container from contamination during storage and transit.

Laboratory Analyses

Penetration tests should be conducted on all plastic laminated paper containers to determine the efficiency of their seal.

For plastic bags, pressure tests are recommended to determine the dependability of sealed joints and filling and dispensing devices.

Routine rinse tests should be made of all completed containers, in accordance with the latest edition of "Standard Methods for the Examination of Dairy Products."

Personnel

Employees, in many instances, will be handling completed containers and must always wear rubber or plastic gloves in the production and handling areas.

Plants should be encouraged to develop automatic handling equipment to completely eliminate the possibility of human contamination of the containers.

Conclusion

The Public Health Service publishes the "Sanitation Compliance and Enforcement Ratings of Interstate Milk Shippers" at regular intervals. To this publication could be added the names of those plants manufacturing single-service containers for milk and milk products to be used by the plants on the list. Thus, local milk control agencies would have available an informational source that would become a useful tool in their enforcement programs.

The physical inspection of the plants manufacturing single-service containers should be the responsibility of the Public Health Service or the state agencies they designate as competent. For this purpose, the "Sanitation Guidelines" would have to be expanded into an explanatory code describing those requirements that are not found in the Milk Ordinance and Code.

There are many container manufacturers who purchase materials in the form of sheets, rolls, or tubes. The source of these materials must be investigated, since prime manufacturers may also supply materials to markets other than the food industry and do not make an attempt to operate in a sanitary manner.

There are some who feel that the Sanitation Guidelines are far too stringent, and that sanitation requirements are not necessary for their industry. Furthermore, they believe that meeting these requirements is uneconomic and unpractical. Their views are completely shattered by those plants which meet every requirement of the Guidelines without affecting their production facilities. In many cases, the establishment of good sanitation practices has helped motivate a program of efficiency and production of a continuously safe product.

References