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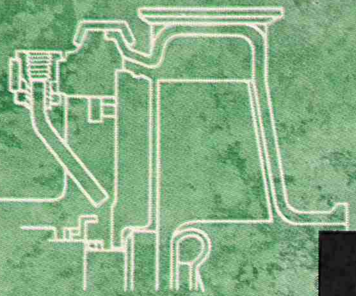

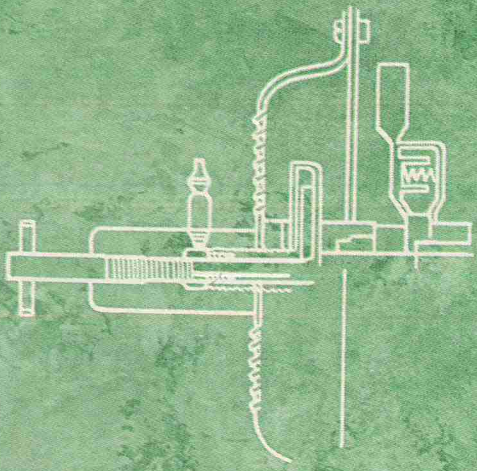

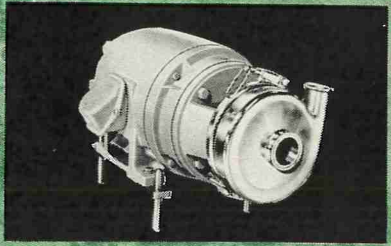

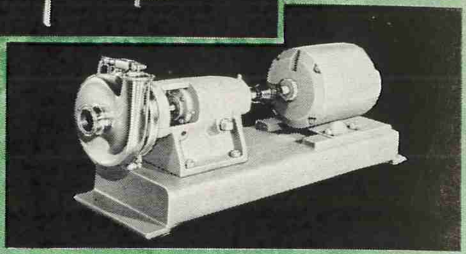

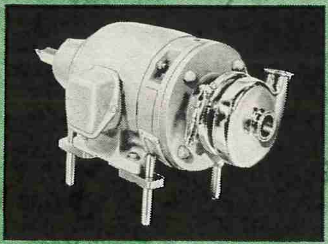

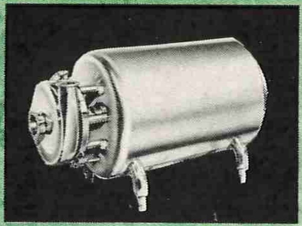

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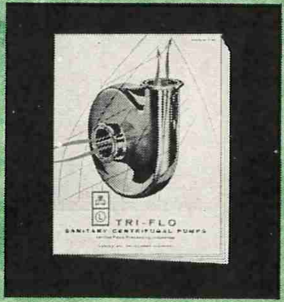

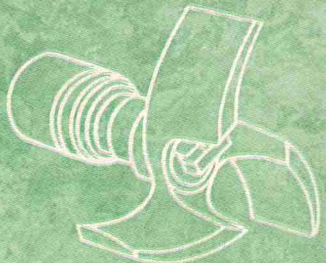

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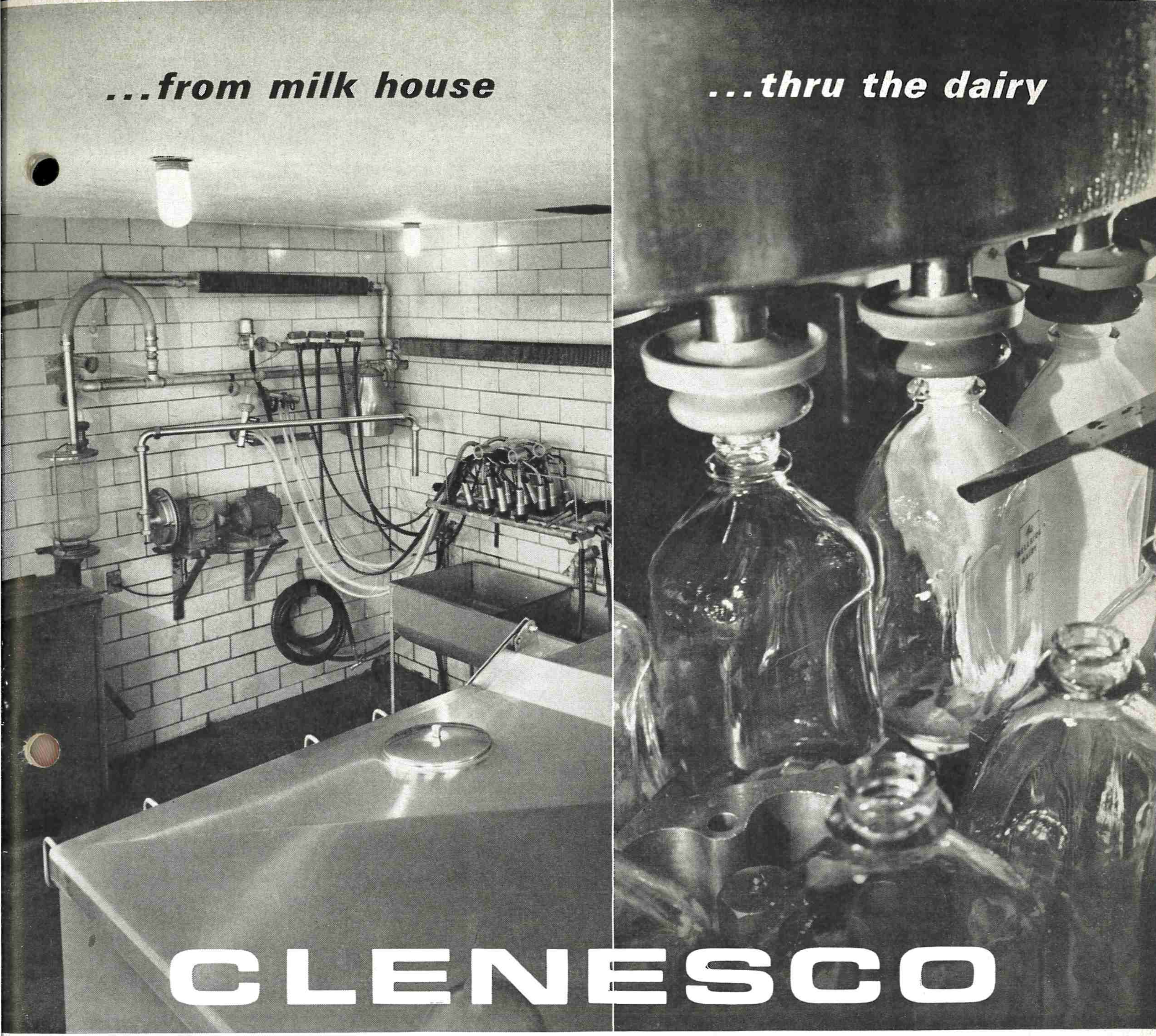

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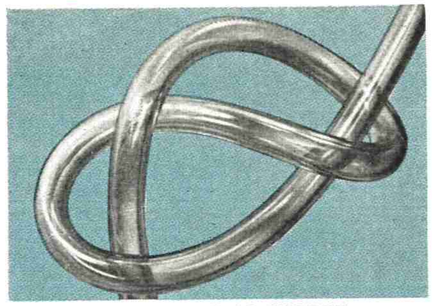
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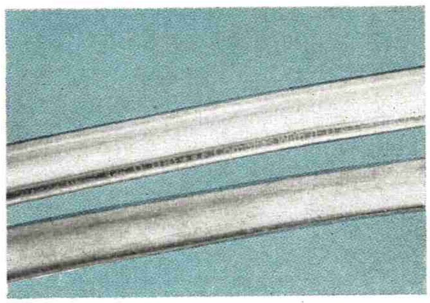
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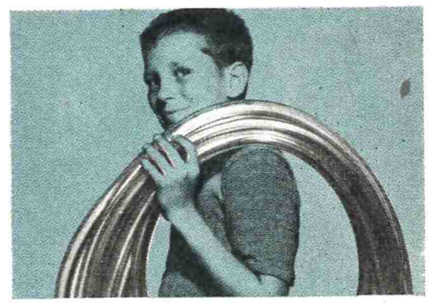
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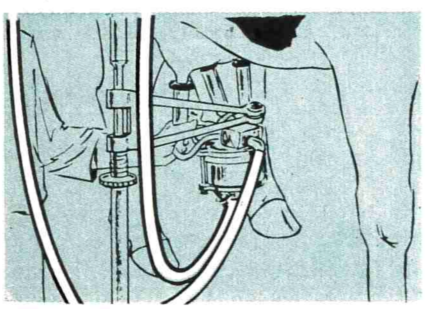
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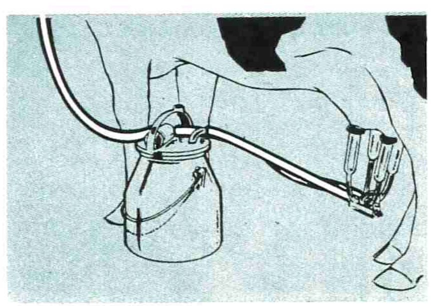
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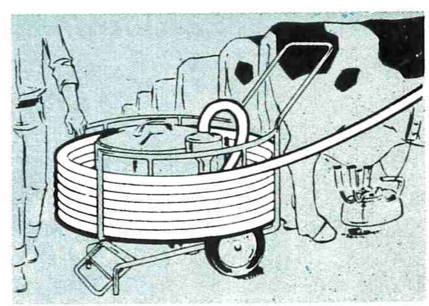
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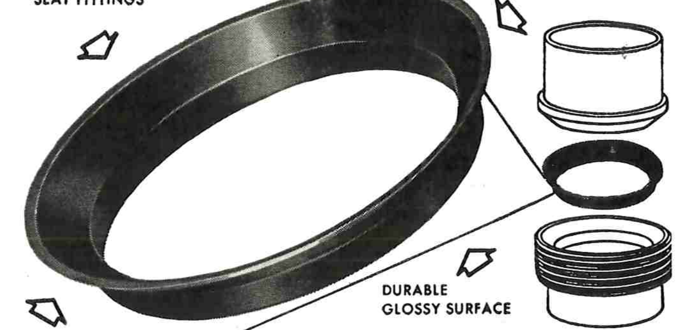

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SANITATION NEWSLETTER

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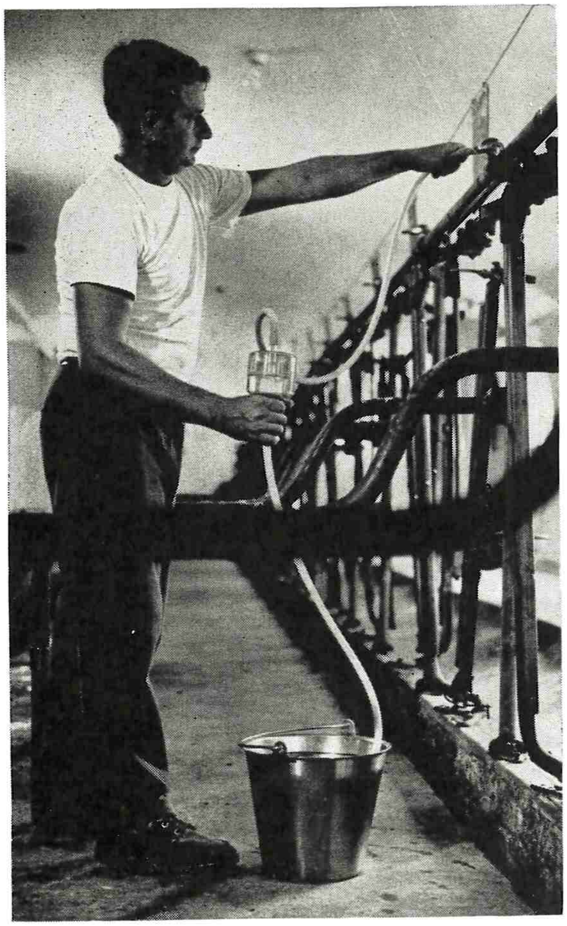

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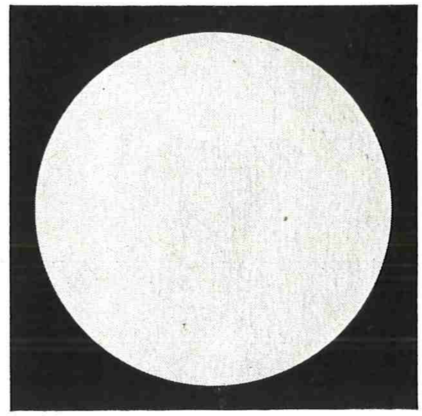

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Editorial

SANITARIANS AWARD

In 1952 the International Association of Milk, Food and Environmental Sanitarians, Inc. finally went into a long delayed action, that of the bestowal of recognition to colleagues who had achieved well-deserved fame in the profession of milk, food and environmental sanitation. The action taken at that time was due to the vision and ability of the Executive Board and to Dr. K. G. Weckel, Chairman of the Committee on Recognition and Awards, who brought into being the Sanitarians Award.

The accomplishments by the Association in 1952 were of course not without support. The Sanitarians Award had as its sponsor the following firms: The Diversey Corporation; Klenzade Products, Inc.; Mathieson Chemical Corporation; Oakite Products, Inc.; and the Pennsalt Chemical Corporation. These companies have the satisfaction of expressing thanks and appreciation for work well done in the public interest by the various Award winners. Each year, since 1952, the Association through its Committee on Recognition and Awards, has had the singular distinction of recognizing the following men, as Sanitarians of the year and presenting them each with an appropriate plaque and a tax free check in the amount of $1,000. 1952–Paul Corash, Chief of Milk Division, Bureau of Food and Drugs, New York City, N.Y.; 1953–Dr. E. F. Meyers, Chief of Milk, Meat, and Food Division, City Health Dept., Grand Rapids, Mich.; 1954–Kelley G. Vester, Senior Sanitarian City Health Dept., Rocky Mount, N. C.; 1955–B. G. Tennant, Chief Sanitarian, Escambia County Health Dept., Pensacola, Florida; 1956–John H. Fritz, Chief of Milk and Food Sect. City Health Dept., Kansas City, Mo.; 1957–Harold J. Barnum, Chief of Milk Sect. City Health Dept., Denver, Colorado; 1958–Carl A. Mohr, Sanitarian and Deputy Health Officer City Health Dept., Green Bay, Wisc.; 1959–William Kempa, Dairy and Milk Inspector, City of Regina ,Saskatchewan, Canada; 1960–James C. Barringer, Formerly Director of Sanitation, City Health Dept., Evansville, Indiana. At present Director of Sanitation, City Health Dept.; Joliet, Illinois; 1961–Martin C. Donovan, Airport Sanitarian, Dade County Health Dept., Miami, Florida; 1962–Larry Gordon, Director, City-County Health Dept., Albuquerque, New Mexico; 1963–R. L. Cooper, Adm. Assist., Calloway County Health Dept., Murray, Kentucky; 1964–NO RECIPIENT; 1965–?????. The recipient so honored must be an employee of a local health department and must have made a distinguished and outstanding contribution to the improvement of milk, food and environmental sanitation in his community.

To those Sanitarians, who have won this coveted award in the past years, there comes more than monetary gain. There is the gain in satisfaction of a job well done along with the acknowledgment that sincerity of purpose and accomplishment has been reconized by their fellows. Also, the award announces to the recipient's community that his work is of a caliber to win National recognition.

This last year was the first year since the inception of the Sanitarians Award that the Committee on Recognition and Awards was unable to fulfill its duties in selecting an Award Winner due to the lack of a sufficient number of nominees. It is with this thought in mind that each member and affiliate association is now asked to give serious consideration to the selection of some deserving individual who has rendered unfailing service and contribution to his community in any of the fields of milk, food, or environmental health. Several of the State Affiliates have their own "Sanitarian of the Year Award" and certainly some of these winners would qualify as candidates for the IAMFES Award.

R. A. Belknap, Chairman,
Committee on Recognition and Awards

The opinions expressed in this editorial are those of the author and do not necessarily represent those of the Association.

BACTERIOLOGICAL STUDIES ON THE SHELF LIFE[1] OF SOFT SHELL CLAMS (Mya arenaria)

J. R. Cox

Natural Resources Institute
University of Maryland, College Park

(Received for publication July 23, 1964)

SUMMARY

Bacteriological shelf life studies on fresh packed soft shell clams harvested from Chesapeake Bay were conducted at three month intervals to determine the effect of seasonal changes on standard plate counts, 25 C plate counts, coliform most probable numbers, and other microflora in relation to spoilage and discoloration. The data obtained in these studies indicate the following: *(a)* no correlation between either standard or 25 C plate counts and the degree of spoilage was noted; *(b)* coliforms multiply in shucked soft shell clams caught in cold waters and stored at 33-35 F, but may decrease during storage when harvested from warmer waters; *(c)* there may be a slight increase followed by a decrease in E.C.+ and *E. coli* (fecal coliforms) most probable numbers after 5-7 days storage, but when E.C.+ MPN's have been very low or 0 no increase has been found; *(d)* no correlation between pink yeast counts and pink discoloration of soft shell clams, or between any chromogenic bacteria or other discolorations was noted; and *(e)* the bacteriological standards for fresh shucked oysters which are based on E.C.+ MPN's (fecal coliforms) and standard plate counts were met although some counts were in the "Acceptable on Condition" classification when sampling was made during summer and early fall.

Since 1951, soft shell clams have been harvested in increasingly large quantities every season of the year in the upper Maryland Chesapeake Bay area. This industry has become an important part of the seafood industry in the State. There are now fifteen packing plants processing some six hundred thousand bushels of soft shell clams per year, having a monetary value of approximately three million dollars.

No literature was found on the bacteriology of soft shell clams during refrigerated storage. The following references on oysters are given, since the same bacteriological standards have been used for soft shell clams as for oysters, and also to compare other microflora to that of clams. Hunter and Harrison *(2)* stated that in shucked oysters stored at temperatures below 10 C (50 F) no multiplication of Escherichia coli or other lactose fermenting bacteria occurs. Tonney and White *(9)* on the other hand, reported that *E. coli* did multiply at temperatures of 5 to 8 C (41-46 F). Wilson and McClesky *(10)* could not confirm this, but found that coliform organisms readily develop when shucked oysters were stored at 4-6 C (39-43 F). Initially, the increase was slow but enormous numbers were encountered after 3 to 4 weeks. *E. coli* did not multiply and usually decreased during refrigerated storage. Hunter and Linden *(3)* reported no correlation between the total aerobic count and the stage of decomposition. Novak et al. *(5)* reported bacterial counts of 26.2 million per g on unwashed oysters stored in ice for 20 days. Hunter and Linden *(4)* reported that members of the genus *Pseudomonas* or *Achromobacter* are the dominating spoilage organisms in oysters although certain species of *Flavobacterium* and *Micrococcus* still grow. Some decomposition is also caused by certain yeasts.

Preliminary investigations by the Maryland Department of Health indicated high coliform most probable numbers (MPN's) were found in soft shell clams harvested from the Chesapeake Bay although the water quality was high and the harvesting areas were free of pollution *(6)*.

The Maryland Department of Health is now using the same standards for packed soft shell clams as are used for oysters i.e., Class 1: a commonly used fecal coliform measurement expressed as (E.C.+) MPN/100 g with a count of not more than 78 with occasional values to 230 and a standard plate count (SPC) of not more than 100,000/g with occasional values to 500,000/g *(7, 8)*.

METHODS AND PROCEDURES

Beginning April 17, 1963, a series of four shelf life studies was begun on fresh packed soft shell clams and repeated at three month intervals ending in January, 1964 to determine the effect of seasonal changes as measured by standard plate counts, 25 C plate counts, coliform most probable numbers, and other microflora related to spoilage and discoloration.

Coded samples in pint containers of freshly shucked clams as packed and closed with friction top lids were procured from clam packing plants, packed in crushed ice, and transported to the laboratory. Bacteriological examinations were made within three hours afer shucking. In the first study duplicate samples from three plants were evaluated; thereafter, duplicate samples from only two plants were examined. After initial examination all remaining unopened samples were removed from ice and placed under refrigeration at 1 C (33-35 F).

Procedures for the bacteriological examination of shell-fish, as outlined by the U. S. Public Health Service *(8)* were followed for SPC, total coliform, and fecal coliform or E.C.+

[1]Contribution No. 277, Natural Resources Institute of the University of Maryland, Seafood Processing Laboratory, Crisfield, Maryland. Supported in part by a grant of the Area Redevelopment Administration (Contract No. Cc6027).

Table 1. Average Bacterial Counts of Shucked Soft Shell Clams During Storage at 1 C (34 F).

Days storage	Shucked soft shell clams (x 1,000/g)							
	April		July		October		January	
	SPC	25 C	SPC	25 C	SPC	25 C	SPC	25 C
0	17	67	110	230	37	140	11	34
2	24	87	110	180	29	140	8	32
5	44	190	190	310	58	260	35	64
7	43	110	120	330	86	460	23	60
9	60	210	110	210	230	810	110	3,600
12	290	1,100	240	150	1,500	2,500	1,100	3,000
14	460	8,800	220	640			2,500	7,000
16	6,700	21,000						
19		30,000						

MPN/100 g. A water jacketed incubator, thermo-regulated to 45.5 C + 0.2 was used for incubation of inoculated tubes of E. C. Medium (BBL) *(1)*. *E. coli* was determined by the routine method of the State of Maryland Department of Health for crab meat i.e., E. C.+ tubes were streaked on Levine's Eosin Methylene Blue Agar (BBL) and colonies resembling those of *E. coli* after 18-24 hr incubation at 35 C were inoculated into Simmons Citrate Agar (BBL). No growth and color change in the citrate medium after 48 hr incubation at 35 C constituted positive tests for *E. coli.* The 25 C plate counts were made using standard plate count media (Trypticase Glucose Extract Agar) (BBL) and incubation was carried out for 72 hr at 25 C. Colony appearance, odor, gram staining reactions, and morphology were used to determine types of bacteria growing on agar plates. Yeast counts were made using Parfitt's Wort Agar (Difco) and Potato Dextrose Agar (Difco) adjusted to a pH of 3.5 with sterile 10% tartaric acid added before using. Examination was continued until odors characteristic of bacterial spoilage were present and/or the clams were judged to be unacceptable.

Table 2. Average Coliform Counts of Shucked Soft Shell Clams During Storage at 1 C (34 F)

Days storage	Shucked soft shell clams (MPN's/100g)			
	April	July	October	January
0	1,500	110,000	36,000	2,100
2	1,500	44,000	60,000	600
5	6,500	24,000	194,000	6,700
7	—[a]	56,000	220,000	4,900
12	—	40,000	3,500,000	100,000
14	—	27,000		390,000
19	240,000+[b]			

[a]Not determined.

[b]Number greater than.

Results and Discussion

The results obtained in these studies are shown in Tables 1-5.

The 25 C plate counts are usually much higher than the SPC's at 35 C as shown in Table 1, and are a better indicator of spoilage, since many species of bacteria that grow at refrigeration temperatures either grow poorly or not at all at 35 C. In the April study bacterial spoilage occurred between 16 and 19 days as evidenced by foul odors. In the July study bacterial spoilage odors were not present after 14 days, but clams had turned black and were considered entirely unacceptable. In the October study bacterial spoilage odors were present in samples after 12 days while in the January study similar type odors were present in one sample after 9 days and after 14 days all samples were either spoiled or judged to be unacceptable because of black discoloration and slimy appearances.

It may be of interest to note that temperature readings of Chesapeake Bay taken at Solomons, Maryland by Douglas E. Ritchie, Jr. of the Chesapeake Biological Laboratory averaged 11 C (51.8 F) in April, 25 C (77.0 F) in July, 19 C (66.2 F) in October, and 0.3 C (32.5 F) in January.

In Table 2 the average coliform MPN's increased during storage when soft shell clams were harvested in April, October, and January, but decreased in the July study. No conclusive evidence is available to explain this decrease during the July study. How frequently this occurs will require further investigation.

The average E.C.+ and *E. coli* MPN's for the most part showed a slight rise after five to seven days storage, but decreased after twelve or more days storage (Table 3). As expected the highest MPN's were obtained during summer and fall weather.

TABLE 3. AVERAGE E.C.+ AND *E. coli* COUNTS OF SHUCKED SOFT SHELL CLAMS DURING STORAGE AT 1 C (34 F)

Days storage	Shucked soft shell clams (MPN's/100 g)							
	April		July		October		January	
	E.C.+	*E. coli*	E.C.+	*E. coli*	E.C.+	*E. coli*	E.C.+	*E. coli*
0	13.0	6.0	49.0	26.0	100.0	103.0	14.0	5.0
2	23.0	7.0	59.0	42.0	190.0	—	5.0	5.0
5	13.0	10.0	78.0	53.0	260.0	—	123.0	0.0
7	—[a]	—	85.0	76.0	130.0	—	9.5	9.5
12	—	—	9.5	9.5	130.0	—	31.0	0.0
14	—	—	27.0				15.0	5.0
19	<18.0	<18.0						

[a]Not determined.

The percent of samples falling into Class 1 for oysters during storage (Table 4), include some samples which were in the "acceptable on condition" class. Again as might be expected these higher values occurred during warm weather. Of the E.C.+ tubes tested 50% confirmed for *E. coli* in April, 78.57% in July, 100% in October, and 23.81% in January, by the method used.

Twenty-four samples are included in Table 5, 18 from the shelf life studies and the remaining 6 from soft clams received at the laboratory for other investigations during the spring, summer, fall, and winter.

The predominating spoilage bacteria throughout these studies were Gram negative rods producing sweet ester-like, musty, oniony, to cess-pool like odors on agar media. No identification of these organisms was undertaken. However, the colonies and odors were characteristic of pseudomonas types. In all cases, a rancid fishy odor developed in the clams after 5-7 days, which did not correlate with bacterial numbers. Soft clams had little or no odor just before bacterial spoilage, but odors appeared along with the rapid rise in numbers.

The main variation noted in micro-flora other than numbers and types of coliform bacteria, was in Gram positive aerobic sporulating rods, and Gram negative chromogenic bacteria producing yellow, orange or yellow-brown pigmentation. Most aerobic spore formers were found in spring, fall, and winter, and at times outnumbered all other micro-flora in fresh soft-clams. Few chromogenic bacteria were found except in summer when large numbers of this type were present. Yeast counts were low ranging from 50 to 3,000 or less per g of clams. No increase in yeast counts could be found during storage nor could any correlation between these counts and pink discoloration of clams be made even though many of the yeast found produced pink pigment on agar plates. Colonies of the chromogenic bacteria found

TABLE 4. PERCENT OF SAMPLES OF SHUCKED SOFT SHELL CLAMS FALLING INTO CLASS 1 FOR OYSTERS DURING STORAGE AT 1 C (34 F)

Days storage	Shucked soft shell clams (% class 1)			
	April	July	October	January
0	100	100	100	100
2	100	100	75[d]	100
5	100	100	75[d]	75[d]
7	100[a]	100	75[d]	100
9	100[a]	100	100[a]	100[a]
12	83[a]	75[c]	25[e]	50[c]
14	67[a]	100		50[c]
16	0[a]			
19	100[b]			

[a]SPC's run only.
[b]E.C.+ MPN's run only.
[c]SPC's too high.
[d]E.C.+ MPN's too high.
[e]E.C.+ MPN's and SPC's too high.

TABLE 5. COMPARISON OF YEARLY AVERAGE OF SPC, E.C.+, AND COLIFORM MPN'S ACCORDING TO SEASON OF FRESHLY SHUCKED SOFT SHELL CLAMS

	Shucked Soft Shell Clam Averages				
	Yearly	Spring	Summer	Winter	Fall
SPC/g.	63,000	23,000	150,000	24,000	11,000
E.C.+/100 g.	41	21	44	64	14
Coliforms/100 g.	41,000	5,400	120,000	21,000	2,000

produced pigments rather similar to the yellowish, rusty to amber colors common to clams throughout the year. Again no correlation could be found between this type of discoloration and the number of chromogenic bacteria present. The pink discoloration was not found in any fresh clams in January, 1964, but developed after 5-7 days in storage. However, the pink discoloration was not as intense as that found during the winter months of the previous year.

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HYDROGEN PEROXIDE AS A BACTERICIDE FOR STAPHYLOCOCCI IN CHEESE MILK[1, 2]

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Raw whole milk containing native and added strains of coagulase-positive *Staphylococcus aureus* was heated to 120 or 130 F and 0.05% H_2O_2 was added to determine the bactericidal efficiency of the treatment. Trials were conducted in the laboratory using 250-ml quantities of milk, and in the pilot plant using 215-lb batches of milk which were made into Cheddar cheese. Hydrogen peroxide was a beneficial adjunct to the heating process in the milk heated to 120 F, but in the milk heated to 130 F the destruction of staphylococci and other miscellaneous organisms normally present in milk was not enhanced by the addition of H_2O_2. When the milk was heated at the lower temperature the populations of staphylococci were much higher in the milk, curd and whey during manufacture, and in the cheese during ripening. Cheddar cheese made from milk to which H_2O_2 had been added contained an average of 40.75% moisture and had a weak body, while cheese made in the same manner from similarly heated milk without H_2O_2 contained an average of 35.71% moisture and had a normal body.

Hydrogen peroxide has been used to preserve various dairy products for many years. Luck *(6)* and Roundy *(10)* have reviewed the subject thoroughly. A few investigations have been performed to determine the efficiency of H_2O_2 in destroying staphylococci in milk subjected to mild heat treatment. Roundy *(10)* reported a 97.8% decrease in *Micrococcus pyogenes (Staphylococcus aureus)* in inoculated milk treated with 0.06% H_2O_2 and heated for 1 min at 130 F. In corresponding milk containing no H_2O_2 the population was reduced only 8.8%. Olson and Price *(8)* reported reductions in the staphylococcus population ranging from 88.1 to 97.9% in milk held for intervals of 0 to 25 min at 88 F after being treated with 0.06% H_2O_2 and heated to 125 F.

Regulatory agencies and cheese manufacturers have continued to seek more information about the use of H_2O_2 and mild heating temperatures in lieu of pasteurization as a treatment for milk to be made into cheese.

A series of experiments were designed to determine the effect of maximum legal concentrations of H_2O_2 on the populations of coagulase-positive *S. aureus* prevailing during manufacture and subsequent curing of the Cheddar cheese.

Procedure

A coagulase-positive strain of *S. aureus* designated as S-1 was isolated from milk from a cow with sub-clinical mastitis. This organism has been subjected to a detailed study of thermal resistance by Walker and Harmon *(12)*. The S-1 strain was used to inoculate separate portions of milk which were heated to 120 or 130 F and held for 15 min with and without the addition of 0.05% H_2O_2. This procedure would simulate the commercial process used if milk were treated with H_2O_2 in the vat. The amount of inoculum was in accord with populations of staphylococci commonly occurring in raw milk.

Trials were conducted using 250 ml quantities of raw whole milk which were treated *in vitro* with heat, H_2O_2 and catalase as indicated in Fig. 1. Larger quantities of raw milk (215 lb each) inoculated with *S. aureus* strain S-1 were subjected to the same treatment in pilot plant equipment and manufactured into Cheddar cheese.

Coagulase-positive organisms which grew on a medium containing 10% sodium chloride and possessed colonial and morphological characteristics similar to *S. aureus* were considered to be staphylococci. Populations of these organisms were enumerated at each of the sampling points designated in Figure 1. When the milk was made into cheese, samples were taken also from the (*a*) milk in vat before addition of starter; (*b*) whey at cutting; (*c*) curd at cutting; (*d*) whey after cooking; (*e*) curd after cooking; (*f*) curd at hooping; and (*g*) cheese after 1, 20, 50, 100, 180 and 280 days of curing at 42 F. The staphylococci were enumerated by the surface plating method described by Punch and Olson *(9)* on a medium containing 3.7% brain heart infusion, 2% yeast mannitol, 1% yeast extract, 10% sodium chloride and 2% agar. The plates were incubated at 37 C for 48 hr. Five replicate plates of each appropriate dilution were prepared, with 0.1 ml of the dilution smeared on the surface of each plate. Total counts were made using the same medium without salt and incubating the plates at 32 C for 48 hr.

The thermal resistance of *S. aureus* strain S-1 was determined in 200 ml quantities of sterile M/15 phosphate buffer, whole milk, skimmilk and whey using an apparatus similar to the one described by Kaufmann and Andrews *(5)*. The substrates were raised to the test temperature, inoculated with 8 to 12 x 10^6 cells per ml and sampled aseptically at intervals of 1 or 2 min during the heating period. The change in temperature caused by the inoculum was less than 0.25 F as measured on a recording potentiometer with a sensitivity of 5 microvolts and equipped with copper constantan thermocouples.

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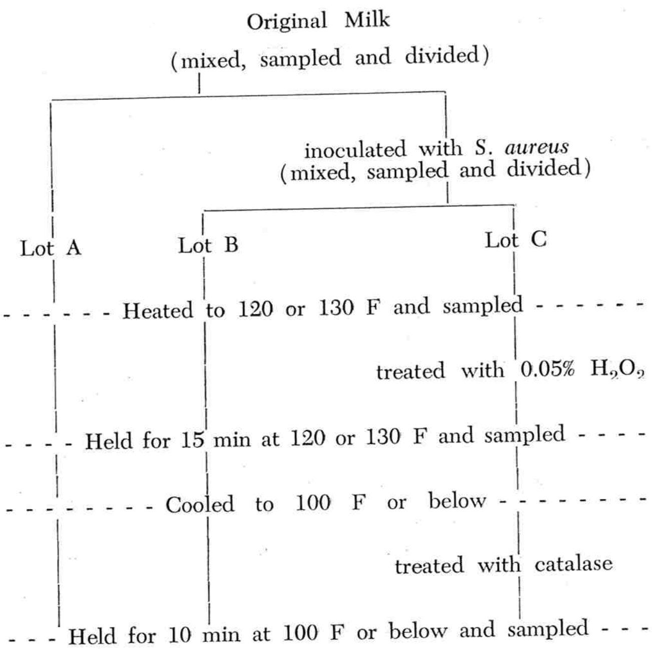

Figure 1. Method of treating milk samples used in determining effect of hydrogen peroxide and low heat treatments on the survival of *S. aureus.*

RESULTS

Effect of hydrogen peroxide on destruction of organisms.

The data in Table 1 show the counts of staphylococci in raw milk inoculated with S. *aureus,* heated to 120 or 130 F and held 15 min with and without H_2O_2 added. When the non-inoculated control milk was heated to 120 F, held 15 min and cooled to 100 F the destruction of staphylococci was only about 19.2%. When the milk was inoculated with strain S-1 and subjected to the same heat treatment, 54.6% of the staphylococci were destroyed; when 0.05% H_2O_2 was added at 120 F the destruction increased to 98.5%.

The data in Table 1 indicate a distinct advantage for the addition of H_2O_2 to milk heated to only 120 F; but the data also show that heating to 130 F resulted in greater than 99% bacterial destruction regardless of whether the milk was inoculated or H_2O_2 added. The difference in the percentage destruction between the non-inoculated and the inoculated milks indicates that the strain of S. *aureus* which had been cultured in the laboratory was more sensitive to heat than the strains indigenous to the milk.

The data in Table 2 show the total counts in average quality milk inoculated with S. *aureus* strain S-1 and heated to 120 or 130 F with and without H_2O_2 added. A comparison of the data in Tables 1 and 2 shows that both of the above temperatures were more destructive to mass populations than to the specific staphylococci.

The data in Table 2 indicate that the inclusion of H_2O_2 had little bactericidal effect on the total bacterial population in the milk heated to 130 F, but caused greater destruction in the milk heated to 120 F. Since the milk was approximately 72 hr old, psychrophiles having low thermal resistance undoubtedly represented the predominent microflora.

TABLE 1. THE EFFECT OF HYDROGEN PEROXIDE ON THE SURVIVAL OF STAPHYLOCOCCI IN SAMPLES OF RAW MILK SUBJECTED TO VARIOUS TIME AND TEMPERATURE EXPOSURES

	Bacterial count per ml					
Description of sample	Non-inoculated (control)	Inoculated with S. *aureus* strain S-1		Non-inoculated (control)	Inoculated with S. *aureus* strain S-1	
Unheated raw milk	2,600	4,400	4,400	2,600	4,400	4,400
Raw milk heated to	120 F			130 F		
	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 120 F	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 130 F
Raw milk						
a) Not held	2,100	4,100	3,500	120	100	190
b) Held 15 min	1,500	*	200	25	19	19
c) Held 15 min, cooled to 100 F and held 10 min	2,100	2,000	66	23	23	22
Percentage destruction	19.2	54.6	98.5	99.1	99.5	99.5

*Sample lost

TABLE 2. THE EFFECT OF HYDROGEN PEROXIDE ON THE TOTAL BACTERIAL POPULATION IN RAW MILK INOCULATED WITH *S. aureus* AND SUBJECTED TO VARIOUS TIME AND TEMPERATURE EXPOSURES

	Bacterial count per ml					
Description of sample	Non-inoculated (control)	Inoculated with *S. aureus* strain S-1		Non-inoculated (control)	Inoculated with *S. aureus* strain S-1	
Unheated raw milk	170,000	180,000	180,000	170,000	180,000	180,000
Raw milk heated to		120 F			130 F	
	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 120 F	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 130 F
Held 15 min, cooled to 100 F and held 10 min	3,500	11,000	3,000	1,700	1,200	110
Percentage destruction	97.9	93.9	99.3	99.0	99.3	99.9

The data in Table 3 show the counts of staphylococci present in *(a)* inoculated and non-inoculated raw milk heated to 120 or 130 F with and without 0.05% H_2O_2; *(b)* milk and cheese at various stages during processing; and *(c)* the finished cheese at intervals during curing up to 280 days.

In the six 215-lb lots of milk processed in pilot plant equipment the time-temperature combination of 120 F for 15 min was relatively ineffective in destroying, the staphylococci indigenous to the milk, but did destroy a major portion of the laboratory strain (Table 3). These data also support the data in Table 1 indicating no advantage in adding H_2O_2 to milk heated to 130 F; but the inclusion of H_2O_2 caused a substantial increase in percentage destruction in milk heated to 120 F. The data show also that the staphylococcal population was higher throughout the manufacturing and curing process in the milk receiving the lower heat treatment.

Effect of hydrogen peroxide on the manufacturing time and composition of the cheese.

When the milk was treated with H_2O_2 and catalase the time required to make Cheddar cheese was increased about 2 hr. The treatment of the milk and the temperature manipulations required approximately 1 hr. An additional delay of approximately 1 hr occurred because of slow acid production during cheddaring. Fox and Kosikowski *(4)* also noted that treatment of milk with H_2O_2 prolonged the manufacturing time 1 1/2 to 2 hr and resulted in cheese with a bland, foreign flavor. Morris and Jezeski *(7)* reported lower milling acidities, higher pH during ripening and higher moisture in cheese made from milk treated with H_2O_2.

The moisture content of the cheese made from milk treated with H_2O_2 averaged 40.75%, while the average moisture in the cheese made from untreated milk was only 35.71%. The body and texture of the cheese made from the treated milk was soft and weak, despite the fact that the curd in all vats was cooked to 102 F. Roundy *(10)*, Teply et al. *(11)* and Morris and Jezeski *(7)* also encountered difficulty with

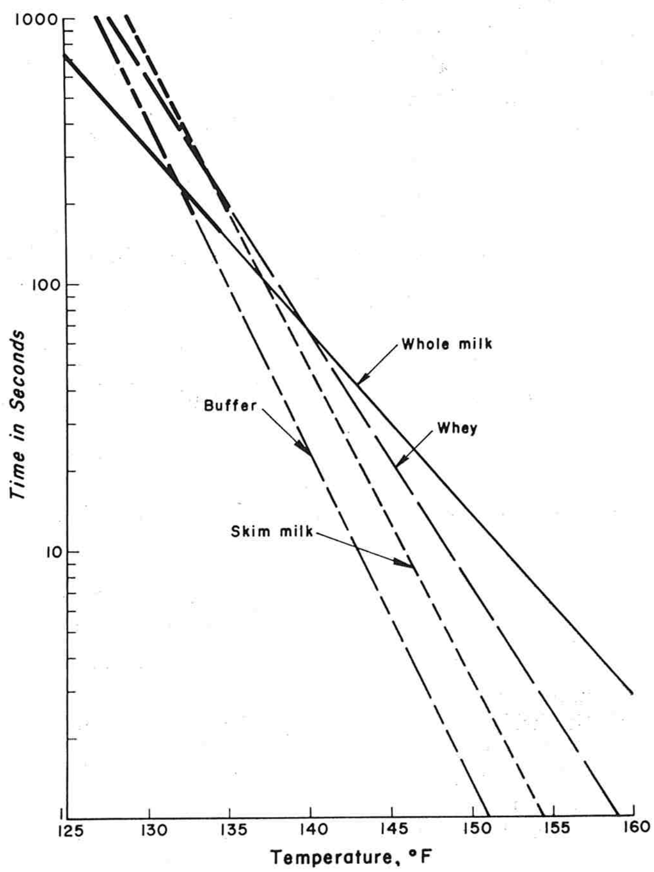

Figure 2. Time and temperature combinations theoretically necessary to destroy 99.999% of *S. aureus* strain S-1 when heated in phosphate buffer, whole milk, skimmilk and whey.

high-moisture cheese made from milk treated with H_2O_2 by the vat or batch method. Buruiana and Pavlu *(2)* reported that the addition of H_2O_2 to milk caused much greater hydration of milk proteins, particularly whey proteins.

Effect of substrate on thermal sensitivity.

The data illustrated in Figure 2 show a moderate difference in the thermal sensitivity of *S. aureus* in M/15 phosphate buffer, whole milk, skimmilk and whey. When strain S-1 was heated in the buffer, 99.999% of the cells were destroyed after 3 min at 132.8 F. At 134.6 F similar destruction was accomplished in whole milk, skimmilk and Cheddar cheese whey after 2.6 3.4 and 3.6 min, respectively. Zottola and Jezeski *(13)* determined that *S. aureus* was destroyed in whole milk heated to 147 F for 21 sec or 150 F for 16 sec, but survived at lower time-temperature combinations.

An extrapolation of the curve representing whole milk (Fig. 2) indicates that 99.999% of *S. aureus* strain S-1 would be destroyed when heated at 150 F for 17 sec or at 147 F for 22 sec. These results compare very well with those of Zottola and Jezeski *(13)* except that data in Tables 1 and 3 indicate that the indigenous strains of staphylococci are more resistant than those propagated on laboratory media. Also, strain S-1 is more susceptible to destruction by heat than some other coagulase-positive strains of *S. aureus* studied *(12)*

The data in Figure 2 also show that theoretically 5.5 min at 130 F would be sufficient to destroy 99.999% of *S. aureus* strain S-1 in whole milk. In comparison, the data in Table 3 show 99.98% destruction of *S. aureus* in raw milk inoculated with strain S-1 and heated in pilot plant equipment for 10 min at 130 F. This time-temperature combination resulted in only 97.7% destruction in the non-inoculated raw milk where the lower population enabled the more resistant indigenous strains to exert a significant influence on the percentage of survivors.

DISCUSSION

The coagulase-positive staphylococci may withstand higher time-temperature combinations than indicated above. In the work reported herein, the staphylococci were enumerated on a medium containing 10% NaCl to inhibit competitive organisms. Busta and Jezeski *(3)* have shown that 7.5% NaCl

TABLE 3. THE NUMBER OF STAPHYLOCOCCI IN INOCULATED RAW MILK AND THE CHEESE MADE THEREFROM WHEN THE MILK WAS HEATED TO 120 OR 130 F AND TREATED AS INDICATED

	Count per ml or g					
Description of sample	Non-inoculated (control)	Inoculated with *S. aureus* strain S-1		Non-inoculated (control)	Inoculated with *S. aureus* strain S-1	
Unheated raw milk	3,600	110,000	110,000	870	95,000	95,000
Raw milk heated to		120 F			130 F	
	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 120 F	Without H_2O_2	Without H_2O_2	0.05% H_2O_2 added at 130 F
a) Not held	4,600	68,000	80,000	30	1,000	300
b) Held 15 min	3,100	3,500	50	20	27	21
c) Held 15 min, cooled to 100 F and held 10 min	2,900	3,800	33	20	19	19
Percentage destruction	19.44	96.55	99.97	97.70	99.98	99.98
Milk in cheese vat after "setting" at 88 F	1,900	2,700	35	8	9	8
Whey at cutting	6,000	1,400	200	<2	10	<2
Curd at cutting	<20,000	40,000	26,000	3	22	12
Whey after cooking	4,600	400	20	20	1	2
Curd after cooking	150,000	110,000	200	400	200	40
Curd at hooping	200,000	240,000	44,000	800	340	120
Age of cheese in days						
1	130,000	60,000	400	<200	320	14
20	64,000	40,000	160	68	280	58
50	34,000	8,800	180	44	70	56
100	3,400	4,400	160	80	80	42
180	12,000	9,200	240	50	72	70
280	1,000	26	44	8	3	4

in a plating medium was sufficiently inhibitory to interfere with the complete recovery of sub-lethally heat treated staphylococci. Also, Walker and Harmon *(12)* have shown that a lag exists in the destruction curve of the coagulase-positive staphylococci after about 99.99 to 99.999% are destroyed. Bhatt and Bennett *(1)*, examining whole milk containing "171 mixed strains" of coagulase-positive staphylococci, found 1.5% survivors after heating for 30 min at 143 F and 0.38% survivors after 15 sec at 161 F. No survivors were found after 45 min at 143 F or 35 sec at 161 F. These data indicate greater thermal resistance for the coagulase-positive staphylococci than any previously reported.

The data reported herein indicate that for the purpose of minimizing populations of staphylococci and other organisms the addition of 0.05% H_2O_2 to cheese milk heated to 120 F has an advantage, but no advantage exists when the milk is heated to 130 F. The use of H_2O_2 lengthens the manufacturing time for Cheddar cheese and results in cheese with high moisture and weak body.

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SOURCES OF AIR-BORNE MICROORGANISMS IN FOOD PROCESSING AREAS – DRAINS[1, 2]

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Summary

The extent to which food plant air may be contaminated with microorganisms from flooding floor drains has been investigated. Results indicate that bacteria counts obtained during flooding may be as high as 140 per ft^3 in areas where normal counts are usually less than 10 per ft^3. The air-borne yeast and mold contributions due to flooding were about 6 per ft^3 compared to a background of 1 per ft^3, and about 12 per ft^3 compared to background counts of 4 per ft^3, respectively. By continuous intermittent flooding, the amount of contamination due to flooding decreases. However, if the drain sets without flooding for a period of one hour, the contribution may be as great as during the first flooding of the day. Results indicated that application of about 5 gallons of a 800 ppm chlorine sanitizer would provide a significant reduction in contribution. A maximum reduction of 87 percent was obtained using a sanitizer concentration of 5000 ppm.

The trend in the dairy industry, has been to use higher processing temperatures to reduce the number of viable microorganisms in the product to a minimum and increase the shelf-life of the product to a maximum. The success of such practices depends to a large extent on the degree or amount of contamination which may occur after processing. Only by reducing this contamination to a minimum or by eliminating it completely can the entire influence of high temperature processing or sterilization be attained.

One source of product contamination is air which comes in contact with the product after processing and before the product container or package is closed. Elimination of air as a source of product contamination would greatly simplify the problem of packaging of sterile product using equipment commonly available for filling operations.

In previous work *(2)*, typical populations of air-borne microorganisms in food packaging areas were established. Floor drains appeared to be one possible source of many microorganisms. Therefore, an objective of further studies was to: determine the extent to which floor drains may contaminate the air and investigate methods of eliminating this type of air contamination.

[1]Approved for publication as Journal Article No. 3462 from the Michigan Agricultural Experiment Station.

[2]Presented at the National Dairy Engineering Conference, Michigan State University, East Lansing, Michigan, February 26, 1964.

Procedure

In order to investigate the contamination of air from floor drains, a single drain in each of four different areas of the Michigan State University Dairy Plant was selected. By isolating the space directly above the drain, and collecting air samples during flooding and periodically thereafter, the results were obtained.

Equipment: A Casella slit sampler was used to quantitatively sample the air from isolated spaces above drains in various dairy plant areas. The sampler operates on a solid impaction technique using a solidified agar medium as a collecting surface at a distance of 2 mm below a slit opening. A vacuum source is used to draw air through the narrow slit which is calibrated to provide an air-flow rate of 1 ft^3 per min. The amount of air sampled can be varied by changing the sampling time to 0.5, 2, or 5 min. The number of microorganisms collected on the agar surface is determined by counting the colonies after suitable incubation periods.

Drain locations: Air samples were collected from isolated spaces above drains in the milk receiving, milk processing, cottage cheese and butter areas of the plant. Two of the drains, receiving and processing areas, were located in sloping trenches to approximately 6 in. below floor level. The drains in the cottage cheese and butter areas were located at floor level. The drain in the butter area has a 10- to 12-in. diameter strainer and 6-in. diameter outlet, while the other three drains have 7-in. diameter strainers and 3-in. diameter outlets.

Sampling methods: Results were obtained during test periods of about 45 min. During the test period, 2-min. air samples were collected continuously while the drain was flooded for 2 min. at 10-min. intervals. All tests were conducted early in the workday before the drains were used for regular plant purposes. The air volume of the space above the drain was isolated by inverting a 21-in. cubed box over the drain during the test period. This provided a volume of between 5 and 5.5 ft^3 of air which was undisturbed by air currents in the room. Precautions to prevent contamination of the collection surface from other sources were taken by sterilizing all sampler parts and related surfaces with 95 percent ethyl alcohol before each test period.

A Tryptone Glucose Yeast Extract agar was used in the standard plate count determinations of air-borne bacteria. Air-borne yeast and mold counts were evaluated by using Potato Dextrose agar adjusted to pH 3.5, by addition of a tartaric acid solution.

Plates after sampling were counted after 48 and 96 hr incubation at 35 C. Yeast and mold colonies were counted after incubation of 7 days at 70 F.

Results

Preliminary tests indicated that the flooding of a floor drain caused an increase in the numbers of air-borne microorganisms in the immediate vicinity of the drain. In order to evaluate the actual contributions of this source, the air volume surrounding the drain was isolated and the flooding controlled to periodic times which could be recorded. Then, by collecting air samples continuously throughout the test period, any fluctuations in air-borne count due to the periodic flooding are recorded.

An illustration of the variations in air-borne bacteria count above the receiving room drain is in Figure 1. In general, the increases in air-borne count due to flooding are very obvious. After a background count of about 10 per 2 ft^3 of air, the count increased just slightly during the first flooding of the drain. During the 2 min. following flooding, an increase in count to above 50 per 2 ft^3 is revealed. This increase is attributed to the previous flooding. After this point, the count decreases and if given sufficient time, would probably return to near the background count. The second flooding of the drain resulted in nearly a 3000% increase in air-borne count, or up to about 140 bacteria per ft^3. This increase was much more significant than that noted for the first flooding and illustrates the effect of flooding in some trials. However, in most trials, the first flooding caused a greater increase than any of the following. After the second flooding, the air-borne count decreased gradually to the measured background count 6 min after flooding.

The third flooding of the floor drain (Figure 1), also resulted in an unusual effect, in that the significant increase in air-borne count due to flooding came in the 2-min period following flooding. This type of situation occurred on a number of occasions, but was less common. After the rapid increase in air-borne count, an equally rapid decrease followed, but apparently does not represent a rapid decrease to the background count since the following two counts are significantly higher.

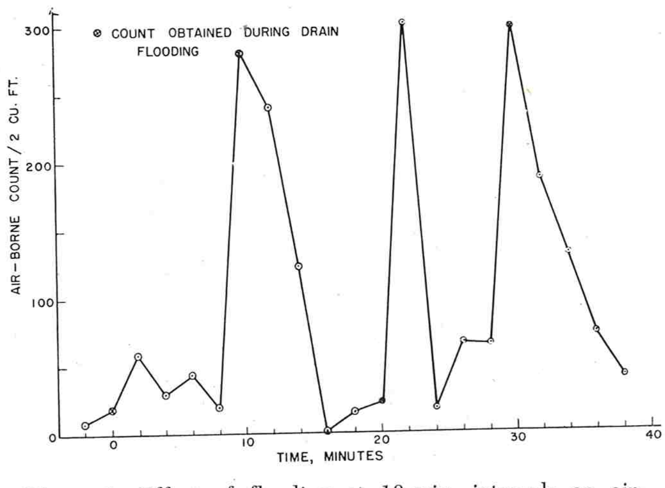

Figure 1. Effect of flooding at 10-min. intervals on air-borne bacteria counts in an isolated space above a receiving area drain.

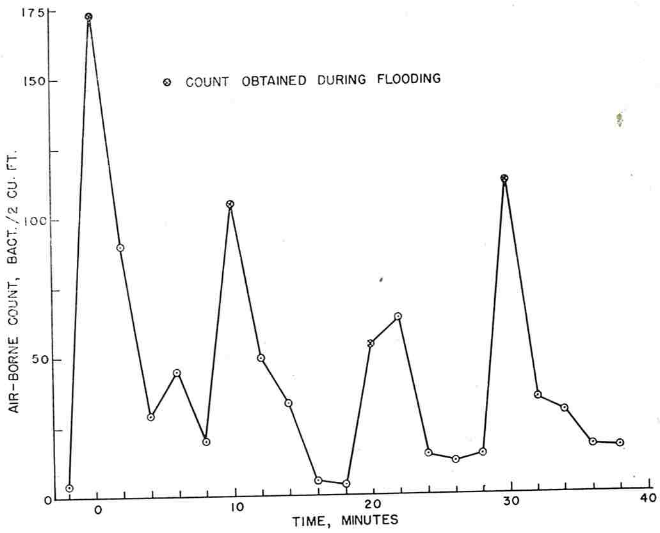

Figure 2. Effect of flooding at 10-min. intervals on air-borne bacteria counts in isolated space above drains in four food plant areas.

The fourth flooding (Figure 1) caused an increase in air-borne count equal in magnitude to the two previous floodings. However, the series of counts following flooding reveal a gradual decrease, which would eventually decrease to about the background count in sufficient time. The decrease in count noted in this case might be expected to be due to gravitational settling of the bacteria in absence of currents after becoming air-borne at the time of flooding.

The results in Figure 2 provide a summary of air-borne bacteria counts obtained from isolated areas above floor drains in four areas of the dairy plant. Each point in the figure represents a mean of 8 different counts, which includes two trials from each of the four drains tested. After a mean background count of 4 per 2 ft^3, the count increased to 173 per 2 ft^3 during the first flooding; 105 per 2 ft^3 during the second; 64 per 2 ft^3, 2 min after the third flooding; and 113 per 2 ft^3 during the final flooding of the drain. After each of these increases, the counts decreased to near the background count within 8 min after the flooding of the drain. These results clearly indicate the contribution of drains to air-borne bacteria counts, since normal populations in these areas are less than 6 bacteria per ft^3 and only a small percentage of individual counts are over 10 per ft^3.

The effect of drain flooding on the air-borne yeast and mold counts in an isolated area above a processing area drain is illustrated in Figure 3. In general, the effects of drain flooding are less consistent than indicated for air-borne bacteria for this drain. The air-borne yeast count increased significantly during the first flooding, only slightly during the second flooding, and did not increase at all during the two following drain floodings. The air-borne mold counts increased significantly during the first, second and fourth floodings of the processing area drain (Figure 3).

The effect of flooding of floor drains in four different areas of the dairy plant are illustrated in Figure 4 where values representing a mean of two trials in four areas are plotted. In general, the results indicate that the air-borne yeast and mold counts during drain flooding are significantly lower than the air-borne bacteria counts. The highest mean air-borne yeast count was 12 per 2 ft^3 during the first flooding and the highest mean air-borne mold count was 25 per 2 ft^3 occurring 2 min after the second flooding. The results indicate that flooding caused more significant increases in air-borne mold counts than in air-borne yeast counts. The effects of drain flooding on air-borne mold and yeast counts is less consistent than those on air-borne bacteria counts, with flooding causing no apparent increase in count in some trials and the increase in count occurring in the period 2 min after flooding in other trials.

Many of the experiments indicated that the con-

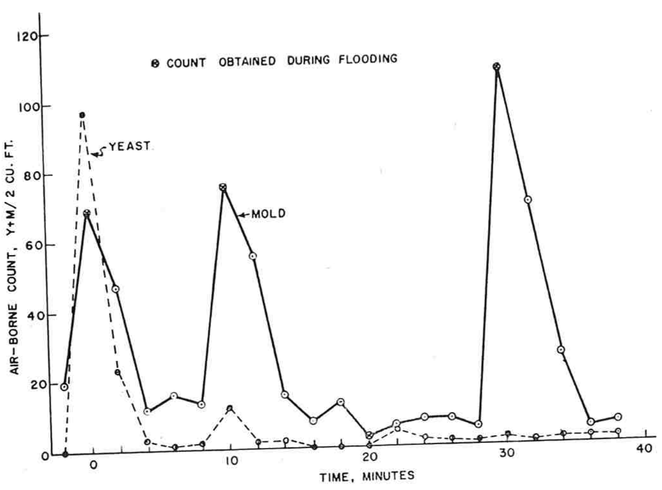

Figure 3. Effect of flooding at 10-min. intervals on air-borne yeast and mold counts in an isolated space above a processing area drain.

tribution of the drain to the air-borne microorganism population decreased with the number of the times it was intermittently flooded. To investigate this possibility further, an extended test period was conducted on the processing area drain. These results (Figure 5) indicate a general decrease in the contamination contribution by the drain for the first four times it was flooded, even though the count during the fourth flooding was slightly greater than during the third. However, by withholding water for approximately one hr after the drain had been flooded four times, the contamination by a fifth flooding

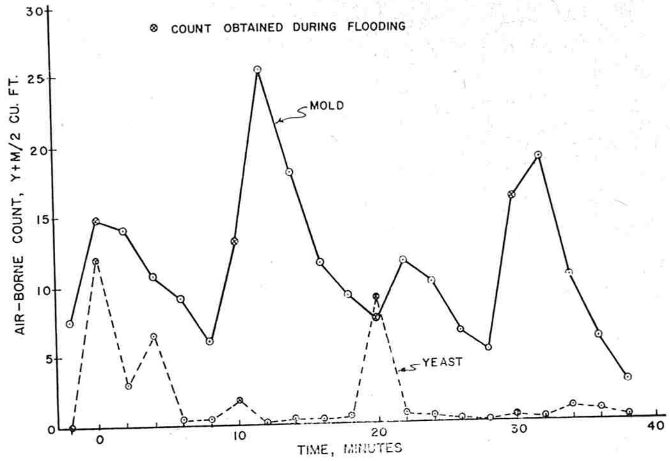

Figure 4. Effect of flooding at 10-min. intervals on air-borne yeast and mold counts in isolated spaces above four food plant drains.

was nearly equal to the first. The sixth, seventh, eighth and ninth floodings each caused less contribution than any of the previous. The results indicate that the contribution of drain flooding to air-borne counts decreases as long as short intermittent flooding was continued. An undistrubed period of as short as one hr, however, may result in increased contribution by the following flooding of the drain.

In an effort to find a means of eliminating or controlling the air-borne contamination during flooding of a drain, a chlorine sanitizer was used just before the second flooding. Undiluted sodium hypochlorite was applied to the drain just before the second flooding of a sequence. The amount was just sufficient for the solution to come in contact with the complete drain surface. The results of this technique are given in Figure 6. After a background count of 27 per 2 ft^3, the air-borne count increased to 550 per 2 ft^3 during the first flooding of the drain. In the 8 min following, a gradual decrease in count occurred.

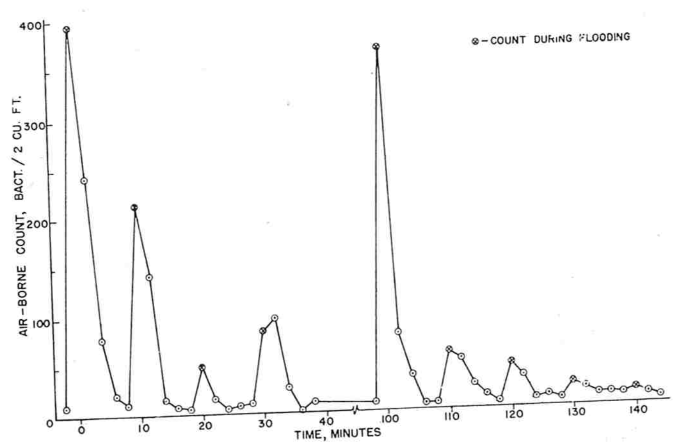

Figure 5. Effect of the number of intermittent floodings on contribution of drains to air-borne microorganisms populations.

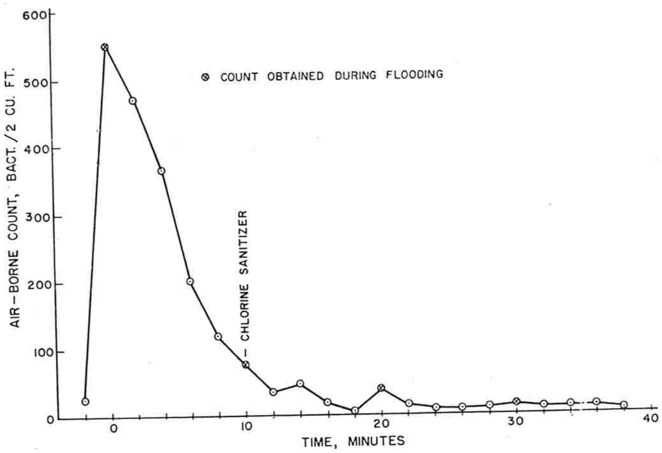

Figure 6. Effect of chlorine sanitizer in controlling air-borne bacteria from drain flooding.

The second flooding was preceded by the sanitizer application. Flooding of the drain at 10-min intervals after sanitizing failed to increase the air-borne count.

In order to more thoroughly determine the influence of chlorine sanitizing on reducing air-borne bacteria above drains during flooding, the processing area drain was used in a series of tests with various concentrations of the sodium hypochlorite. The results are illustrated in Figure 7. The relative air-borne counts obtained during flooding are presented. These results are based on the count obtained during the first flooding of the drain and therefore represent percentages of the contribution obtained during the first flooding.

The control data were obtained from Figure 2 and represent a mean of two trials from four different drains. The data from various concentrations of sodium hypochlorite were obtained by rinsing the drain with 5 gal of the solution and flooding the drain within about 20 to 30 sec with water the second time. The results (Figure 7) indicate a

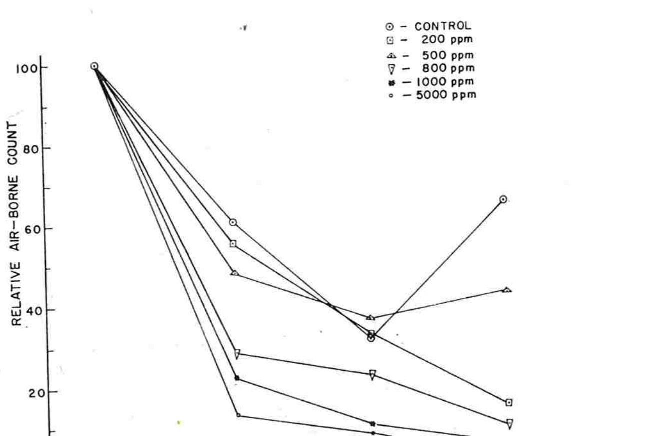

Figure 7. Effect of chlorine sanitizer concentration on air-borne bacteria populations caused by flooding drains.

direct relationship between the contamination from the second flooding and the strength of the sanitizing solution.

The results for the third flooding indicate that the sanitizer strengths of 200 and 500 ppm had no effect. Sanitizer solutions of 800 ppm or more did decrease the contribution of the drain during that particular flooding period. Results for the fourth flooding indicate that the contamination, for conditions when sanitizer was used, is less than the control in all cases. In general, however, the results indicate that a sanitizer strength of 800 ppm is required to provide a significant reduction in the contamination by the drain for all cases encountered.

The reduction of air-borne bacteria caused by the 5000 ppm solution compares very favorably with results presented in Figure 6, indicating that 5 gal of 5000 ppm solution had the same effect as a smaller amount of undiluted solution. In addition, these results suggest the maximum reduction by using chlorine of any strength, with the relative counts being around 13 to 14% of those from the first flooding.

Discussion

In an effort to prevent contamination of dairy products by air-borne microorganisms, two factors become involved:

1. Attaining air which is free of microorganisms.
2. Preventing secondary contamination of that air which is already free of microorganisms.

The biggest problem seems to be the prevention of secondary contamination of the air from the many sources of microorganisms in food plant areas. Therefore, sources such as floor drains must be controlled or eliminated. Probably the first step toward this goal would be to explain why drains act as a source of air-borne microorganisms.

The presence of microorganisms in and around floor drains of a dairy plant is not unexpected due to the many nutrients inherent to dairy products. Since portions of these products collect in and on the walls of floor drains, a plentiful source of nutrients for microorganism growth is available. With a warm temperature, the microorganisms will multiply rapidly overnight in an unused drain.

One mechanism which might explain how these microorganisms become air-borne involves the following factors. Possibly, before the first flooding of the drain on a new work day, air currents, which pass over the drain cause sufficient movement of the air inside the drain for some of the microflora to become air-borne, but air movement is not sufficient to carry them from the drain interior. The largest contributor to the mechanism would be the flooding of the drain, when the air inside the drain is forced to move out of the drain very rapidly as the liquid enters. This rapid moving air probably picks up many of the microorganisms from the walls of the floor drain and transports them to the surrounding space.

Application of chlorine sanitizer to the drain reduces the number of viable microorganisms present. Then even though the particles become air-borne during flooding, the number of viable microorganisms is reduced. The need for high concentration (800 ppm) to cause a significant effect is probably related to the influence of organic material in the drain on the effectiveness of the chlorine.

Many approaches to controlling or eliminating floor drains as a source of air-borne microorganisms might be taken. Possibly new floor drains should be designed for use in food plant areas or possibly the redesign of the drains now used may be sufficient. Probably the most effective approach would be to completely remove the floor drain from the area to be protected from air contamination.

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A SURVEY OF DAIRY CATTLE HOUSING IN INDIANA[1, 2]

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SUMMARY

In three testing periods from January 1 to April 20, 1964 the milk, physical appearance of the cows and the bedded area in the free stall housing were cleaner than the other two basic systems of housing. Bedding requirements in free stall housing were reduced approximately 74 and 56% below those of loose housing and stanchion barns, respectively. Health disorders were reduced in free stall housing.

Until recently, dairymen in the Northern part of the United States utilized two general systems of housing and caring for dairy cattle: The stall-barn (stanchion or tie-stall) and loose housing (tramp shed). These methods have been reviewed recently in terms of economics, milk quality and milk production *(2)*.

In the early winter of 1961-62, individual stalls (free stalls) were placed in a loose housing system by a commercial firm in Indiana *(1)*. This housing-management system has received support and endorsement from dairy farms, sanitarians and fieldmen alike. A 1964 Indiana DHIA survey with 1,079 herds reporting found that 4.4% of the herds are housed in free stalls with 65.5% using loose housing and the remainder or 30.1% had stanchion barns *(4)*.

A recent study by Wadsworth *(10)* with 15 Indiana dairymen using free stall barns during the winter of 1962-63 indicated that they were well satisfied with this recent innovation in dairy cattle housing. Primary benefits were a reduction in bedding and lower labor requirements. Lower labor requirements resulted from faster cleanout than in stanchion barns and less bedding time than tramp sheds. The net advantage of a free stall barn over conventional loose housing amounted to about $13.00 per cow per year. The advantage was approximately $22.00 per cow per year compared to stanchion barns, given the present investment, bedding and labor costs. Dairy herd management problems were not increased. Building and stall arrangements with user's comments have been summarized by Mentzer, Moeller and Sell *(8)*.

Hoglund et al. *(6)* have checked the economcs (using 1963 prices) of conventional loose housing and free stall housing on dairy farms located in Indiana, Michigan, New York, Ohio and Pennsylvania. They found that the total annual housing costs were slightly reduced utilizing the free stall principle.

[1]Journal Paper Number 2391 of the Purdue Agricultural Experiment Station.

[2]These data are a portion of the report of the Farm Methods Committee presented at the 14th Annual Meeting of the Indiana Association of Sanitarians, Inc., Indianapolis, Indiana June 2, 1964.

A considerable amount of enthusiasm has crept into the popular press concerning the advantages and to a somewhat lesser degree the limitations of free stall housing. A midwest dairyman suggested that cows produce 5-10% more milk and they are cleaner in free stall barns *(9)*. Actual data were not presented.

During the severe winter in Indiana (1962-63) numerous farms experienced difficulty in keeping the cow's flanks, tails and udders free of an accumulation of foreign material.

Last year, the Indiana Association of Sanitarians, Inc. appointed its first Committee on Dairy Farm Methods. Because of the interest in the general area of housing it was the consensus of opinion to make a field study of the three types of cow housing used in Indiana. The main purpose of the study was to determine if a relationship exists between the cleanliness of the cow and milk with the type of dairy housing commonly used by dairy farmers.

METHODS

Twelve fieldmen and sanitarians volunteered to participate in the survey. Each man chose at random and surveyed stanchion, loose housing, and free stall housing facilities using forms developed by Purdue University. A total of 36 farms was studied. The cows on the farms were predominately of the Holstein breed. The average herd size per system was 28, 54 and 46 for stanchion, loose and free stall housing, respectively. Three separate survey sampling times were selected. The first period of inspection was January 1 to February 15, the second period of inspection was from February 15 to March 15, and the third period from March 15 to April 20, 1964 at which time the survey was completed.

TABLE 1. MILK AND COW CLEANLINESS RATINGS UNDER VARIOUS TYPES OF HOUSING (AVERAGES OF THE THREE SURVEY PERIODS)

	Sediment rating[a]	Cow cleanliness[b]	Washing and drying technique[c]	Condition of bedded area[d]
Stanchion	1.6	2.2	3.0	2.0
Loose	1.9	3.4	2.8	2.6
Free Stall	1.4	2.1	2.9	1.9

[a]Sediment rating—1 through 4 with 1 being the best value.

[b]Cow cleanliness—1 through 5 with 1 being the best value.

[c]Washing & drying technique—1 through 5 with 1 being the best value.

[d]Condition of bedded area—1 through 5 with 1 being the best value.

Since the Farm Methods Committee was specifically interested in the cleanliness of the milk as well as the cow, sediment tests were taken. Before obtaining the detailed survey information on each farm, bulk milk samples were tested using the Liska method *(7)*. The sediment pads were graded on the farms. Visual estimates were made for cow cleanliness, washing and drying of the udder and condition of the bedded area on a basis of 1 through 5 with 1 being the best value.

Four meetings were held during this study with a December, 1963 meeting held as a training session to help standardize the ratings of the cooperators. Three farms (stanchion, loose, and free stall housing) in the Rochester, Indiana area were chosen for the training meeting.

Prior to the last farm inspection, a special questionnaire on free stall housing was given to each cooperating sanitarian or fieldman. Eleven completed the questionnaire with the assistance of their free stall housing producer.

RESULTS AND DISCUSSION

On the average, the milk, physical appearance of the cows and the bedded area in free stall housing were cleaner in each testing period than the other two systems of housing (Table 1). Milk and cow cleanliness in stanchion housing was quite similar to free stall management in the survey. There were no sediment ratings rated higher than a score of 3. Washing and drying techniques were essentially the same in all housing types.

Other factors influence cow cleanliness (Table 2). The average washing time was essentially the same in all systems. Free stall operators were more careful in drying the udders. On the other hand, they appear to be negligent in clipping udders and flanks. Perhaps they had such confidence in their new system of housing-management that it was no longer deemed necessary.

The use of bedding is important from the standpoint of keeping cows clean, preventing injuries and absorbing excess moisture. Supplies of bedding materials are oftentimes limited and expensive. The amount of bedding used by producers surveyed in this study was found to be in general agreement with the findings of Wadsworth *(10)*. Bedding requirements of free stall housing were reduced 74 and 56% below those of tramp sheds and stanchion barns, respectively (Table 3). The square feet per cow was lower in free stall housing as compared to stanchion and loose housing.

Table 4 lists the number of health disorders found with cows in the three types of housing. The results are listed by individual periods due to the possibility of carry-over effects. Foot problems were more

Table 2. Other Factors Influencing Cow Cleanliness

	Average washing time (Seconds)	Udder properly dried (%)	Udder clipped (%)	Flank cilpped (%)
Stanchion	37	25	80	60
Loose	30	44	41	16
Free Stall	33	50	27	18

Table 3. Bedding and Area Dimensions

	Amount of bedding used/cow/day (Lb)	(Range)	Square feet/cow	Range
Stanchion	6.5	2.0 to 14.8	54	40 to 73
Loose	7.3	4.3 to 16.0	68	37 to 91
Free Stall	4.2	.6 to 7.2	49	41 to 60

Table 4. Health Disorders Associated With Housing

	Foot problems (Foot rot and sore feet) (Period)			Stepped on teats (Period)		
	1	2	3	1	2	3
Stanchion	6	6	7	2	2	4
Loose	6	1	3	6	13[a]	12[b]
Free Stall	0	3[c]	0	0	0	0

[a] 6 cases on one farm.

[b]10 cases on one farm.

[c]All on one farm in a 30 day period.

prevalent in stanchion barns than the other housing styles. This is in agreement with the long range Wisconsin study *(5)* of stanchion compared to loose housing. On the other hand, the large number of stepped on teats in the tramp sheds was not expected and is not in agreement with the work reported from the University of Wisconsin *(5)*.

Regarding the special free stall questionnaire, of all farms surveyed, only one cow (out of 478 cows) was reported to have frostbitten teats. No records on this factor were kept on the other housing systems.

Attempts were made to consider and evaluate age, education and economic status of the herd manager but the data were incomplete and inconclusive.

In regard to behavior and temperament from 0 to 10% of the cows had to be forced to use the stalls. Cows that did not use the free stalls were found to lie in the alley, in the lot, or half in and half out of the stall.

Cavanaugh *(3)* reported that the most important item on the dairy farm is the farmer himself. Good management is the solution to clean cows on any dairy farm. The system of free stall housing provides a way to house cows that is more likely to promote cleanliness of the cow in a more efficient manner.

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AN OUTWARD LOOKING PHILOSOPHY ON DAIRY SCIENCE AND TECHNOLOGY EDUCATION[1]

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Editorial note: Relative to the views expressed herein by Dr. Kosikowski, it is of interest to note that according to a news item in the October 1964 issue of "Western Dairy Foods," the Food Technology Department at Oregon State University has recently undergone reorganization into commodity sections, such as, meats, fruits, vegetables, sea foods, dairy products, and sensory evaluation. This was done in recognition that specialization is necessary and that responsibilities in various commodity areas should be delegated to individuals who have been trained and are working with respective or closely related commodities. Of significance also is the recent establishment of an FAO Expert Panel on Dairy Education and Research, in recognition of the continuing importance of dairy science and technology. Its first session will convene during 1965, in Rome, Italy, to consider improving and coordinating dairy science education throughout the world.

Dairy science and technology education is being subjected to strong challenges, arising from uncontrolled world trends and controlled group pressures, which threaten its very existence.

It has been suggested that our teaching discipline, for reasons of economy, lack of students, or for aligning its curricula along unit processes, should be in certain areas integrated in the general field of food science or technology *(2)*. The proposals have the quality of showing some merit under special circumstances and, certainly, on the surface, appeal to many school administrators. Complete integration into food technology generally requires a severance from the historically strong biological base upon which dairy science and technology has rested and a move towards an engineering base. In its ultimate concept, integration may mean a disappearance of dairy science and technology education. I submit that, especially for developing countries, this would be a disaster.

Progressive change is necessary and indeed welcomed and closer ties with food science are laudable. But I doubt that complete integration will achieve its stated objectives or indeed that this Assembly, in the majority, favors such a step. Reasons for my belief are presented here and hopefully alternative proposals for strengthening dairy science and technology education are suggested.

A PARTNERSHIP AT CORNELL

First, however, may I state that since 1959, Cornell University, my university, has had in operation a Department of Dairy and Food Science in which the two spheres of activity are organized into separate divisions. Additionally, the Cornell Graduate School lists two fields of study: Dairy Science and Food Science and Technology. Being a faculty member of both fields has given me the unique opportunity to observe the requirements of either, and to note their contributions and problems. Cornell University then has not integrated dairy science into food science; it has made them partners with identity preserved.

SPECIAL RESPONSIBILITIES AND CHARACTERISTICS OF DAIRY SCIENCE

The point is often made that milk is a food, albeit there is no reason why it should not be treated as any other food within the organization of a general food technology discipline. Naturally, milk is a food but one that is extremely perishable and especially vulnerable, in the hands of the inexperienced, to growth of bacteria, not excluding disease producers. Furthermore, the production of milk into natural cheese or fermented products is dependent upon intricate biochemical and fermentation reactions, which cannot be absorbed by even the most gifted of students in a few weeks. I do not believe we are yet at the point where students can be taught the making of Gruyére cheese and pickles in the same pickle barrel. Our discipline requires a special emphasis on biological training not possessed by many other portions of the food industries, in order to prevent disease epidemics and to preserve the true character of its many products.

Furthermore, dairy science and technology teaching historically has extended its chain of responsibility all the way back to the agricultural community and the farm. It is directly concerned with teaching students the principles of milk development work in areas where little milk was produced previously, with the sanitary production and care of milk at the farm, with its testing and transport. Perhaps it has not accomplished an outstanding success but nevertheless many important developments have occurred as a result of the training received.

[1]Presented by the author, who is Professor of Dairy Science, Cornell University, and Consultant to the Food and Agriculture Organization, U. N., at the FAO International Meeting on Dairy Education, Paris, France, June 2-8, 1964.

Food science and technology, on the other hand, deals mostly with processing and with processed foods. It is concerned little with raw materials, a point confirmed in Professor Scott's well-written paper *(1)*, in which he expressively limits his discussion of dairy science training in the context of food technology to the training required for personnel employed in the many branches of food processes and specifically excludes the training of personnel in the production of raw materials, as raw milk. Which discipline then, especially in developing countries, will assume this major responsibility of training dairy technologists, chemists, and microbiologists expert in milk flavors, bacterial counts, rancidity and oxidation reactions, refrigeration, equipment cleaning practices? This is a major challenge present at the farm level.

Placing Food Science at its Proper Level

In its historical evolution, dairy science and technology education has been and still is mainly associated with centers of agricultural learning. Whether this association presents a restrictive relationship in modern times is not clear, but it is only fair to add that some elements of agricultural science will always be necessary in the dairy science and technology discipline. At the same time, the general field often referred to as food science and technology has been absorbing, to a limited degree, dairy science and technology into its activities.

It is my view, however, that the real role and meaning of food science and technology is misapplied presently. Agriculture colleges or institutes are in themselves centers for food science and technology and the latter field covers so many areas of interest that to place it at a level of dairy science, a much specialized activity, does not do food science and technology full justice. Rather, food science activities are on a par with agricultural science activities except for the production of raw food materials.

If this interpretation were accepted, the line of academic organizations could be greatly simplified where desired. Rather than integrate two dissimilar activities, it would be possible now to make dairy science and technology stronger, yet essential to food science and technology by placing the latter at a higher administrative level while maintaining the department status of dairy science. Other departments, meat technology, plant food technology, poultryand egg technology, fish technology, then could be coordinated with food science and technology in the same pattern.

Examining the Economics and Consequences of Integration

In pursuing the logic and reasons for complete integration of dairy science into food science, important savings are cited by others because integration purportedly leads to greater student enrollments and reduction of facilities and staff.

Fewer and fewer students are enrolling in dairy science and technology departments, but equally fewer students are enrolling in the activity often listed as food science and technology but more realistically appraised as the limited field of food processing. Naturally, if an institute of food science is established more students will be attracted, but in this case the fair comparison should not be against a dairy science department but against the generalized field of agricultural sciences.

At Cornell University, student enrollments in the Division of Food Science present as much of a problem as that for Dairy Science. In another large midwestern American university in the heart of the food processing area, other than dairy, enrollment in the curricula of dairy science has been consistently higher for many years than in all other areas of the food technology department. Student shortages are not necessarily the sole prerogative of dairy science education but exist in food processing departments, in other agricultural areas, in engineering and in medicine.

Furthermore, it is pure conjecture to state that a government with a large or active dairy industry, or a developing country aspiring to dairy development, will curtail the activities of its present, generally small, scientific dairy staffs, should student enrollment be low. Usually the only site for dairy education, research, and extension is centered in one institution of a state or province. The same professors who are engaged in teaching would most likely continue in the same facilities with increased research loads and with providing greater scientific and technical advice to industry and to government bodies in order to maintain leadership in dairy production and processing. Countries, states, and provinces must have quick access to reliable and scientific information. For example, New York State produces annually 230 million pounds of cheese. It has only one university professor engaged in teaching, research, and advisory activities on cheese technology. If few students were to enroll, would it be advisable for the State with its huge investment to turn away from its only close contact with scientific cheese technology?

In an age where, by necessity, specialization has strongly influenced teaching disciplines, it is now being suggested that dairy science and technology education integrate with resulting generalization of subject matter. The point is made that students taking mostly chemistry, microbiology, and engineering courses will be trained by industry for dairy processes after graduation.

The fact of the matter is that dairy science and technology training in the better universities does not neglect these basic courses for its students. These are usually well covered in the first two years of a four-year course, even before most students enter the dairy technology area, and are continued throughout. Furthermore, it is quite obvious that the private dairy industry is not equipped for the demanding and costly task of providing specialized training. A dairy industry which is rapidly losing its trained dairy personnel without adequate replacement is in no strong position to organize training programs, as I have observed from direct personal experience. Also, for the many dairy development projects of Asia, Africa, and Latin-America, who will train the generalists sent to construct and manage milk and milk product plants or to increase milk production? Is it to be the dairy industries of these countries which do not exist? I simply raise these points to show that, as Dr. Trout *(3)* so eloquently stated yesterday, the dairy industry of the world is rapidly expanding and that we must give careful thought to its adequate staffing. The heart of the problem is proper education.

Some Past Weaknesses of Dairy Science and Technology Education

Dairy science and technology education is more necessary now than ever before but this discipline too must take a good look at itself and reshape its organization and objectives to 21st Century requirements. In certain circumstances, it may find itself working in a more natural relationship with food processing or even with chemical engineering teaching units. It must accept, however, not only the advantages but the limitations of such arrangements. The important qualification is that dairy science and technology education is permitted to retain an identity and freedom of action to train students devoted to and knowledgeable in the subject matter principles, in accordance with the requirements of the field.

If criticism is to be leveled at dairy science and technology, it is that its activities have become too limited and fragmented and that some teaching units at university levels are more inclined to favor practice over principles, although the same weakness is also evident with food processing teaching units.

Too much emphasis has been placed on producing managers for milk plants and not enough attention has been given to the total role of dairy science and technology education in society. For years, our discipline, without realizing it, has successfully trained many fine leaders for international food development work, for government administration, for research, and for regulatory activities in and out of the dairy profession. In addition, the personnel files of many of the finest milk and food sanitary corps of municipalities are filled with names of dairy technologists. There is a great potential for further service in these allied fields.

An Outward Looking Dairy Science and Technology Discipline

In summary, the following points are suggested to give an outward look to training in dairy science and technology. They are:

1. That food science and technology be considered by government and school administrators for a more important role than that usually given to it now, which is usually that of a restricted departmental one. Its broadness and coverage of many fields entitles it to be considered administratively, either as the nucleus of a College, or jointly integrated as a College of Food and Agriculture, or organized as a Division[2] within the existing College of Agriculture.

2. That once such a principle is accepted, technical departments, coordinated with the above unit, be organized separately as meat technology, fruit and vegetable processing, poultry and egg technology, fish technology, and dairy science and technology.

3. That dairy science and technology departments be strengthened in depth by actively engaging in providing qualified students for sanitary handling and production of milk on farms, for international service in dairy development programs for milk and milk product processes, for dairy management, and for milk distribution, nutrition, and economics.

4. That where it is possible to integrate some activities with elements of general food processing, the following basic specializations would be deemed most appropriate and listed as such: dairy and food microbiology, dairy and food chemistry, and dairy and food engineering.

5. That some form of international study group, perhaps the proposed FAO expert panel on dairy

[2]Some institutions administratively place departments above divisions. The formation of a broad administrative unit called a Department rather than a Division of Food Science is also acceptable to the author if, in such instances, the technologies of meat, fruit and vegetables, poultry and eggs, fish, and dairy are first organized separately and identified as technical divisions of this wide area department. Staff members of the separate divisions then, in effect, would form the Faculty of the Food Science Department and collectively would determine its course in teaching and research at the general level.

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.

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SANITATION IN PLANTS FABRICATING PLASTICS, PAPER, PAPERBOARD, OR MOLDED PULP FOR SINGLE-SERVICE MILK AND MILK PRODUCTS CONTAINERS[1]

Harold Wainess

Harold Wainess and Associates, Chicago, Illinois

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[2].

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 plant 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 containes, 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.

[1]Presented at 50th Annual Meeting of International Association of Milk and Food Sanitarians, Inc., at Toronto, Ontario, Canada, October 24, 1963.

[2]Copies 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.

TOXICTY 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 regrinding 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.

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EVERYONE KNOWS WHAT WATER IS— OR DO THEY?[1]

Lois Messenger is a student at Northwestern University, outside of Chicago. She's part of a generation growing up in a time beset with problems; some more complex than those we know. One of the problems fringing her era is that of water supply. Unlike most of her predecessors, she's aware of the problem . . . made so through who knows what means of advertising. She's aware, for instance, that there's more to the element than most people perceive. She asked us if we'd like her impressions, and we said yes. What follows is, in narrative form, one girl's impression of water. We like to think there are millions more of her generation who have taken the time to wonder—Ed.

"Hey, Sam. Ya' know what water is?"

"Huh . . ."

"I said, do you know what water is?"

"Ah, get serious. Everyone knows what water is."

"Do they?"

"Sure. Water's water. You know, that's like saying I'm me, or grass is green, or Sophia Loren's a woman. You know, it's obvious. Anyway, you don't go around asking people what water is. They'd think you were nuts. . . . Uh, why are you asking me anyway?"

"Well, I have this theory. It seems like not everyone thinks water's the same thing."

"What do you mean? Sure, everybody thinks water's the same thing. We all drink it, we all take baths in it, we all go swimming or beating, we all like a pretty lake or a good rain. Yeah, that's all water is. All those things, and everyone knows it."

"Well, Sam. You're wrong."

"How do you figure that?"

"For instance, take my wife. Now she complains all the time about water. Well, not really water, but all the work it involves, like washing clothes, and cooking meals, and heating the house. Then there are all those side jobs like washing windows and floors, and watering the flower garden. Just ask her. She's got a million and one uses for water. But of course, all I ever hear about are the dishpan hands. But aside from that, you see, she's got one idea about what water is and what it does. It keeps her house clean and her family cared for. You understand that?"

"Sure, just about any housewife looks at water that way."

"O. K., now I've got a sister-in-law who's a medical technician, and she doesn't think of water in any of those ways. You know, she says you might as well not talk about water unless you mean distilled water. Hard water, soft water, it doesn't matter. It's got to be distilled. And in that big lab where she works, the most water they use is about a gallon a day. Feature that! With one gallon of water they wash and rinse all their instruments, use it in their tests, and use it at different temperatures to store chemicals."

"Well, I'll be. They use only one gallon a day. I remember my wife telling me that over at her beauty parlor they use about 200 gallons of water a day."

"Sure, that's another way of looking at water. Those beauticians really see water in one way. They're interested in what it does to hair. A beautician told me that it really make a difference whether they use hard or soft water. Hard water leaves an ugly film on hair, and it requires more soap. So if you're a beautician, you sure don't care about distilled water or dishpan hands, but the most important thing is whether it makes hair soft and shiny."

"Yeah, I guess you're right. But I can tell you one person who couldn't care less about what water is—but only about one thing that water does. That's a fireman."

"Well, Sam. You're wrong again."

"What do you mean?"

"It does make a difference to a fireman what water is. For instance, it makes a difference to him whether this water gushes out in a solid stream, say for a wood fire, or whether it's a fine spray for an oil fire. And sometimes he doesn't even use water, but dry chemicals, like baking soda, when he's got a big grease fire. It even matters to him how wet water is. Bet you didn't know that! When there's a fire in bales of paper or cotton, or anything packed solid, firemen add chemicals to the water to make it 'wet water', or duterium, which makes the water heavier and it penetrates more to put the fire out quicker. But all in all, the big importance is that it puts out the fire. It's so important that at capacity an average fire department can pump as much as 5,000 gallons per minute."

"Guess I never quite thought of it in that way . . . Say, I can tell you one person whose whole job is concerned with water, but he doesn't care anything about it. That's a plumber. You know, he's worried about how to get water from one place to another, but he couldn't care less what happens to that water."

"Ummmmm, Sam. You're wrong about that. For one thing, plumbers use water as a tool for hydraulic force, for siphoning water from basements, or in heating pumps. Sure their big concern is to get water transported, but the quality of the water makes a difference, too. For example, soft water prevents the formation of lime in the hot water pipes, or in

[1]Reprinted from July 1964 issue of "Water Conditioning Sales".

heating coils, and that cuts down on rust. And what's more, for some extra information, a plumber friend of mine told me that soft water boils faster than hard water.

"Sure, Sam. Everybody cares about water—even animals. The owner of that pet shop across the street says that fish are pretty particular about their water. He has to remove all chlorine from the water, and then make sure that there's plenty of air circulating. Then, they have a special 'ph adjuster', he says, which changes the chemistry of water. So you see, Sam, there's just about no place you can go where water isn't important.

"Do you know that the waterworks system is among the top ten largest industries in the world. There are 17,000 water works in the United States and Canada supplying 17 billion gallons of water per day. There is a big business of collecting, purifying, and distributing water. An average city of 10,000 in North America requires between $50 and $300 per person to construct an entire water works system, yet it costs large consumers only two cents a ton delivered, or small consumers, four cents a ton. And they figure that every person uses about 50 gallons of water per day.

"Why water is so important that it could cause another war, my politician friend tells me. He says that in the Middle East, Israel has constructed a huge canal to carry water from the Jordan River into Israel. This is a real threat to the surrounding Arab states. He says that if the Israelis successfully draw water from the Jordan River, the Arabs may answer with a show of gunshot.

"So you see, Sam. Water's pretty important. But you can't look at it in just one way because it means something different to everybody. But the best way to figure out what water really is is to take a look around you and imagine how and what it must mean to someone else, how they use it, and how much and for what. Don't you agree, Sam?"

"Sure, but how do you know so much about what water is?"

"Oh, I've just been going around asking people, 'Do you know what water is?' . . ."

ASSOCIATION AFFAIRS

FROM YOUR PRESIDENT

To IAMFES Membership:

In my previous letter to the editor, I pointed out the responsibilities of the officers of the association to the membership as I saw them. I would now like to point out what I consider the responsibilities of the member to his profession.

Currently, the sanitarian is striving for professional status, such as has been achieved by doctors, lawyers, and engineers, so this is a timely question.

We might readily ask ourselves "What is professionalism?" Often we can find no answer. In ignoring the things that constitute a professional, many groups have tried to attain this status by regulation or some other pressure process, and in so doing have greatly hampered the cause of true professional acceptance for the sanitarians.

Before a person or group can be expected to be recognized as belonging to a profession, recognition must be earned through long dedication to the particular job, a profound awareness of responsibility, and a willingness to work toward creating an image that insures recognition by the public.

I believe all professional people have certain standards to which they must adhere, and amongst these standards are some of the following. The education of the individual is superior, and he takes advantage of all opportunities to further his education — even at his own expense. The professional is competent enough in his training, ability, and interpretations that he can work together with his contemporaries harmoniously. He is sufficiently proud of his profession that he belongs to its association and pays dues commensurate with the service provided, even when these are high compared to dues in non-professional organizations.

(I might point out at this point that the dues to this association on an annual basis are about equivalent to those dues paid by the trade union membership on a monthly basis.)

A professional man is proud of his profession, and it is meaningful enough to him that he will make every effort to attend annual meetings of his association, to read and contribute to his technical journal, and in other ways attempt to upgrade his professional capability. He is constantly aware of his personal appearance and how the public reacts to him, and, as a consequence, is dedicated to the welfare of his community, and participates actively in community affairs.

As I look at the total membership of IAMFES, evaluate the participation in the association affairs and attendance at annual meetings, I sometimes question whether we are in a position as individuals to say "I am a professional belonging to a professional organization."

We consistently have less than 10 percent of our membership at annual meetings, and the most recent mail balloting on a change in the constitution that greatly affects the procedure for electing officers of the association, yielded a total of 58 votes!

We regularly hear criticism that the Journal contains material too difficult to comprehend by the working sanitarian. This criticism is seldom accompanied by suitable material that can be comprehended, and certainly is contrary to the desire for professionalism to admit that you can not comprehend the material used by your profession.

A professional journal must carry material of professional caliber, if it desires to be so classed and recognized by other professional people. The journal provides the best and surest way of continually keeping before the scientific fraternity the professional status of the people who contribute, publish, and read the journal.

Undoubtedly, a great number of sanitarians could readily qualify for recognition as professional sanitarians. However, because of the wide range of individuals who have called themselves sanitarians, and in many cases continue to do so, the designation has not impressed the public as a high caliber occupation. In other words, we have not created an image in the minds of other people to indicate that sanitarians are professionals. This image may or may not be right. Nevertheless, ask the next 10 people you meet for a definition of a sanitarian, and you might be rather surprised at the image the man on the street has of the sanitarian as a profession.

Sincerely,
W. C. LAWTON, *President*, IAMFES

MINUTES OF ANNUAL MEETING OF IAMFES COUNCIL OF AFFILIATES, AUGUST 18, 1964 PORTLAND, OREGON

Minutes of the 1963 meeting were read and approved. Chairman R. P. March called for Committee reports. F. L. Kelley reporting for the Committee on Affiliate Association Award indicated that the committee had not agreed on an award but suggested that the award be based upon some type of point system which would consider affiliate program activities, percentage of sanitarians belonging to IAMFES, and percentage of sanitarians attending annual meetings. The Council agreed to request Mr. Kelley to present the material gathered by his committee to the Executive Board of IAMFES.

Chairman March asked each delegate to describe the dues structure for their respective affiliate. The ensuing discussion revealed considerable variation in affiliate dues. This was followed by a general discussion of the probable effect of a proposed IAMFES dues increase. An affiliate probably would be lost and the opinion was expressed that considerable loss in membership might result. Senior Past President Charles Walton gave an explanation of the need for a dues increase.

A most interesting and informative report was given by Mr. Darold Taylor, Milk and Food Branch, USPHS. Mr. Taylor has recently been assigned the responsibility of Sanitarian's Liaison Officer within the Public Health Service. He gave a summary of the organizational structure and objectives of the three principal national sanitarian associations. Similarities and differences were discussed. Mr. Taylor's presentation was followed by open discussion of the sanitarian registration programs and the development of professional sanitarians.

The meeting was concluded by election of Mr. Orlowe Osten as Chairman for 1965.

The following were in attendance

L. W. Brown	J. C. Olson, Jr.
E. M. Causey	O. M. Osten
D. J. Connor	R. M. Parry
M. W. Jefferson	J. M. Schlegel
F. L. Kelley	V. N. Simmons
Ben Luce	R. E. Stedman
R. P. March	D. W. Taylor
J. T. Mason	Chas. Walton

NOTICE

All IAMFES members are urged to consider submitting nominations for the annual $1,000 Sanitarians Award. We also invite suggestions for the Citation Award from any individual or affiliate. Submit your nominations and supporting evidence as soon as possible to:

H. L. Thomasson, Executive-Secretary
International Association Milk, Food & Environmental Sanitarians, Inc.
P. O. Box 437
Shelbyville, Indiana

The deadline is June 15, 1965

Nomination papers & information on the rules and procedures are available from the Executive-Secretary or from:

R. A. Belknap, Chairman
Committee on Recognition & Awards
1850 No. Lexington Ave.
St. Paul, Minnesota 55113

IAMFES, Inc. Committees 1965

COMMITTEE ON APPLIED LABORATORY METHODS

(Appointments expire 1966)

MEMBERS

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Burdet Heinemann, Producers Creamery, Springfield, Missouri.

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COMMITTEE ON BAKING INDUSTRY EQUIPMENT

(Appointments expire in 1966)

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COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN

(Appointments expire in 1965)

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Calvin E. Sevy, Staff Veterinarian, Milk and Food Branch, DEEFP, USPHS, Department of Health, Education, and Welfare, Washington, D. C.

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COMMITTEE ON DAIRY FARM METHODS

(Appointments expire in 1965)

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COMMITTEE ON ENVIRONMENTAL HEALTH PROGRAMS

(Appointments expire in 1965)

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COMMITTEE ON FOOD EQUIPMENT SANITARY STANDARDS

(Appointments expire 1966)

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COMMITTEE ON ORDINANCES AND REGULATIONS PERTAINING TO MILK AND DAIRY PRODUCTS

(Appointments expire in 1965)

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COMMITTEE ON RECOGNITION AND AWARDS

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COMMITTEE ON SANITARY PROCEDURES

(Appointments expire 1966)

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INTERIM REPORT OF THE COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN—1964

Progress is being made in revision of the booklet "Procedure for the Investigation of Foodborne Disease Outbreaks". While most of the work is being done by correspondence, the committee chairman has utilized travel for other reasons to have individual conferences regarding the booklet revision. Conferences have been held with other persons highly knowledgeable in specific areas of foodborne disease outbreaks. Association members who have used the "Procedure" or parts of it are urged to submit suggested changes to the committee.

It is hoped the revision will be completed within the next year.

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REPORT OF THE COMMITTEE ON FOOD EQUIPMENT SANITARY STANDARDS—1964

The Committee met twice during the last year, once during the 1963 Annual Meeting of the Association and again during July, 1964. These meetings were significantly important in understanding and carrying out the objectives of the Committee. However, the major responsibilities of the Committee were handled via correspondence, as in previous years.

This Committee is charged with the responsibility of cooperating with other interested organizations and industries in the formulation of sanitary standards and educational materials for the fabrication, installation, and operation of food equipment and to present to the membership those standards and educational materials which the Committee recommends be endorsed by the Association.

The purpose of this cooperative program is to aid industry to improve the design, construction and installation of equipment so that it will lead to easy cleaning and proper functioning when placed into service in food establishments. It is the Committee's further purpose to cooperate with industry in the preparation of standards or guidelines which public health agencies will accept, thereby securing uniformity in the manufacture and nationwide acceptance of such equipment.

The following report will outline the Committee's activities during the past two years in working with two health and industry organizations (National Sanitation Foundation's Joint Committee on Food Equipment Standards and the National Automatic Merchandising Association's Automatic Merchandising Health Industry Council) and progress in meeting its purposes and objectives. It is expected these organizations will be the two groups that the Committee will work with during the coming year.

NATIONAL SANITATION FOUNDATION (NSF)

The 1963 and 1964 Annual Meetings of the National Sanitation Foundation's Joint Committee on Food Equipment Standards were held in Ann Arbor, Michigan, April 9-12, 1963, and April 8-10, 1964, which the Chairman of this Committee attended. During these meetings appropriate consideration and action was given to proposed revisions of Standards 1, 2, 3, 4, 7, Basic Criteria C-1 and C-2, and to the development of Standard No. 12 for Automatic Ice Making Equipment and of Policies and Procedures for the Joint Committee.

Policies and Procedures for the NSF Joint Committee

The members of this Committee believing that the NSF Joint Committee on Food Equipment Standards would function better and more efficiently under a set of written policies and procedures recommended to the National Sanitation Foundation and to the other members of the Joint Committee that such written procedural guidelines be developed. The National Sanitation Foundation developed a proposed set of written policies and procedures for the Joint Committee; and prior to its approval at the 1963 Joint Committee Meeting, this Committee reviewed the proposal and offered comments to the Foundation.

Standard No. 1—Soda Fountain and Luncheonette Equipment

The proposed revision of Standard No. 1 was given tentative approval by the Joint Committee, and full approval was withheld pending a study of solder, solder requirements and limitations of use. This completed a two year review of Standard No. 1 by industry and public health officials, and this was the second of nine Standards to receive a major revision.

The significant changes and additions in this Standard include: uniform definitions; installation of screens in water lines to minimize malfunctioning of check valves; means of protecting the water supply from contamination by toxic copper due to the action of carbonic acid on copper water lines; increased coves on food contact surfaces; self-leveling devices; ventilating systems; construction and cleaning details for wheeled equipment; and performance standards for specified equipment.

Standard No. 2—Food Service Equipment and Appurtenances

Standard No. 2 as adopted by the Joint Committee in 1962 practically eliminated any possibility of large aluminum pots and pans meeting this Standard. It prohibited exposed screws, projecting screws, projecting studs or rivet heads in food contact surfaces. After much discussion and briefing by the NSF Staff, the Standard was amended to permit the use of "low profiled type (brazier head) rivets" properly affixed without open joints and seams to attach handles on pots and pans.

During the 1961 Joint Committee Meeting, it was deemed advisable to restrict the use of wood to cutting boards which could be removed for cleaning. This was based upon the lack of information as to the suitability of wood as a general purpose for food contact material. "It was the consensus of the Joint Committee (1961) that the reference to wood top tables (in Standard No. 2) should be deleted because of the difficulty in maintaining the surface of presently manufactured tables in a smooth, easily cleanable condition." The wood industry met with the Joint Committee during the 1964 Meeting and again urged that the Standard be amended to permit the use of wood top tables and meat blocks. It was indicated there were bonding materials for wood fabrication which would make wood a suitable food contact material but at the present time no data were available as to their effectiveness. The Foundation plans to explore the matter further in cooperation with the wood industry and to implement such research as may be necessary to determine what further use, if any, may be made of wood. The Committee will have an opportunity to review and comment on this research data in the future.

Standard No. 3—Spray-Type Dishwashing Machines

The NSF Staff presented to the 1964 Joint Committee a preliminary draft of a proposed major revision of Standard No. 3 and a recent research report of a Study of Commercial Multiple Tank Spray-Type Dishwashing Machines. Both the research report and the proposed revision of the Standard were recommended by the dishwashing machine industry. The Joint Committee did not have sufficient time to thoroughly study and evaluate these proposals. However, several comments were offered to and accepted by the industry and Foundation. The study indicated that the wash and rinse water temperatures of commercial multiple tank spray-type machines could be safely changed to 150°F. for the wash water and 160°F. for the power rinse water with the final rinse water remaining at 180°F. without altering the speed of the conveyor. The revision of the Standard seemed to be concerned with up-dating the provisions, making the Standard consistent with C-2 and other Standards, and including those machines which use chemicals rather than hot water to sanitize utensils. It is hoped that the revised Standard will include all other existing utensil washing and sanitizing machines. Copies of the proposed revision and study should soon be available for this Committee's perusal and comment.

Standard No. 4—Commercial Gas and Electric Cooking and Warming Equipment

The Joint Committee felt that Standard No. 4 encouraged the holding of potentially hazardous foods at only warm, unsafe temperatures and, consequently, amended the first sentence of the Item "Units for Storing Warm Foods" by substituting the word "hot" for "warm". The sentence now reads: "Equipment for use in keeping hot food or utensils hot, ...". It also was deemed advisable to change the title of the Standard prior to the next printing from the present "Gas and Electric Cooking and Warming Equipment" to "Gas and Electric Cooking and Hot Food Storage Equipment". This change is necessitated by the large number of operators using the steamtables and similar hot food holding equipment to heat cold foods to serving temperatures.

Standard No. 7—Food Service Refrigerators and Storage Freezers

After a year of thoroughly studying and considering all aspects and ramifications of a proposal to change the classifications of walls and ceilings of prefabricated walk-in refrigerators from food zones to splash zones, the walls and ceilings were reclassified as splash zones, provided however the inside walls, ceilings, and floors of such refrigerators would be required to meet the design and construction section's general provisions, those for corners or angles, and the soldering provisions of the Standard. The definition of the food zone was also amended to conform with Basic Criteria C-2 with the one exception that the refrigerated interior of reach-in refrigerators would be considered "food zone".

This Committee was recently requested by the Foundation to vote on a proposed amendment to change the racks and shelves of walk-in refrigerators from food zone to splash zone. After much discussion of the current and common practices of the food service industry in storing unpackaged food in direct contact with such equipment, the Committee voted in favor of retaining the present classification for racks and shelves.

Standard 12—Automatic Ice-Making Equipment

The manufacturers and users of such equipment and public health officials have long recognized the need for properly designed and constructed automatic ice-making equipment. Standard No. 12 which has been under development for the past three years was reviewed for the first time by this Committee during April, 1963. A final draft of this proposed Standard was reviewed and comments were submitted during the year by this Committee. At the 1964 Joint Committee Meeting, general review of the ice-making equipment proposal was conducted and tentative approval was given with the understanding that the areas of the Standard involving solder would be subject to modification based upon an exploratory study being conducted by the Foundation on the requirements for solder and appropriate use areas. The manufacturers indicated that the industry would require approximately 24 months to effect the necessary redesign and retooling to produce equipment in compliance with the Standard.

General

The proposed requirement for casters was reviewed several times by the Committee and was finally adopted by the Joint Committee at the 1964 Meeting. The Joint Committee recommended that these requirements be made a part of the NSF Basic Criteria C-2 and other food equipment standards where applicable.

The National Sanitation Foundation requested that the public health member organizations of the Joint Committee take a definite position on incorporating safety features in the NSF Standards. These organizations generally agreed that the Standards and Criteria should relate specifically to sanitary features; but if safety devices were installed in or on food equipment, they should comply with applicable sanitary provisions of these guidelines.

The Use and Ware Tester which has been under development for the past five years is now considered to be ready for sample evaluation. This new technique according to the Foundation Staff permits factual determination of the suitability of a given food contact material and finish, by recreating on an accelerated basis the actual use and wear conditions to be found in a specific use environment.

The National Sanitation Foundation has been exploring with the 3-A Symbol Council the possibility of evaluating equipment using the 3-A Standards and compliance with these Standards as a basis for issuing the Seal of Approval. In case this plan should not prove feasible, the Foundation and Joint Committee would consider the advisability of adopting the 3-A Standards by reference, thus making them NSF Standards.

Future Projects

In the coming year the development of standards or criteria in the following areas is expected to be initiated: Plasticware, detergent dispensers for commercial dishwashing machines, build-in place walk-in refrigerators and storage freezers for food markets, installation guide for all food equipment. Plans are also being made to replace the present Basic Criteria C-1 with two Criteria, one to cover coin-operated vending machines and the other one for manually-operated vending machines.

NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION (NAMA)

The National Automatic Merchandising Association's Automatic Merchandising Health-Industry Council held its seventh annual meeting September, 1963, and this Association, represented by the Chairman of this Committee, and other public health organizations and the manufacturers and operators of vending equipment were at this meeting and participated in the Council's deliberations concerning the Evaluation Manual, the Public Health Service's 1957 Recommendations for Vending of Foods and Beverages, scoresheet for the evaluation of machines, industry spot checking program, conversion of machines, and labeling of foods and machines.

Evaluation Manual

A number of major changes in the Evaluation Manual, including revision of definitions and provisions for wet storage of food, protection of product contact surfaces, design and construction, cleanability of product contact surfaces, material requirements in conformance with U. S. Food and Drug Administration "Food Additives Amendment", and access for cleaning and inspection, were among items reviewed and adopted during the AMHIC meeting. Many of these changes had been recommended by this Committee during the past two years.

It was the consensus of the Council members there was a continuing need for amending and elaborating on various items contained in the Manual. As an example, a need for more specificity for ice makers in soft drink machines has been evident for some time. Consequently, a subcommittee has been appointed for developing specific requirements for ice maker components of vending machines. Specifications for the construction of can openers and similar items were also suggested as appropriate topics for elaboration in the Manual. It is felt that major work on the Manual in the near future will be concerned with revising the Manual to make it more specific, thereby promoting more uniformity in the manufacture and evaluation of vending equipment.

Checklist for Use in Evaluating Machines

The present checklist has been used by the NAMA Evaluation Agencies since 1957, and it has not been revised to include new requirements which are contained in the Manual. The Council recommended that the NAMA and the evaluating agencies begin the checklist revision and consider including introduction of data sheets to personalize the machine being tested, the addition of boxes indicating compliance and non-compliance, and cross-referencing of the checklist with the Evaluation Manual. A preliminary draft of the proposed revision of the checklist should be available soon for review and comment by this Committee.

Conversion of Machines

It was brought to the attention of the Council that some of the machines which were manufactured in compliance with the Evaluation Manual and for which a Letter of Compliance had been issued were being rebuilt by some service agencies in such a manner as to no longer comply with the Manual. At the recommendations of the Council, the NAMA has secured a list of all known organizations which rebuild machines and has sent a letter and all available literature concerning the Council and the NAMA Evaluation Program to these organizations, stressing the importance of maintaining the public health status of the machines.

Some of the operators are creating another problem which nullifies the manufacturers' and evaluation agencies' efforts in making properly designed and constructed machines available to the operators and public. As an example, some of the operators or installers remove the legs from the machine, leaving a space for the accumulation of soil and vermin and an inaccessible cleaning area between the floor and the machine. The location fronts which are attached physically to existing machine doors also introduce potentials for insect, rodent, and soil harborages. It was the opinion of the Council members that the suppliers of conversion kits should have the kits cleared by the evaluation agencies before offering them for sale. In order to alleviate to some extent this problem, it was recommended by the Council and agreed to by the NAMA that a notice suitable for operator mailing, which would bring to the operator's attention the common errors observed in shop conversion of approved machines, would be prepared and distributed to appropriate persons.

All persons concerned with maintaining the machines in compliance with public health standards should check the service organizations, operators, and installers of vending equipment in their respective communities to determine if they are familiar with the evaluation program.

Public Health Service 1957 Recommendations for the Vending of Foods and Beverages

The Evaluation Program requires that a machine evaluated under the Evaluation Manual must first comply with all of the applicable provisions of the 1957 Recommendations of the Public Health Service for the Vending of Foods and Beverages. Recognizing the significant changes in the vending industry during the past seven years, the Public Health Service recently asked the states to comment on possible revision of its 1957 Recommendations. As with the 1957 version, the Public Health Service plans to confer with the NAMA on revision of the PHS Code. Consequently, AMHIC was requested by NAMA to offer any suggestions for revision of the Code. This Committee has already reviewed possible Code changes and offered its comments to AMHIC.

In all machines manufactured in the past which met the requirements of the Evaluation Manual and which were having temperature control problems with a readily perishable food or ingredient would not vend any food or ingredient, regardless whether it might be a nonperishable one, until serviced by the operator. Based upon a recent interpretation of the Public Health Service that the intent of the readily perishable food cut-off control requirement was to preclude further sale of a perishable product or ingredient and not necessarily to make the entire machine inoperative resulted in this interpretation being incorporated into the Manual.

Industry Spot Checking Program

The vending industry is presently studying a follow-up program for the spot checking of certified vending equipment for the purpose of determining compliance with the Vending Machine Evaluation Manual and would include an annual reconfirmation of the manufacturer responsibilities by affidavit. It would also require one designated person in each manufacturing company to be held responsible for reporting on renewal affidavits, plans for construction changes and other reportable information. It was recommended by the Council that the spot checking program include a requirement to terminate any Letter of Compliance issued to a manufacturer who fails to return an annual reconfirmation. This spot checking proposal or industry self-policing proposed program should be available to this Committee in the near future for comment and will be considered by AMHIC at its 1964 Meeting.

Labeling

Most of the vending machines are sold in interstate commerce and many are also operated in interstate commerce so that proper and uniform labeling of the product is recognized as essential for free flow of trade. Therefore, a special committee composed of public health and industry representatives of the Council has been instructed to prepare a Report on Product Labeling for the Vending Industry and have it reviewed by appropriate authorities prior to submitting it to the Council at the 1964 Meeting. This report should prove to be of much value to the vending industry and regulatory agencies.

At the 1963 and 1964 Meetings of the AMHIC, the Chairman of IAMFES Food Equipment Committee was elected Co-Chairman of the Council to represent the public health group.

General

The NSF Joint Committee on Food Equipment Standards as well as the NAMA Automatic Merchandising Health-Industry Council are to be commended, as they both reserved approximately one-half day prior to the start of their official annual meetings for the public health representatives to review technical aspects of the programs and to discuss public health objectives and policies to be followed in their work with the entire membership of the Committee and Council. This was a valuable experience for the Association's representative and enabled the public health members to coordinate and clarify their views, thereby expediting the work of the two groups.

Recommendations

1. The Association reaffirm its support of the National Sanitation Foundation and the National Automatic Merchandising Association and continue to work with these two organizations in developing acceptable standards and educational materials for the food industry and public health.
2. The Association urge all sanitarians to obtain a complete set of the National Sanitation Foundation's Food Equipment Standards and Criteria and a copy of the National Automatic Merchandising Association-Automatic Merchandising Health-Industry Council's Vending Machine Evaluation Manual; also to evaluate each piece of food equipment and vending machine in the field to determine compliance with the applicable sanitation guidelines, and to let the appropriate agency know of any manufacturer, installer, or operator failing to comply with these guidelines.
3. The Association urge all sanitarians and regulatory agencies to support the work of the Association's Committee and subscribe, by law or administrative policy, to the Standards and Criteria and the Evaluation Manual for food equipment and vending machines.

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REPORT OF THE COMMITTEE ON BAKING INDUSTRY EQUIPMENT—1964

Since our interim report the Committee on Baking Industry Equipment has had two meetings with the Baking Industry Sanitation Standards Committee (BISSC). One meeting was held October 11-12, 1963; the other February 28-29, 1964; both meetings were held in Chicago, Illinois.

To date, 23 Standards have been written and published. There are 14 other Standards in various stages of development, ranging from "development pending" to "final approval pending." In addition, the older Standards are being rewritten and modernized. This is necessary due to the tremendous amount of mechanized equipment being installed in our modern bakeries, equipment which was not available when the first Standard was published in 1952.

BISSC is actively working on an Office of Certification program designed to provide a control over equipment manufactured to conform to BISSC Standards. This Office of Certification is similar to the 3A program which has done such an excellent job in achieving wide acceptance and usage of sanitary milk handling equipment.

The purposes of the Office of Certification are:

1. To promote the public's health through the use of bakery equipment of sanitary design thereby producing a more sanitary product.
2. To encourage bakery owners to purchase equipment conforming to BISSC Standards.
3. To receive applications and grant approval for the use of the BISSC symbol.
4. To publish lists of equipment meeting the Standards and authorized to use the BISSC symbol.
5. To determine that the symbol is being used only by those manufacturers authorized to do so and on equipment duly certified to conform to the pertinent Standard.

The control of the Office of Certification will be vested in the Board of Directors of BISSC who shall appoint or approve a Director of Certification who will be the presiding officer and four other men selected from the baking industry, the bakery equipment manufacturers, the sanitarian organizations and a member from a health department actively supervising a bakery inspectional program.

It is expected with the initiation of the Office of Certification that the awareness of BISSC and its activities will become more familiar both to sanitarians and bakery owners. The end result should be reflected in the production of a more sanitary and appetizing product adding another link in the chain of total consumer protection, a goal which sanitarians are actively working for everywhere.

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REPORT OF THE COMMITTEE ON FROZEN FOOD SANITATION—1964

This Committee selected two projects for study during the 1963-1964 period. The public is exposed to a great deal of misinformation regarding the safety, wholesomeness and nutritional value of our food supply. Much of this material is presented in a sensational manner calculated to raise serious doubts as to the effectiveness of the programs and activities of the regulatory agencies. This Committee is studying the feasibility of developing a pamphlet or information document which would emphasize the respective roles of the sanitarian and the industry in building up and maintaining the quality and wholesomeness of our food supply. We believe that it is important to give emphasis to the positive actions that contribute to the safety of our foods to counteract some of the adverse publicity and misinformation that is being peddled to the consuming public.

Our first thought was to confine this to frozen foods, but later felt that it could be expanded to include other fields of interest to the members of the Association. Our work on this project has not reached the point where we have a concrete proposal to offer the membership at this time, but we believe the idea has merit and should be further pursued.

Our second project was to compile information concerning the new freeze-dry method of preserving foods. Since earliest times, man has faced the problem of storing and preserving his food. Dr. Jensen, the noted bacteriologist, once stated: "Reduced to its very fundamentals, the manufacture and subsequent handling of food products may be considered as a race between man and microbes to see which will be the first to consume such materials." As you know, most "bad" food is simply being consumed by spoilage organisms or bacteria.

One of man's oldest preservation techniques is drying by hot air or dehydration by heating. This method often left vegetables discolored and meats were tough and impossible to reconstitute. Although modern methods of air drying, utilizing heated air at controlled temperatures, humidity, and velocity, have minimized heat damage and changes in color, flavor, and texture, all of us who served in World War II can testify that these products still leave something to be desired. Meats in particular, when air dried, are tough and unappetizing. This is because of the effect of heat on the proteins in the meat causing shrinking and toughening.

The new freeze drying technique avoids this by operating below zero, using the principle of sublimation. This means that ice is changed from the solid state to the gaseous state without passing through the liquid state. Sublimation is seen when a wet sheet is hung outside on a frosty day. It first freezes, then dries, the water turning from solid to vapor without passing through the liquid state.

The principle of freeze drying is simple. The food is first fast frozen and then, in the frozen state, is placed in a chamber and subjected to a high vacuum. At this high vacuum, the moisture in the ice of the product sublimes and is collected on a condenser. Although heat is added, the vacuum or negative pressure is such that the point of sublimation is below the freezing point so that the ice does not melt, but passes directly from the solid to the vapor state. Evaporation of the moisture produces a cooling effect that helps to maintain the food in frozen form. Conventional air drying reduces the moisture content uniformly throughout the product as it is dried. This causes shrinkage and toughening of the food. In freeze drying, moisture is removed from the outside in. Therefore, the outer section of the food is completely dried while the inner section is still completely saturated but frozen. This slow subliming of the ice crystals leaves small cavities in the food and produces a sponge-like structure which will reconstitute readily.

Freeze drying avoids chemical changes in heat labile components and prevents the loss of volatile constituents of the food. Therefore, the volatile oils and flavor components remain so that the flavor remains in the food. In freeze drying, food retains its original shape and, because the drying takes place at freezing temperatures, a minimum amount of heat damage occurs during drying. In present-day processing of freeze dried foods, the moisture content of the finished food is reduced to 2% or less. This, of course, deprives the bacteria of the water necessary for reproduction.

When the moisture content of the food has been reduced to 2%, the drying chamber is backflushed with nitrogen and the product is removed for packaging. Since it is necessary to exclude moisture and oxygen, many of the freeze dried products are nitrogen packed although vacuum packaging is also used. Both cans and plastic pouches are being used. Cans, of course, provide better mechanical protection to the product and it is easier to obtain a satisfactory seal with a can than with a plastic pouch. Freeze dried foods must be in effectively sealed packages to prevent oxidation and the re-entry of water.

Final products are, dehydrated products—not frozen products. Properly packaged, they can be stored for long periods of time at room temperature with a minimum of deterioration. The shelf life will depend on the quality of the original raw product, the care with which it was freeze dried, and the effectiveness of the seal on the package. Finished products are very light weight. For example, 100 pounds of beef reduces to 42 pounds, and 100 pounds of mushrooms weigh only 10 pounds after drying.

Of course, there are several disadvantages to the process. Many foods, particularly the meats, look extremely unappetizing when the natural moisture is removed. Packaging of freeze dried foods is difficult and costly since it is necessary to exclude moisture and oxygen from the product. However, the affinity of the freeze dried products for water is also a distinct advantage because it enables the product to be rehydrated more quickly and completely than foods dried by other methods. The necessity to vacuum pack or nitrogen pack is also a disadvantage. Processing costs of freeze drying are high. This is because the food must first be frozen, then freeze dried, then canned or otherwise packaged. Therefore, an additional processing step, which is fairly expensive, has been introduced. Because of high processing costs and relatively small volumes, prices of freeze dried products are high. For example, peas and corn that have been freeze dried command a wholesale price of $1.50 to $2.00 per pound. Green beans, strawberries, and peaches sell at about $4.00 per pound of dried weight. Cottage cheese is about $2.50 per pound of dried product. Meat may sell as high as $8.00 to $10.00 per pound of dried product.

It is not necessary to rehydrate freeze dried foods with water. Freeze dried strawberries and peaches are being tested in breakfast cereal. Corn flakes and strawberries and corn flakes and peaches are being sold in foil-overwrapped cartons. The fruit ingredient is said to reconstitute within 30 seconds in milk or cream. Strawberries or peaches could also be rehydrated with syrup or fish with dilute lemon juice. It has been suggested that it would be possible to rehydrate these freeze dried foods with beer, wine, brandy, or similar beverages which could lead to some exciting culinary achievements.

At the present time, there are several categories of food being freeze dried commercially. First, there are products which are shredded or diced, or otherwise prepared, and are not heated or blanched during this preparation. Cabbage, peppers, celery, and other salad type ingredients, are examples. Any contamination in the product, whether natural or introduced during the preparation stage, will remain in the product since only a limited number of bacteria are killed in the drying process. These products are normally rehydrated in cold water, so all viable organisms in the products will be eaten by the consumer. Therefore, it is imperative that a high degree of personal cleanliness and sanitation be maintained in the processing plant to reduce the bacterial load in these products.

A number of the vegetables now being freeze dried are blanched in the preparation stage. This blanching is usually accomplished by exposing the product to steam or hot water long enough to inactivate the enzymes. These products are usually rehydrated by a short cooking period, although some of the tender ones, such as peas, can be used immediately after rehydration with hot water. The blanching will kill most of the bacteria present and should result in a product with reasonably low bacterial count. Dehydration will lower this count slightly. If coliforms are found in the final product, this would certainly be an indication of recontamination of the product after blanching through careless personal habits of employees or inadequate cleaning of the equipment used to handle the food.

Cooked dehydrated vegetables are merely rehydrated in hot water and are ready to eat. During preparation, these products are cooked and then freeze dried. Since cooking should kill most of the bacteria, any appreciable number in the finished product are probably the result of mishandling during processing, handling and packaging. This would be particularly true of salmonella organisms. Since rehydration in hot water cannot be expected to kill all of the contaminating organisms, strict sanitary practices during production are necessary.

The raw dehydrated meats are sliced or formed and frozen before freeze drying. Other than the effect of dessication, there is nothing in this process that will kill bacteria. Therefore, any bacteria present in the raw meat and any contamination introduced during the preparation phase will be present in the finished product. The saving grace in this category is that the meat will be rehydrated and cooked before eating.

Cooked dehydrated meats are only rehydrated in hot water and are eaten without any further cooking. During the preparation stage, the cooking process should kill practically all of the bacteria and the presence of coliform or other sanitary index organisms would indicate recontamination through mishandling or poor sanitation practices during the preparation and subsequent handling of the cooked product. Since this type of food is eaten after rehydration in hot water but with no further cooking, strict sanitation practices should be followed throughout preparation and handling.

In general, freeze dried foods which are prepared without blanching or cooking and are subsequently rehydrated with cold water or not cooked during the final preparation stage, present potential hazards if they should become contaminated with pathogenic organisms during their preparation. A freeze dried product which is to be rehydrated and cooked before eating may present less of a public health hazard, but is certainly not excused from satisfactory handling and processing methods to minimize contamination of the product. Since there is nothing in the freeze drying method which will be lethal to any appreciable number of bacteria, it is essential that the bacterial population be kept at a minimum during the processing and packaging operations. Drying in the frozen stage eliminates the possibilities of bacterial growth during this stage of processing, but it also minimizes the number of bacteria that are killed during drying.

The Quartermaster Food Container Institute's Industry Advisory Committee is of the opinion that bacteriological standards must be established for precooked, freeze dried foods. The suggested standard is 5,000 standard plate count per gram with staphylococci and probably E coli absent in 0.1 gram dilution. No recommendations have been made concerning other classes of freeze dried foods.

This report has touched only the high points in the freeze drying process. The development of any new method of food preservation offers a challenge to regulatory officials because, through his efforts in the commercial plant, quality control becomes easier and more effective, and wholesomeness can better be assured. It is essential that we understand what the hazards are. It is during the processing and handling that the quality of the final product is determined. The condemning of low quality or contaminated items in the food market is not the place to start. Every food manufacturing concern should be encouraged to install and maintain good sanitation practices to prevent undesirable products from being marketed. It is evident that this step would ease the task of regulatory officials. It is also evident that effective sanitation can play an important role in bringing good quality, wholesome, and nutritious products to the consumer. The control of heavy bacterial contamination becomes increasingly important as consumer demands turn to the use of convenience foods that are served in the home without cooking or heating, or after short periods of cooking at relatively low temperatures.

Frank E. Fisher, *Chairman*
Glen C. Slocum
H. P. Schmitt
G. L. Hays
Eaton E. Smith
A. C. Leggatt
J. L. Adams
George E. Prime

REPORT OF THE COMMITTEE ON SANITARY PROCEDURE—1964

Because of the change in the frequency of making full reports this report will, in fact, be a report in brief of 1963-64 activities of this Committee.

As the new year 1964 was ushered in, our Committee was deprived of three faithful members: C. K. Luchterhand by reason of schedule complications and travel authorization; R. L. Sanders absorbed so much in committee that USPHS convinced him their side of the conference table had softer seats; and I. E. Parkin arrived at that old age of retirement and the last report indicated he had started around the world to sell the "Parkin" way of life.

Scheduled Meetings

1. January 9, 1963—Ad Hoc on Plastics, the Committee was represented by W. K. Jordan and R. M. Parry.

2. March 12-14, 1963—3-A Sanitary Standards Committees, Atlantic City, New Jersey. During this meeting the following were completed for signature: (*a*) Plastics Standard, (*b*) Air Under Pressure, (*c*) Rubber Amendments (11), (*d*) Pump Standard (Revised), (*e*) Fitting Standards Amendments, and (*f*) Fitting Standards Amendments to Supplement No. 5.

3. May 3, 1963—Joint Meeting D.I.C. and 3-A Sanitary Standards Committee—to Implement Plastics Standard Committee, Washington, D. C., represented by C. A. Abele, D. B. Whitehead.

4. June 19, 1963—Ad Hoc on Transportation Tanks, Chicago, Illinois, represented by C. A. Abele, D. B. Whitehead.

5. June 20, 1963—Ad Hoc on Silo Storage Tanks, Chicago, Illinois, represented by D. B. Whitehead, C. A. Abele, R. M. Parry, W. K. Jordan.

July 17, 1963—Ad Hoc on Batch Pasteurizers, Chicago, Illinois, represented by C. A. Abele, James Meaney, Milton Fisher.

7. October 1, 1963—3-A Committee's, Cincinnati, Ohio. During this meeting the following were accepted for editorial polishing and signature: (*a*) Sio-Type Storage Tanks, (*b*) Ice Cream and Cottage Cheese Fillers (2 Separate), (*c*) Transportation Tanks Amendment, (*d*) Batch Pasteurizers, (*e*) Batch Processors, (*f*) Electric Motors (Rescinded), and (*g*) Revised Standard Operating Procedure.

8. January 14, 1964—Ad Hoc on Welded Pipelines, Chicago, Illinois represented by D. B. Whitehead, C. A. Abele.

9. January 15, 1964—Ad Hoc on Stainless Steel, Chicago, Illinois represented by D. B. Whitehead and C. A. Abele.

10. February 4, 1964—Ad Hoc on Dry Milk Sifters—Committee on Sanitary Procedure was not represented.

11. May 5-7, 1964—3-A Committees, Bal Harbour, Florida. At this meeting, with editing and one appendix to be completed, the following were voted for signature: (*a*) Dry Milk Sifters, (*b*) Plastics Amendments (9), (*c*) Air Under Pressure Amendments (reference: Pure Pak), and (*d*) Transportation Tanks Amendment (to handle Electric Motors rescinding).

Future considerations will include: (*a*) Fittings Supplement, (*b*) Nickle Alloy, (*c*) Stainless Steel, and (*d*) Welded Pipelines.

The Chairmen and C. A. Abele represented the Committee on Sanitary Procedure and IAMFES in a tribute to Dr. E. H. Parfitt who retired as 3-A Chairman October 1, 1963. Mr. Dean Stambaugh assumes responsibility as the new Chairman.

It is also worthy of note that Tom Burress and George Putnam have been lost to the cooperative effort of 3-A Committees by reason of retirement. Their effective imprint on accomplishment is truly indelible.

Summary

Exceptionally fine attendance was maintained at the three regular meetings of the fall 3-A Sanitary Standards Committees in spite of some communication problems due to mailing procedures. Remedial efforts have corrected this difficulty.

There remains some problem relative to Stainless Steel finishes and composition which are in process of study. Cleanability-criteria, terminology, its application within the frame work of standards, and how to properly treat continues to be a serious consideration. This is brought on by rapid changes in technology, equipment design and variety of construction materials.

All of the meetings during the past two years, seasoned with the usual spice of the democratic process and a zesty mixture of politics and statesmanship have been most productive and stand as a great tribute to the cooperative efforts of the 3-A Committees.

Dick B. Whitehead,
Chairman,
Klenzade Southern, Inc.,
Jackson, Mississippi

C. A. Abele, *Co-Chairman,*
The Diversey Corporation,
Chicago, Illinois

D. C. Cleveland,
County Health Department,
Oklahoma City, Okla.

Kenneth Carl,
State Dept. of Agriculture,
Salem, Oregon

Pat Dolan,
State Dept. of Agriculture,
Sacramento, California

M. R. Fisher,
St. Louis Health Dept.,
St. Louis, Missouri

Harold Irvin,
Douglas Health Dept.,
Omaha, Nebraska

W. K. Jordan,
Cornell University,
Ithaca, New York

Joseph J. Karsh,
Allegheny-City Health Dept.,
Pittsburgh, Pennsylvania

James A. Meany,
Chicago Board of Health,
Chicago, Illinois

Sam O. Noles,
State Health Dept.,
Jacksonville, Fla.

Richard M. Parry,
State Dept. of Agri.,
Hartford, Conn.

George H. Steele,
State Dept. of Agriculture,
St. Paul, Minnesota

H. L. Thomasson,
Ex-Officio,
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1964 ANNUAL REPORT OF THE 3-A SANITARY STANDARDS SYMBOL ADMINISTRATIVE COUNCIL

Because IAMFES is one of the three corporate partners in the 3-A Sanitary Standards Symbol Administrative Council, it has become customary to present a report of the activities and actions of the Council during business sessions of this Association.

No meetings of the Board of Trustees of the 3-A Symbol Council have been held since the 1963 Report was presented in Toronto. Meetings of the Trustees were not held in conjunction with meetings of the 3-A Sanitary Standards Committees, in Cincinnati in the Fall of 1963, and in Bal Harbour, Florida, in the Spring of 1964, because not matters of sufficiently serious nature to warrant the required time and travel of busy executives required consideration by the Board of Trustees.

Although a few authorizations have not been renewed upon their expiration, a sufficient number has been applied for, and issued, to maintain Council operations at a consistently uniform level during 1963 and 1964, as a glance at the following tabulation of authorizations in effect during these two years will reveal.

3-A SYMBOL AUTHORIZATIONS ISSUED AND IN EFFECT OCT. 15, 1963 and AUG. 1, 1964

Equipment	Authorizations issued	Authorizations in effect Oct. 15, 1963	Aug. 1, 1964
Storage tanks	25	20	17
Pumps	11	7	10
Weigh cans	0	0	0
Homogenizers	3	3	3
Automotive tanks	24	20	18
Electric motors	2	0	0
Can-type strainers	0	0	0
Piping fittings	14	11	11
Thermometer fittings	1	1	1
Pipe-line filters	1	1	1
Heat exchangers—plate	8	7	7
Heat exchangers—tubular	2	2	2
Farm tanks	36	25	24
Leak-protector valves	4	4	4
Bulk milk dispensers	6	5	6
Evaporators	6	5	5
Fillers and sealers	5	5	5
Freezers	2	1	2
	150	117	116

Twelve authorizations have been relinquished since January 1, 1963, but only one since January 1, 1964. One of these relinquished authorizations was really a transfer.

Four new authorizations have been issued since January 1, 1964. (These statements cannot be coordinated with the data in the tabulation, because the periods covered do not coincide.

When the 3-A Sanitary Standards for Frozen Desserts and Cottage Cheese Packaging Equipment, Silo-Type Storage Tanks, and Non-Coil Type Batch Pasteurizers and Processers become effective, respectively, in January, February, and March, 1965, a corresponding increase in the number of authorizations in effect may be anticipated.

The adoption of 3-A Sanitary Standards for materials, such as rubber and plastics, necessitating amendment of numbers of extant 3-A Sanitary Standards, presents the 3-A Symbol Council with the necessity for cinsiderable administrative adjustment prior to the effective date of the amended 3-A Sanitary Standards. In the case of the amendments pertaining to rubber (conformance to the 3-A Sanitary Standards for Multiple-Use Rubber . . . which became effective on July 26, 1964, signature of reprints of amendments, and information concerning the classes of rubber employed, had to be obtained from 61 holders of 76 authorizations, and letters validating the authorization certificates in effect have had to be mailed. This procedure will have to be repeated before the amendments requiring conformance to the 3-A Sanitary Standards for Multiple-Use Plastic Materials . . ., adopted at the Bal Harbour meeting in May, become effective.

The paucity of reports of non-conformance to pertinent 3-A Sanitary Standards by equipment bearing the 3-A symbol has been a theme of foregoing Annual Reports of the 3-A Symbol Council. Reports of instances of non-conformance have not been significantly more numerous during the past ten months; but those received revealed short-comings in the 3-A Sanitary Standards rather than non-conformance, and have been referred to appropriate Task Committees of the Dairy and Food Industries Supply Association for consideration with respect to tightening provisions of the 3-A Sanitary Standards.

As has been reported to the Executive Committee, the financial status of the 3-A Symbol is such as to relieve the Association of the early prospect of fiscal rescue operations. Indeed, the reverse is not a remote potentiality.

D. C. Cleveland, *Trustee*
M. R. Fisher, *Trustee*
K. G. Weckel, *Trustee*
C. A. Abele, *Secy.-Treas.*