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DAIRY, FOOD AND ENVIRONMENTAL

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A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

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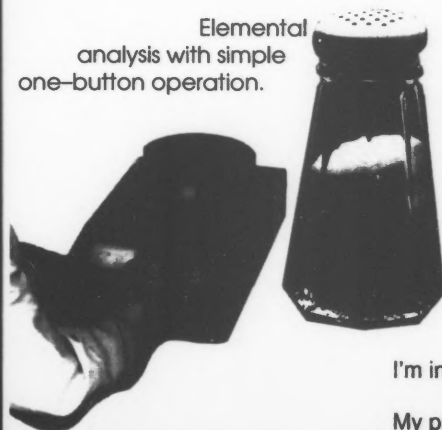
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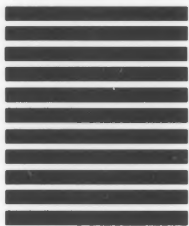
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# Thoughts From the President . . .

As my term as IAMFES President comes to a close, I want to look back on our goals for 1988-89 and see what progress your executive board and our association has made.

**Goal #1** — Strive for 3,700 individual members

As of July 23, 1989 have 3,100 individual members; that number includes 600 new members and 563 individuals who did not renew their membership in 1989. In addition, there are also 1,100 agency subscribers and 270 direct subscribers to our journals. It is obvious that we all must encourage colleagues and friends with interests in food protection to become active members of IAMFES and to renew their memberships annually.

**Goal #2** — Strive for 900 professional attendees at our Annual Meeting in Kansas City on August 13-17, 1989.

As of the middle of July, there are 450 individuals pre-registered for the meeting. With the quality of the technical program, the exhibits and our social program, I think that we will come very close to achieving our goal.

**Goal #3** — Continue to strengthen the Annual Meeting program and related activities.

This year with the organization and implementation of an annual meeting program advisory committee, the technical program continues to improve. Our 76th meeting in Kansas City featured the Ivan Parkin Lecture, given by Dr. R. B. Read, Jr. and about 124 presentations on food safety, sanitation and environmental topics. There were also 16 graduate students from eight different universities who competed for the prestigious IAMFES Developing Scientist Award. In addition, there were 66 table-top educational exhibits at the meeting. For the first time, registration was handled by the Ames office and the procedure worked out very well.

**Goal #4** — Streamline, upgrade and further improve policies, procedures and communications with our association.

The Ames office staff is continually reviewing and updating policies and procedures to reflect the changing nature of our membership and their diverse needs. With the selection of a new Executive Manager, I'm sure that these areas will continue to receive a very thorough review.

Our two outstanding journals serve as our main communication vehicles and provide a great deal of information to members and subscribers. We are constantly encouraging members and affiliates to provide technical papers and information on their activities for these publications. This monthly column, "Thoughts From The President" has been an attempt to improve communications to the membership and stimulate some thoughts about key issues, board activities, and getting more members involved in our organization.

**Goal #5** — Improve and strengthen the structure and activities of all IAMFES committees.

The committee system is the lifeblood of any organization and ours is no exception. In the past year, several new committees have been formed while others have been dissolved. Each Vice President for the last several years (including current VP Bob Sanders) has devoted a great deal of energy to assisting committee chairs with their goals and objectives. This important work needs to continue in the future. For the last three years, all committee chairs have met as a group with the board to discuss concerns and suggestions for improving our system. We certainly need more members to become actively involved in committee affairs.

**Goal #6** — Continue to improve communication and services to our affiliates and all of our membership.

Our Council of Affiliates Chairman, Bill Coleman, has been working on improving election procedures for the Council Chairman's position. Some valuable input has been received from affiliate representatives on this important topic. More work is needed to continue strengthening our affiliate system and in providing services to the affiliates.

The IAMFES Audio Visuals Library has been a huge success since its inception a few years ago. There are currently 24 visual aids in the dairy, food and environmental areas. Over 290 members have used the library in the last year and there is a waiting list for the most popular training programs.

Dee Buske and our Ames office has represented the association at 30 meetings throughout the United States in the last year. They have carried the IAMFES exhibit to meetings like the *International Dairy Show*, the *International Expo of Food Processors*, the *Conference for Food Protection* and many others. They have also attended 13 affiliate and state environmental



By  
**Robert B. Gravani, Ph.D.**  
IAMFES President

health association annual meetings and provided an IAMFES presence at these sessions. New members, exhibitors, and advertisers were generated from these visits.

**Goal #7** — Begin to implement the Long Range Planning Committee's recommendations.

The Long Range Planning Committee, chaired by Dr. Michael Wehr, did an outstanding job of studying the status for our organization and developing some excellent recommendations to guide IAMFES in the next 3-5 years. Many of these recommendations are currently being implemented.

**Goal #8** — Complete an IAMFES Policy Manual.

Under the direction of Leon Townsend, the first draft of an IAMFES policy manual has been completed. This manual should be very useful to new executive board members, committee chairs, affiliate officers and others who are interested in the procedures and policies of IAMFES. Plans to periodically review the manual and keep it updated are now being discussed.

Well, how have we done on accomplishing our goals? My feeling is that we've made a great deal of progress on some of them, "broken some ground" on others, and made a little progress on a few of them. In all, I think that we have done well, but the job must be continued. Periodic reviews of our entire organization, goal setting and prioritizing and implementation of action plans to strengthen the organization must be undertaken on an annual basis. One important saying summarizes my feelings on this topic. It is, "The largest room in the world is the room for improvement." IAMFES, no matter how good it is, if it is going to grow and prosper and meet the needs of our membership in the 1990's and beyond needs to constantly improve. Your board is committed to this challenge!

I have been honored to be your President during the past year and hope that I have served you and IAMFES well. My work has been directed toward strengthening the organization and improving services to our members.

It has been a real pleasure to work with my colleagues and friends on your executive board — Leon Townsend, Ron Case, Bob Sanders, Damien Gabis, and Bill Coleman. They are true professionals whose ideas and decisions represent careful thought and the membership's best interests. I want to thank them very much for their advice, counsel and friendship during the past year.

I also want to thank the Ames office staff — Margie Marble (who served as Acting Executive Manager after Kathy Hathaway left), Sandy Engelman, Julie Heim, Scott Wells, Dolores Taylor, Dee Buske and the advertising staff — they are truly excellent to work with. They are all dedicated and hardworking individuals and I am pleased to have them as IAMFES employees.

It has also been a pleasure to work with the committee chairs, committee members, affiliate representatives and other interested members who have written or called on association business. Without this cadre of dedicated members, our organization would not function properly or effectively. I want to thank them for all their assistance and support.

My family, Eileen and Kristen, also deserve special thanks for their constant support and encouragement while I served as President.

And finally, I'd like to thank you, the membership, for your interest in food safety, sanitation, and environmental issues and for participating in IAMFES. Your involvement makes this a truly great organization!

I look forward to continuing to serve you as Past President in the year ahead.

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Dairy, Food and Environmental Sanitation

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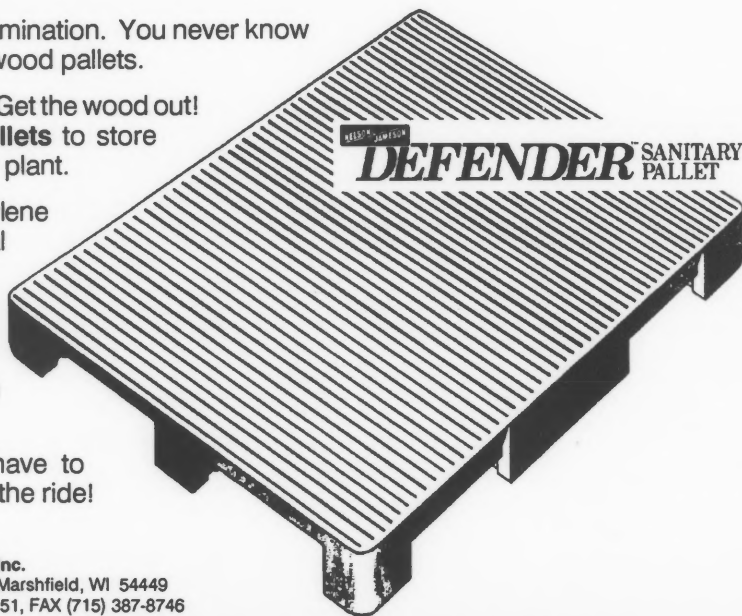
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## Use of Time Temperature Indicators to Monitor Fluid Milk Movement in Commercial Practice

by

Y.S. Cherng and Robert R. Zall

Department of Food Science, Cornell University, Ithaca, NY 14853

### Introduction

The importance of milk in the human diet cannot be overemphasized. It plays a major role as a source of energy and nutrients for people of all ages. Consumers' acceptance of milk is generally based on flavor and shelf life. Milk that has deteriorated in quality before use is undesirable, and consumers are unlikely to buy products with unacceptable flavors. In most cases, loss of quality does not threaten health, but it does cause some discontent. Customers' dissatisfaction can result not only in loss of company's profits but of the customers' loyalty. The shelf life of milk is affected by the initial quality of the raw material, the processing and packaging facilities used, and the environmental conditions the product encounters. No matter how well milk is processed in a factory, the dealer may not have the ability to control standards in handling and storing milk during the product's distribution. Once the milk leaves the processing plant, the way it is handled through the distribution channels determines its quality and shelf life. Many studies have suggested guidelines for handling milk. A cardinal rule is the maintenance of temperature of 4.4°C (40°F) or below and proper stock rotation (6). Since milk can be vulnerable to mishandling during distribution at all points, any abuse to the milk will cause some loss of quality. Milk processors commonly put code dates on their packaged milk to monitor the product's quality, to inform the consumer about how fresh the milk is, and to assist the retailers in stock rotation. In the current code date system, milk products show the same date on the package no matter what temperature it was held at during storage and transportation. For example, one lot may be shipped and stored at 40°C and be good for only a few hours while another lot with the same code date stored at 4°C could be good for several days. Hence, a stock rotation policy such as the first-in first-out (FIFO) system that rotates the stock based on sell-by date may not be realistic.

Without a method to determine whether a product has been thermally abused during storage and transportation, the retailers may rotate milk that has been properly handled before another that has not (3,10). Therefore, a stock rotation method based on thermal history instead of product age would be an improvement. A useful device would be a system that monitors conditions products undergo after merchandise leaves the processing plants.

Time-temperature indicator systems or devices that can integrate the time-temperature exposures of a stored product and give an indication of its shelf life are available to food processors. Over the years, there have been numerous efforts to introduce indicators that could be affixed to a package or shipping container to provide decision-making information based on the thermal history of a product. According to a report published by a trade paper, *The Cheese Reporter*, U.S. demand for time-temperature indicators could grow as much as tenfold from an estimated \$20 million in 1987 to \$200 million by 1992 (8). In addition, results from the packaging buyers' survey in 1988 on the use of time-temperature package monitors show considerable potential for growth (4). As more time-temperature indicators become available, such devices can be used to monitor temperature of the milk over time. In this study, a LifeLines™ Inventory Management System was used as a time-temperature indicator for monitoring the quality of market fluid milk through a distribution network. This system consists of a printed indicator label with polymer compounds that change color as a function of time and temperature exposure, an optical wand connecting with a hand-held micro-computer for reading the indicator label, software for data analysis and telecommunications, and an IBM personal computer to process the indicator data. The system can be used to determine product freshness at specific points in the distribution channel and as such can alert people to rotate inventories based on product freshness rather than sell-by date. Some researchers have tested such indicators for

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monitoring market fluid milk (5). These tests were mostly conducted in-house using simulated models or distribution situations. Few trials at best were made to test indicators in marketing fluid milk within commercial distribution systems.

This paper describes the results of a study where the LifeLines<sup>TM</sup> Inventory Management System was used to track fluid milk movement during storage and in marketing according to commercial practices.

## MATERIALS & METHODS

### Shipping Test

Quart (944 ml) and half-gallon (1890 ml) cartons of pasteurized homogenized whole milk were used as test material in shipping tests. Trials were carried in duplicate, using milk from the Cornell Dairy Plant and two additional New York State cooperating commercial plants. Samples were tracked through individual distribution systems from the time they left the packaging line through the days they were stored in the retailer's display cabinet. LifeLines<sup>TM</sup> model 68 indicator labels were affixed to representative cartons and were scanned in a manner described by other researchers (2,11). At distribution key points, i.e. processing line, shipping dock, receiving dock, retailer's storage room, and display cabinet, labels were scanned and samples of each lot were brought back to the university laboratory and subjected to organoleptic and microbial tests. Figure 1 illustrates the activities at critical points in the distribution system. A panel of 9 to 10 trained panelists from the Department of Food Science of Cornell University participated in five separate evaluation sessions held at one-week intervals. Each panelist was instructed in the use of sensory evaluation facilities and techniques to ensure that he or she knew what constitutes good quality and the relative impor-

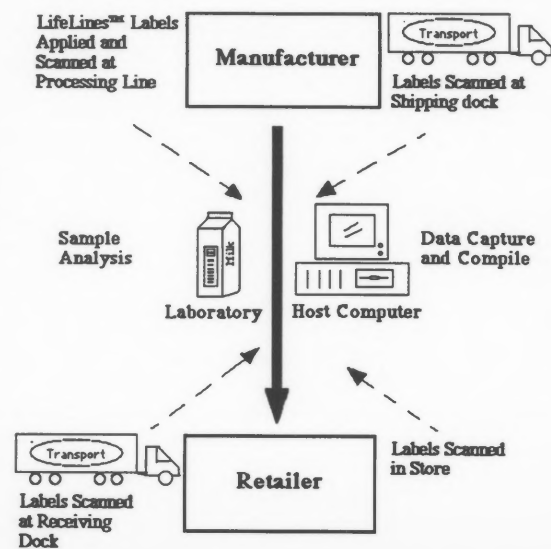


Figure 1. Activities taken throughout the distribution system.

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tance of the various quality attributes. Panelists were asked to evaluate the samples using the American Dairy Science Association (ADSA) scoring system (9). In addition to the sensory test, milk quality was monitored using the standard plate count (SPC) test method to analyze samples of milk following procedures outlined in *Standard Methods for the Examination of Dairy Products* (7). All counts were expressed as colony-forming units (CFU) per milliliter and then converted to logarithmic form, i.e. Log(CFU/ml).

**Retail Shelf Temperature Monitoring Test**

When milk reaches retail outlets, the vendor is responsible to keep the milk refrigerated. LifeLines™ system was used to record the thermal history of the storage equipment. Two LifeLines™ labels model 68 were put into envelopes and attached to shelf walls of individual dairy cabinets. Over a two-week period, the labels were scanned at least three times a week. Simultaneously, a portable temperature recorder, CHAR-TEMPTM CT-380, manufactured by Omega Engineering Incorporated, was placed in each cabinet to record temperatures encountered during the test periods.

**RESULTS AND DISCUSSION**

**Shipping Test**

Figures 2 and 3 show changes in LifeLines™ indica-



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tors model 68 attached to milk packages and milk quality changes when monitored over time during commercial distribution. The data depict trends of the actual reflectance values for the LifeLines™ model 68 indicator. These data are in close agreement with those for flavor scores and microbial growth. Because storage temperature is one of the most critical factors affecting milk quality, the recommended storage temperature for milk is 4.4°C (40°F). In the upper part of these figures, a straight line, representing the theoretical response of a LifeLines™ indicator model 68 stored at 4.4°C, was drawn as a reference line. The reflectance curve above the reference line indicates that the milk was handled at temperatures below 4.4°C. A reflectance curve below the reference line shows that the milk has been handled at temperatures higher than 4.4°C. As can be seen from the first trial, only the reflectance responses from plant A's milk deviated slightly from this standard. This information seems to suggest that only the milk from plant A was kept at the recommended temperature.

Further investigation of microbial growth over time showed that the initial microbial count for the milk from plant A and plant B was similar; however, after 4 days, the microbial count of the milk from plant B increased significantly in contrast to that of the plant A milk, which showed only slight changes for 7 days. This difference was probably because the milk from plant A had been handled at a temperature much closer to the recommended temperature than the milk from plant B. As shown in Figures 2 and 3, Cornell milk seemed more acceptable than the milk from

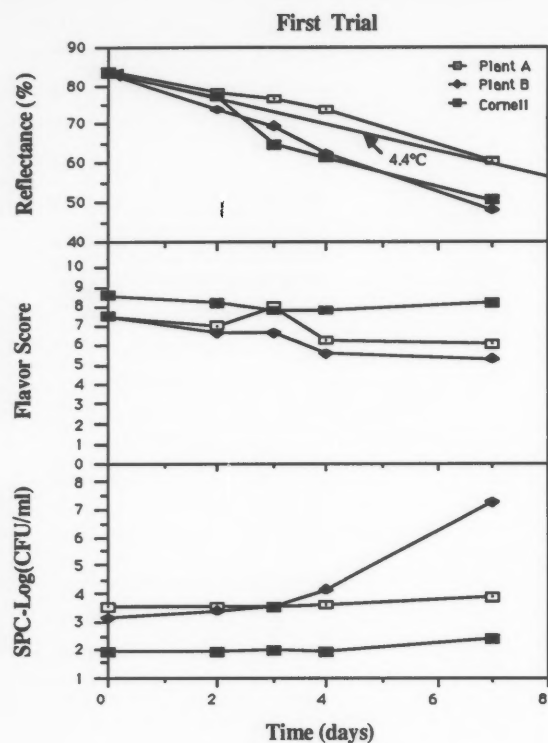


Figure 2. Response of LifeLines™ model 68 indicators, flavor scores, and standard plate counts of quart packages of market fluid milk stored under commercial temperature conditions (First trial).

the other two plants. These observations were noted probably because the Cornell milk had lower initial microbial counts than the milk from the other two plants. Initial milk quality has an important impact on the overall quality of milk in addition to storage temperature, not only in number but probably as to types of organisms.

In the second trial, milk from plant B seemed to be handled better than that in the first trial. This was further confirmed by the thermal history obtained from the portable temperature recorder installed with the milk in the retail outlet. The thermal history plot showed that the storage temperature of the milk at plant B's retail outlet in the second trial was also lower than that in the first trial. The improved storage temperature of the milk from plant B at its retail outlet might be the reason why plant B's milk in the second trial maintained a slow microbial growth rate and remained acceptable to the panelists until the end of the test periods.

These results show that proper milk handling, especially storage temperature, reduces the rate at which milk deteriorates in quality. The LifeLines™ system provides a thermal history of the product as it goes through distribution channels. This kind of a record, it seems, would be useful as a tool to monitor the change in the milk quality

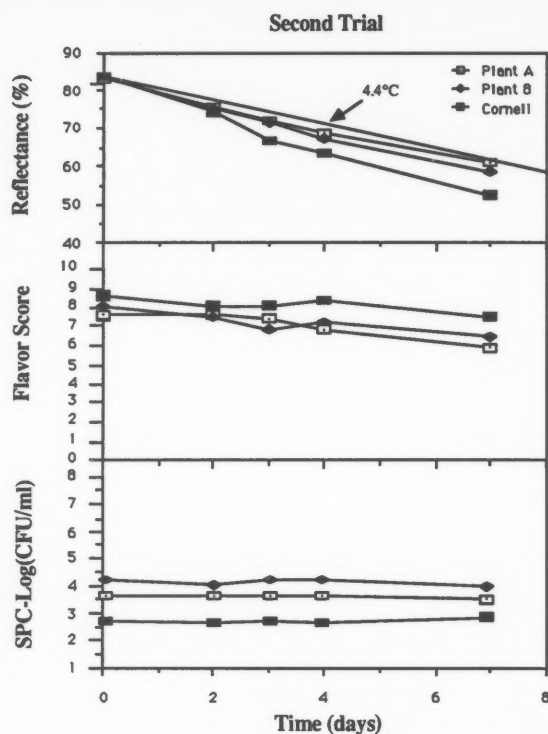


Figure 3. Response of LifeLines™ model 68 indicators, flavor scores, and standard plate counts of quart packages of market fluid milk stored under commercial temperature conditions (Second trial).

and may also aid processors by improving the way milk is handled once processed.

#### Retail Shelf Temperature Monitoring Test

Figures 4 and 5 illustrate separate trials of the LifeLines™ indicator model 68 response, when stored in envelopes in the retailer's refrigerated dairy cases in the store. The indicator has the ability to show variable temperature exposures. In these figures, 4 straight lines representing the theoretical responses of the LifeLines™ indicator model 68 when stored at four constant temperatures, i.e., 1.7°, 4.4°, 7.2°, and 10°C, were drawn as the references. The indicator response to the variable temperature exposure in each dairy case can be seen to be an intermediate response between two constant temperature exposures. Such information suggests that with proper mathematical modeling, an indicator response to unknown storage conditions could be used to estimate an approximate constant temperature equivalent. A program has been developed by Allied Corporation for determining an average kinetic temperature. The kinetic average temperature is derived from the reflectance readings, elapsed time, and the known kinetics of the LifeLines™ indicator materials. Kinetic average temperature



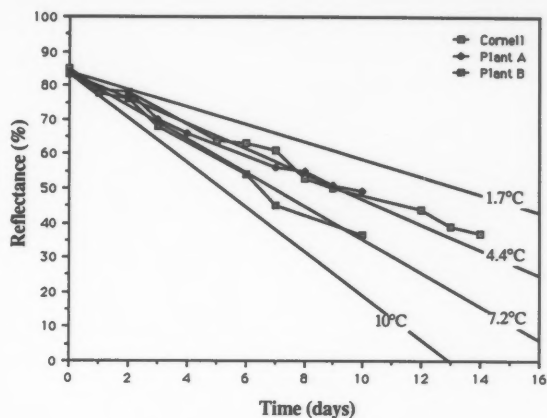


Figure 4. Response of LifeLines™ model 68 indicators stored in envelopes in retailers' refrigerated dairy cases (First trial).

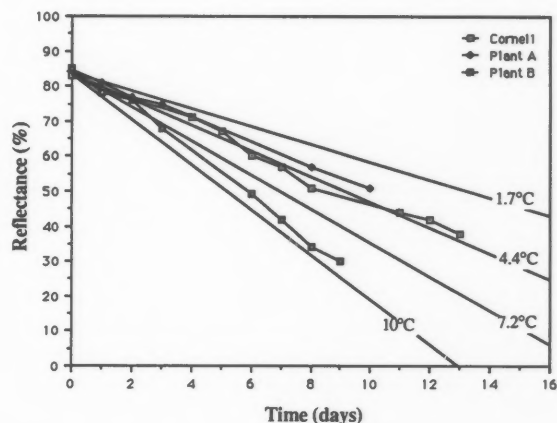


Figure 5. Response of LifeLines™ model 68 indicators stored in envelopes in retailers' refrigerated dairy cases (Second trial).

may be considered as the temperature that would produce the same change in indicator reflectance in the same time as the actual thermal history (1). By using the system program, the kinetic average temperature for individual dairy cases can be estimated and these data can be used to monitor dairy case performance at each retail point. Table 1 lists the kinetic average temperature and standard deviation for each dairy case during the testing period. The data show that the recommended temperatures were not maintained in different trials at plant B's retail dairy case. The findings were further confirmed by the same result from the thermal history plot obtained from the portable time temperature recorders installed in the retail dairy cases. These tests show that the LifeLines™ system can be used to record retailers' display cabinet temperatures. The trials suggest that the LifeLines™ system can be extended further than expected such as to monitor the performance of milk storage equipment. Such labels provide an inexpensive tool to control storage temperatures at retail outlets.

TABLE 1. Kinetic average storage temperature and standard deviation measured from LifeLines™ system for retailers' refrigerated dairy cases.

Location	Kinetic Average Temperature	Standard Deviation
First Trial		
Cornell	3.80	0.64
Plant A	3.93	0.40
Plant B	6.57	0.95
Second Trial		
Cornell	4.08	0.36
Plant A	3.41	0.79
Plant B	8.75	0.85

## CONCLUSIONS

This study provides information that: (1) LifeLines™ system can be used to monitor quality changes of market milk during commercial distribution. (2) The system has value as an inexpensive method for monitoring performance of refrigerated cabinets in vending outlets.

## ACKNOWLEDGMENTS

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# Recycling Food Processing Wastes in Agriculture\*

by

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M.E. Tumbleson, Ph.D.<sup>2</sup>

## Abstract

Pretreatment is becoming much more common in the food processing industry, as city facilities to whom they discharge become overloaded. As a result, an increasing amount of sludge (biomass) is being produced. This material is very low in pollutants while high in minerals as well as protein. Thus, this material should make an excellent fertilizer or animal feed.

The concentrations of over 100 priority pollutants have been determined in five different food processing sludges. Even though several priority pollutants have been detected, their levels are low and often are lower than in background soil. Long-term feeding studies of the biomass to sheep and swine indicate no adverse effects when fed as high as 10% of the diet. Land application studies have shown that lime stabilized biomass will significantly increase tall fescue and red clover dry matter yields. Biomass is a valuable material that needs to be recycled to agriculture.

## Introduction

Waste application to land and feeding of wastes to livestock are two viable alternatives for waste management. These alternatives are especially desirable when the wastes are from the food processing industry because of low levels of priority pollutants. In fact, for appeal to farmers and others, these wastes might be labeled "agricultural processing wastes."

Neither land application nor feeding of wastes to animals is particularly unique. Page et al. (1987) recently summarized the overall subject of sludge application to land.

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Likewise, Beszedits (1981) has discussed the feeding of sludge to animals. The emphasis of much of the past work was on municipal wastes.

The goal of this project was to evaluate the characteristics of wastes from various food processors and to evaluate and study the problems and benefits arising from land applying and feeding these wastes.

## Methods

Wastes from several food processing plants have been collected using standard sampling techniques. Influent to secondary treatment, output from secondary treatment and sludge resulting from clarification of the secondary treatment effluent have been analyzed for over 100 EPA priority pollutants and the major elements using standard procedures (EPA 1983). Only the inorganic elements will be discussed in this paper. The biomass samples were freeze-dried, digested, and analyzed by inductively coupled argon plasma emission spectroscopy (ICP), hydride atomic absorption (selenium and arsenic), and cold vapor atomic absorption (mercury). Each of these methods required a different type of digestion. All samples for ICP analysis were digested using a nitric-perchloric acid method and analyzed using a Jarrell-Ash Model 1100 Mark III with 40 analytical channels. All samples for mercury analysis were digested using a nitric acid reflux method and analyzed using acid vapor atomic absorption. In this method, the samples were reduced with hydroxylamine and then with stannous chloride. The resulting mercury vapor is analyzed as it passes through a quartz cell on a Perkin-Elmer Model 403 atomic absorption instrument. Samples requiring selenium analysis were digested using the nitric-perchloric method and diluted with HCl. Samples were analyzed using the Varian VGA-76 hydride generation accessory mounted on a Perkin-Elmer Model 3030 atomic absorption instrument.

The initial land application focused upon lime stabi-



lized sludge or biomass (LSB) from milk processing plants. The LSB was sludge produced from clarification of the effluent from tricking filter secondary treatment. The LSB was selected for study to determine appropriate loading rates on the acid, low phosphorus, and leached soils surrounding the treatment plants. There was concern that over-application would induce nutrient imbalances in the crops grown on the treated land.

Ewes and sows ranging from 1-3 years of age and weighing an average of 53.3 and 128 kg, respectively, were randomly assigned to 10% and 20% dairy biomass treatments. Both animal species were fed conventional diets (corn, cottonseed hulls and soybean meal for ewes and corn-soybean based diets for sows) to which biomass replaced the soybean meal on the basis of its protein content. The biomass was oven-dried in a forced air oven at 55°C to a dry matter content of approximately 90%. Ewes and sows were fed these diets through breeding, gestation and parturition. The lambs and pigs were weaned at 56 and 30 days after birth.

The ewes and sows were weighed at 28 day intervals. The offspring were weighed at birth and at 28 day intervals to determine if supplemental biomass influenced milk production from ewes and sows.

## Results and Discussion

### Land Application

The land application studies of food processing waste were started in 1982 using LSB. A company with a milk processing plant near a Missouri research station requested and supported the early work to obtain agronomic data to determine the best use of their waste product. The first attempt to apply increasing amounts of LSB pointed to the first problem. The tendency is to express the quantity applied in terms of volume per land area because the volume of the vehicle spreading the sludge is known and the treated land area can be measured. Our application equipment was

designed on a small scale to simulate the larger field application equipment.

In spite of the best intentions of the plant operator, the final LSB applied varied in percent solids and in chemical composition on a dry matter basis. The later variation was not great, but when one bases the application quantity solely on volume of sludge per unit land area potentially serious errors are likely in quantity of agronomically important chemical constituents applied. Because of these variations which influenced the actual volume applied per unit land area, the application was expressed as kilograms of solids per hectare ( $\text{kg/ha}/1.12 = \text{lbs/acres}$ ) (Table 1).

The initial LSB applications were made in 1982 and repeat applications were made on some plots in 1984. The data are separated into the two time periods in Table 1. The initial LSB contained 2.4% nitrogen and 0.2% potassium. The nitrogen content, while useful for a grass forage crop the year of application, would not sustain continued production of quality forage. The K content of the LSB was insignificant. Therefore, treatments were added to provide optimum quantities of both N and K with and without the LSB.

The yield data (Table 1) clearly show the benefits of both LSB and the added nutrients on tall fescue hay production in both study periods. The lower yields in the second period were not due to treatments but to inadequate rainfall. We attempted to demonstrate that there was a limit to the amount of LSB that should be applied but, so far, we have failed to clearly demonstrate that level. With the added N and K in the first study when weather was most desirable, maximum yields were obtained with 3500 kg of solids per hectare. Based upon our sludge analyses, this treatment applied 135 kilograms of phosphorus (P) and 700 kilograms of calcium (Ca) per hectare. An adjacent study where variable quantities and sources of N were being studied showed the supplemental N used on the LSB study was adequate for top yields given the moisture available.

One of the concerns about overuse of LSB is the incidence of nutrient imbalances resulting from excessive application of P and lime to the soil. The repeated appli-

TABLE 1. The effect of Lime Stabilized Biomass (LSB) upon tall fescue dry matter yields. Southwest Center, Mt. Vernon, Missouri.

Nutrients Added	1982-83		1984-85	
	Total LSB Solids kg/ha	Mean Dry Matter Mg/ha	Total LSB Solids kg/ha	Mean Dry Matter Mg/ha
None	0	3.7	0	2.1
	1700	4.6	10000	3.6
	3520	4.4	5360	2.6
	7960	5.3	7960	2.2
	7960	6.0	11650	3.0
N + K	0	6.9	0	4.6
	1700	8.4	10000	7.2
	3520	9.6	5360	6.8
	7960	9.0	7960	6.6
	7960	9.1	11650	7.6

cations of LSB in 1984 were expected to show the threshold level of LSB where the adverse effect would be seen. The yield data suggested no such threshold (Table 1). Instead, the yield data for the second two year period show an apparent yield decline, the longer it was after LSB application. Our recent studies are designed to explain this effect.

Part of the mission of agricultural experiment stations is to provide useful and timely information to farmers. We decided that four years of data on tall fescue were adequate. In the early 1980s, considerable research documented that much of the tall fescue in the "fescue belt" was infected with an endophytic fungus that caused poor animal performance. It would be desirable to develop alternatives to tall fescue; legumes are such an alternative.

The LSB had been demonstrated to contain sufficient P and lime to raise the available soil P and lower soil acidity to levels that were desirable for legume forages. The tall fescue on the LSB study area was killed in August, 1985 and red clover was seeded with a no-till drill into the killed sod. No further LSB additions were made.

The red clover yield data showed the dramatic carry-over effects of LSB treatments (Table 2). The lower yields from the plots which had received the supplemental N and K were likely due to a combination of factors. The added

TABLE 2. Carry-over effects of LSB upon red clover yields. Southwest Center, Mt. Vernon, Missouri.

Nutrients Added to Fescue	Total LSB Solids	Mean Dry Matter
	kg/ha	Mg/ha
None	0	5.3
	10000	10.2
	5360	9.2
	7960	9.9
	11650	10.0
N + K	0	4.5
	10000	9.1
	5360	8.4
	7960	9.0
	11650	9.7

TABLE 3. Residual effects of LSB on soil properties. Fall 1985.

Nutrients Added	Total LSB Solids kg/ha	P ppm	pH	Soil Properties+	
				Ca	K
				-----ppm-----	
None	0	10	5.4	1540	370
	10000	58	7.2	3540	289
	5360	37	6.7	2440	307
	7860	63	6.4	2560	277
	11650	76	7.2	3210	224
N + K	0	4	4.6	1280	260
	10000	51	7.0	3260	155
	5360	21	6.1	2320	183
	7860	48	6.2	2420	188
	11650	57	7.0	3110	185

+Bray and Kurtz #1 extractable P, pH in 1:1 0.01M, CaCl<sub>2</sub>, NH<sub>4</sub> Acetate @ pH 7.0 extractable Ca and K.

N had, by 1985, increased soil acidity (Table 3). The higher yields had removed more P and K when the additional N had been used. The important point to be made, which has been supported by our latest work, is that LSB is quite useful as a soil amendment for the establishment of legume forages. In 1984, it became obvious that our loading rates would not answer the question of what would be the maximum load of LSB that would be tolerated by the tall fescue. In the spring of 1985, an additional study was started using quantities of LSB of 0, 9,000, 18,000, and 27,000 gallons per acre. Our results, to date, suggest that the upper limit has not been reached (Table 4). The only problem we observed with the highest loading rate was physical interference with leaf extension immediately after application. The site received several rains the first month after application that kept the large load of solids moist so leaf extension and tilling could continue. Based purely upon observation on the physical effects on the forage, no more than 9,000 kilograms of solids per hectare should be applied in a short period of time to forages. This work was done on nearly level land. The higher quantities of LSB used in this study would be prohibitive on more rolling sites due to the potential for runoff during extended high intensity rainfall events.

This study is continuing to determine the influence of large LSB applications upon soil properties with depth. One replicate will be sacrificed late this fall to dig a trench across each treatment to permit soil samples to be taken uncontaminated by overlying soil so downward movement, if any, can be detected. Previous sampling results suggest that sampling tubes contaminate lower soil when high loading rates are applied.

#### Animal Nutrition

In the animal feeding studies, the major intent was to determine how much biomass may be included in diets before performance of the mother and offspring were affected. The feeding of diets containing 10 and 20% biomass did not significantly affect daily gain of ewes and sows (Tables 5 and 6). However, the lower weights for the

TABLE 4. The effect of high LSB quantities on tall fescue hay production. 1985-88.

LSB Treatment gal/A	Total Solids kg/ha	Hay Yields			
		1985	1986	1987	1988
0	0	7.5	6.4	4.6	2.9
9000	4460	9.7	8.6	7.5	6.4
18000	8920	10.8	9.5	7.3	7.3
27000	13380	10.8	9.5	7.5	7.0

ewes and sows 28-30 days after the birth of the offspring suggest that 20% biomass is too high a level to include in the diet.

The differences in birth weight of lambs from the dietary treatments were attributed to a ram effect as well as the nutritional value of biomass. The greater birth weights for lambs from the 10% biomass treatment vs. the control treatment were attributed to the different genetic background of the 3 rams used for breeding the ewes. The lower birth weight of lambs from the 20% biomass treatment may stem from the lower digestibility of the protein in dairy biomass. The daily gain of lambs for the first 56 days was not affected by feeding biomass to ewes.

TABLE 5. Performance of ewes fed biomass.

	Biomass		
	0%	10%	20%
Initial	53.1	54.0	52.6
28d post-lambing Wt., kg	66.7	61.2	53.1
Ewes after weaning, no.	12	13	13

TABLE 6. Performance of sows fed biomass.

	Biomass		
	0%	10%	20%
Initial	127.5	127.0	128.8
30d postweaning Wt., kg	155.0	154.7	148.3
No. of sows after weaning,	16	16	16

TABLE 7. Performance of lambs from ewes fed biomass.

	Biomass		
	0%	10%	20%
Birth wt. (lbs.)	4.9 <sup>a</sup>	5.7 <sup>b</sup>	4.1 <sup>c</sup>
Daily Gain (kg/day)	0.29	0.29	0.23
0-28d	0.29	0.29	0.23
0-56d	0.24	0.23	0.20

<sup>abc</sup>Means with different superscripts differ at P < .05.

TABLE 8. Performance of pigs from sows fed biomass - parity 1.

	Biomass		
	0%	10%	20%
Birth Wt., kg	1.4	1.4	1.5
30-d Wt., kg	6.9	7.5	7.3

The birth weight of pigs (Table 8) was not affected by the dietary treatment to which the sows were fed. The 21 and 30 day daily gains for pigs also were not affected by the dietary treatment.

However, the number of pigs born was reduced by 1.6 and 2.3 pigs/litter, when sows were fed diets containing 10 and 20% biomass, respectively. The number of pigs weaned per sow also was reduced by 2.5 when sows were fed biomass (Table 9).

The lower number of pigs born alive and weaned from sows fed biomass may be attributed to the protein quality of biomass.

#### Characterization

The types of products that can be used during the processing of foods are well regulated and it would not be expected that the resulting washwater biological treatment sludge would have a very high concentration of metals. Table 10 shows a comparison of the sludge from five different dairy processing wastewater facilities. Two facilities use trickling filter with the addition of lime to promote flocculation and to stabilize the sludge. The other three facilities utilize an activated sludge process. As predicted, the levels of the inorganic priority pollutants are much less than the levels in municipal sludge. Table 10 also compares the priority pollutant levels in the biomass to that of a normal clay soil. The levels of heavy metals present in the biomass are even lower than in a normal clay soil.

At the same time the levels of the minerals, which are desirable as a fertilizer in biomass, are higher than that in the municipal sludge (Table 11).

The high levels of Ca, Mg and P make it very suitable for a fertilizer.

The chemicals present in the washwater influent into the treatment facility consist primarily of phosphoric acid, several different basic cleaning solutions and spills from the various processes. This would tend to indicate that the influent will be quite variable and it may not be possible to produce a biomass that will have a consistent composition. Table 12 compares the percent deviation of 12 influent

TABLE 9. Number of pigs born and survived from sows fed biomass - parity 1.

	Biomass		
	0%	10%	20%
No. of Pigs/litter born	11.5 <sup>a</sup>	9.9 <sup>b</sup>	9.3 <sup>b</sup>
No. of Pigs/litter weaned	9.8 <sup>a</sup>	7.4 <sup>b</sup>	7.3 <sup>b</sup>

<sup>ab</sup>Means with different superscripts differ at P < .05.

TABLE 10. *Inorganic priority pollutants.*

Element	Plant						Municipal Sludge	Normal Clay Soil
	AS-1	TF-1	TF-2	AS-2	AS-3	AS-3		
Ag	<1	<1	<1	<1	<1	<1		0.1
As	<2	1.0	<2	0.6	0.8		7.5	10
Be	<0.1	<0.1	<0.1	<0.1	<0.1			5
Cd	<0.2	<0.2	<0.2	<0.2	<0.2		22	0.5
Cr	8.1	80	7.1	11.0	17		660	100
Cu	22	89	18	68	23		550	50
Ni	7.8	40	4.4	7	7		330	50
Pb	8.0	26.0	35.0	0.5	6.0		210	30
Sb	<4	<4	<4	<4	<4			5
Se	<4	0.54	<4	0.6	0.4		3.9	0.2
Tl	<4	<4	<4	<4	<4			0.1
Zn	122	272	88	147	52		1800	500

Concentration units = mg/kg dry weight

samples collected over 24 hours to the percent deviation of 18 different biomass samples collected over 18 weeks.

As expected, there are extreme variations in the influent depending upon what type of washing is being done. The deviation of the minerals is 83-164%. Due to the fact that biomass concentrates the minerals over a period of time and is able to average the peak loads, its percent variations are small. The biomass will need to be monitored as to exact composition but should provide a good consistent product suitable for land application or as a feed ingredient.

### Summary

Field studies to date have shown no adverse effects of lime stabilized biomass applied to soils used for forage production in spite of concern about excessive application of soil P and an increase of soil pH in excess of 7.0. There were beneficial effects on hay yields of the LSB. There were significant long-term effects of the treatments. The LSB must be supplemented with potassium for use on all forages.

TABLE 11. *Major elements present in biomass and municipal sludge.*

Element	Plant						Sludge
	AS-1	TF-1	TF-2	AS-2	AS-3	AS-3	
Ca	77,800	160,000	109,000	21,900	9,290		55,000
Mg	10,900	7,090	7,820	4,350	3,280		16,000
Na	11,700	2,575	3,770	22,500	18,600		3,300
P	70,700	22,600	45,500	28,700	15,300		5,100
K	14,400	4,310	640	12,800	5,960		17,000

Concentration units = mg/kg dry weight

TABLE 12. *Variation in trace elemental concentration.*

Major Trace Element	Biomass (% Deviation)	Influent (% Deviation)
Ca	14	161
K	12	164
Mg	8	164
Na	9	155
P	8	83

Feeding biomass at 10% and 20% of the diet had no significant adverse effects on performance of ewes and sows and daily gain of the offspring. However, the birth weight of lambs and number of pigs weaned at 30 days of age were reduced from those ewes and sows fed the 20% biomass.

### Acknowledgements

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## *Assuring Safe Drug Use in Dairy Production*

by

N.J. Corlett, Jr., Manager of Quality Control Milk Marketing Inc., Strongsville, Ohio

The last two years have seen dramatic changes in the dairy industry's view of potential drug residues in milk. This change was heralded by an increase in sensitivity of testing methods and a report from the Center for Toxicological Research linking sulfamethazine to cancer in laboratory animals.

Though human health never became an issue, these events followed on the heels of earlier evidence which traced listeriosis and salmonellosis in humans to improperly processed dairy products. Sensitized by this experience, industry representatives, veterinary organizations and regulatory officials teamed up to develop far reaching drug use reforms. These measures first effects have already virtually eliminated sulfa residues; and, judging from experience in Ohio and surrounding states, reduced other drug residues detected in farm bulk milk to the lowest levels in recent history.

To many in dairy production, this news is welcomed relief. However, it also focuses on critical issues that need a permanent solution. The reality is that very few drugs are approved for use in lactating dairy animals; and that to use other than approved drugs is illegal. Further, it is now readily apparent that, given the ultra-sensitivity of new testing methods, detection of illegal residues is virtually inescapable.

Since there are no approved drugs, or dosages of approved drugs are found to be inadequate to treat several common diseases in dairy animals, it is common practice to treat these diseases with drugs approved for use in other species or at higher dosage levels. This "extra-label" drug use is an illegal act, according to the Code of Federal Regulations. Veterinarians, however, are currently assured by FDA Center for Veterinary Medicine that they will not be prosecuted for extra-label drug use, provided certain very restrictive conditions exist, and they follow specific procedures. Laymen dairy producers do not have such assurance and are subject to prosecution.

Drug manufacturers do not have an economic incentive to obtain approval for drug use in dairy animals. Obtaining approval to market a drug for use in dairy animals is often

a long, expensive process that may, in addition, result in lengthy label withholding times for milk. In order to manage costs and keep prices competitive, approvals are therefore routinely sought for species other than dairy animals. Once a drug is on the market for other species, veterinarians and ultimately laymen recognize, through trial and error, the value of the drug in treating diseases in dairy animals. These conditions and the relative insensitivity of official testing methods for some drugs commonly used in an extra-label fashion have resulted in widespread, illegal, extra-label use of drugs. The industry, veterinary and regulatory communities alike actively discourage this practice which is central to drug reform measures now under consideration.

The FDA has played an active role in discouraging extra-label drug use. The agency has also assisted by: developing confirmatory chemical methods to detect illegal drugs, documenting illegal sale and distribution and bringing charges against flagrant violators. In conjunction with the Conference on Interstate Milk Shipments, FDA has also conducted follow-up surveys to monitor illegal residues of sulfamethazine in milk. In coordination with state regulatory agencies, it has increased enforcement of Pasteurized Milk Ordinance sections relating to drug use and storage on dairy farms. Currently, pending actions include a report of a public hearing on the safety of sulfamethazine and a notice to remove from the market sulfa drugs which have only "interim approval". These activities, along with industry and veterinary initiatives, have focused great attention on all facets of drug use and distribution. The result has been a reduced prevalence of low level drug residues now detected in market milk.

Dairy producers themselves have, through their cooperatives and the National Milk Producers Federation (NMPF), advocated aggressive policies aimed at protecting the public health. Responding immediately to reports linking sulfamethazine to cancer in laboratory animals, the Federation requested dairy producers to voluntarily ban sulfamethazine use in dairy animals. That action, followed up by a series of resolutions, strikes at the root of the problem. These include actions to: encourage pharmaceu-



tical companies meeting FDA requirements to obtain approval of additional drugs for use in dairy animals; implement educational and monitoring programs; expand development of screening technology to the farm level enabling dairy producers to test treated animals for residues before milk is offered for sale; develop, in conjunction with the American Veterinary Medical Association and the Bovine Practitioners Association, standard safe drug use guidelines for use by veterinarians and dairy producers; and to request FDA address the need to validate new ultra-sensitive residue testing methods as they come on the market.

All of these initiatives are in stages of implementation. Biotechnology firms have already responded with at least two additional rapid drug residue tests for milk. Personal experience with these tests shows they are easily adaptable to field and on-farm use. These new entrants into the milk testing market introduce a welcome degree of competition which can keep drug monitoring costs down for dairy producers and processors. Active cooperation with federal and state officials and educational programs placed in effect by many cooperatives across the nation have led the dairy industry in achieving a dramatic reduction in low level drug residues. Improved conditions noted on inspections under the National Conference on Interstate Milk Shipments program have also been achieved.

Pharmaceutical companies share industry concern for drug use that results in illegal drug residues in milk and meat. They have a high stake in the evolution of the reform process; for, if certain drugs develop a history of misuse through residues or other means, approvals will be in jeopardy. The banning of chloramphenicol and the scrutiny by FDA of sulfa approvals are good reasons for pharmaceutical companies to expand education and improve labeling to encourage proper use of approved drugs. Their proposal for an animal health product use documentation program is

a valid expression of their interest in assuring safe use of drugs in farm animals. While such documentation is an important element in assuring proper drug use, it is only one of the many important elements which must be addressed.

From the producer side, increased sales of approved drugs can send a clear message to the pharmaceutical industry that there is a preference for approved drugs over extra-label use drugs which should be evaluated.

The genesis of initiative outlined above, and a key factor in future research and development of new drugs, is the specificity and sensitivity of residue detection technology. While official methodology now in use can detect beta lactam residues at extremely low levels, it is less capable of detecting low concentrations of other drug families. Reports of various drug residues in market milk reflect the relative sensitivity of the *B. stearothermophilis* disk assay to various drugs. These studies show incidents of beta lactam residues to be only a fraction of those of other drugs. It is clear that as the level of sensitivity changes, so will the incidents of residue detection. This was demonstrated by the recent dramatic reductions of sulfa residues as testing for sulfamethazine at 10ppb was introduced in the fall of 1988. As testing for other families of drugs proceeds, we may expect a decrease in residues from these drugs as well. Though some may question the relevancy of sub-nanogram concentrations of contaminants in milk (or in any food), industry will continue efforts to meet legal and consumer specifications. The alternative of trying to convince consumers that a little bit of contamination is "ok" is simply bad politics.

Given the aggressive cooperative efforts by dairy producers, the FDA and states to eliminate sulfa residues, and given the success of initiatives currently underway to reform drug labeling, distribution and use, it is anticipated the dairy industry will be able to continue to assure the American public that responsible action is being pursued to eliminate drug residues from the milk supply and that consumers will continue to receive safe and wholesome milk and dairy products.

## COURSES & SEMINARS

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Clayton Yeutter, Secretary of Agriculture (second from right) receives a special copy of *Poultry... More Than A Meal!* from Richard M. O'Hanlon, Vice President of Marketing and Sales, Agri-Bio Corporation (second from left). George B. Watts, National Broiler Council President (right) and Stuart E. Proctor, National Turkey Federation Executive Vice President (left) join in the presentation. *Poultry... More Than A Meal!* is a 12-page, colorful booklet which summarizes the dynamic U.S. poultry industry's economic impact nationwide. For more information contact Jerry Chapman, Agri-Bio Corporation, at 404/536-0111. (Photo courtesy of the U.S. Department of Agriculture.)

## Secretary of Agriculture Receives Unique Poultry Publication

During special ceremonies in Washington, Secretary of Agriculture Clayton Yeutter was presented with a copy of a new booklet entitled *Poultry...More than Meal!*

The presentation was made by Richard M. O'Hanlon, vice president of marketing and sales for the Agri-Bio Corporation. Joining him in the presentation were George B. Watts, president of the National Broiler Council, and Stuart E. Proctor, executive vice president of the National Turkey Federation.

*Poultry...More than a Meal!* describes the fantastic contribution poultry makes to the U.S. economy. Beyond providing wholesome, nutritious, economical meals, the poultry industry directly employs more than 150,000 people, generates more than \$26 billion in retail sales, and helps stabilize the agricultural economy, the booklet explains.

At the presentation, Secretary Yeutter said he admires the dynamic growth the poultry industry has sustained over the years. Despite many tough challenges, the industry has worked together to expand markets, Yeutter noted. The Secretary told the poultry industry representatives that the people in the poultry industry should be very proud of their accomplishments.

National Broiler Council's George B. Walls noted that the booklet is impressive and can be used to quickly educate business and financial leaders about the poultry industry's success story. National Turkey Federation's Stuart Proctor believes the booklet will prove effective in educating and informing the leaders outside the industry. This effort is vitally important as more and more legislative and regulatory challenges face the poultry industry, Proctor noted.

O'Hanlon told the Secretary that he feels *Poultry...More than a Meal!* will be an effective publication in communicating the industry's accomplishments to not only the agricultural community, but more importantly, to the people outside agriculture. The booklet will be used to communicate with businesses that supply the poultry industry and businesses that use the poultry industry's products, O'Hanlon added.

Agri-Bio is making copies of the 12-page, full-color booklet available to all poultry associations and organizations. Also, a copy is being sent to each member of the U.S. Congress and the governor of each poultry-producing state.

Poultry industry executives are encouraged to contact Jerry Chapman, Associate Product Manager, Agri-Bio Corporation, P.O. Box 897, Gainesville, GA 404/536-0111, telefax 404/535-7886, for copies to distribute to their companies' customers and to companies outside agriculture that have an important stake in the poultry business.

## Frank Named President of National Seafood Trade Organization

William J. Frank, President and CEO of Morey Fish Co., based in Motley, Minnesota, was named President of the National Fisheries Institute (NFI) -- the industry's largest trade association. The Washington, D.C.-based trade association represents over 1,100 seafood processors, traders, distributors, importers, and exporters.

Mr. Frank has been president of Morey Fish Co., a producer of smoked fish and processor of lake fish, since 1986. Approximately one-third of Morey's production goes to foodservice markets. In 1983, Frank founded WJF International, Inc., a Minneapolis-based seafood importing and trading firm supplying markets throughout the U.S. and Canada. He continues to serve as a president of WJF.

Mr. Frank is past president and CEO of Juhl Brokerage, Inc., a regional food brokerage firm based in Minneapolis with offices in Omaha, Fargo, and Milwaukee.

He has also served as past chairman of The Foodservice Group, a national organization of foodservice brokers representing industry-wide concerns.

Actively involved with NFI for many years, Mr. Frank was Chairman of the Government Relations Committee and First Vice President in 1988-89, and has held the offices of Treasurer and Assistant Treasurer. Mr. Frank was elected at the NFI's 44th Annual Convention, held in Las Vegas April 9-12, 1989. He succeeds Tom Elliott, president of San Francisco-based TEMA, Inc., who becomes NFI's chairman of the Board. Mr. Frank's term is for one year.

Other new officers elected at the convention were: First Vice President - Peter Cardone, Harbor Seafood, New Hyde Park, New York  
Treasurer - Robert F. Brophy, Icicle Seafoods, Inc., Seattle, Washington  
Assistant Treasurer - Jack Mitsakopoulos, Chicago Fish House, Chicago, Illinois  
Secretary - Donald J. Short, Fishery Products, Inc., Danvers, Massachusetts

The National Fisheries Institute is a non-profit trade association involved in all aspects of the U.S. fish and seafood industry.

For more information contact the National Fisheries Institute, Communications Department, 2000 M St., NW Suite 580, Washington DC 20036. (202)296-3428.

## *Eat Fish, Live Better Book Signing*

Senator John Breaux (D-LA) and Ted Stevens (R-AK) received "just-off-the-press" copies of *Eat Fish, Live Better* by "current rage" author, Anne Fletcher, M.S., R.D.

Ms. Fletcher conducted a whirlwind twenty-city media tour highlighting the heart healthy benefits of a diet rich in nutritious seafood. Both Senators Stevens and Breaux authored the legislation in 1985 that created the National Fish and Seafood Promotional Council -- the group co-sponsoring the national media tour.

Ms. Fletcher's book has generated radio, television and press coverage in several Southern cities, the West Coast, East Coast and in key cities in the Midwest.

The highlight of the coverage was a *USA Today* newspaper article listing *Eat Fish, Live Better* as one of the five most important diet books Americans should buy.

Other sponsors of the media tour include the National Fisheries Institute, the Florida Department of Natural Resources, Bureau of Seafood Marketing and the California Fish and Seafood Institute.

For more information contact: Clare G. Vanderbeek or Peggy Parker, National Fisheries Institute, Department of Promotions/Public Relations, 2000 M Street, NW Suite 580, Washington, DC 20036 (202)296-3428.

## *Food Cost Control Expert "Computerized"*

Restaurant managers trying to lower their food costs will be able to consult a computerized "expert system" copyrighted by a Washington State University professor.

Dr. Lothar A. Kreck, the Ivar Haglund Professor of Hotel and Restaurant Administration, has extensive industry experience. He wrote the new food costs system for operators of restaurants, hotels, clubs and institutional food services. Called the "First Food Costs Expert" (TM) because it is the first in the United States, it will be marketed soon to business software companies.

An expert system is a computer program which simulates the thought processes of an expert in a given area. Kreck said that he wrote the system "because food cost control is not always clearly understood by some operators." Yet, because food costs can draw off as much as half of total sales income, even a small drop in costs can translate directly into profit.

An operator using the system would first enter three figures representing the business' ideal (or theoretical), actual and budgeted food costs as percentages of its sales income. If these are not equal there is a problem, and the system takes the operator through questions based upon Kreck's "Golden Rules" of cost control. These are grouped by functional areas, such as purchasing, preparation, or storage. Questions answered "no" represent rules the business is not following, and can be printed out as a plan of action.

Kreck has 20 years of experience in restaurants, hotels and clubs in eight countries, and is past president of the National Council on Hotel, Restaurant and Institutional Education. He has taught food cost control classes for 25 years, teaches industry seminars internationally and does consulting. He has also published two books relating to the subject.

Terry Umbreit, director of the WSU Hotel and Restaurant Administration Program, said, "One of our major functions is to assist the hotel and restaurant industry in enhancing its productivity and cost control. We are hoping this computer program created by Dr. Kreck will be a valuable tool for food service operators."

## *New Employee HACCP-Based Food Safety Text*

The true critical control point to assure safe food is the foodservice employee doing the food preparation tasks. **Government inspection is neither prevention nor education.** Managers are legally responsible for their employee training and safety development programs

in order to assure that food is always safe. Dr. Snyder of the Hospitality Institute of Technology and Management has recently completed the first HACCP-based employee safe food handling text, *Food Safety Quality Assurance for Foodservice Employees (Empl 0901)*. Foodservice managers can use this text to teach the fundamental information needed for safety-assured food handling procedures. This course teaches employees the hazardous food preparation situations and kitchen conditions, and the technically correct procedures and standards to assure that a customer is never made ill. Essential topics include: foodborne illness hazards, illness-causing microorganisms (i.e., bacteria, viruses, parasites, molds), adequate personal hygiene, safe hand washing, correct cleaning and sanitizing techniques, how to cool food in less than four hours, safe food preparation and hot holding, proper thermometer care and use, and correct storage techniques. Managers can certify employees in safe food handling by administering the HITM Employee Food Safety Test. Sanitarians who want to aid the industry can use the text and test as part of a certified city-wide employee educational program. The test manual can be purchased for \$17.50, to include postage/handling. A slide set for group training is also available.

To assure that your employees prepare safe food, contact: HITM;760 Transfer Road, #16; St. Paul, MN 55114; (612) 646-7077.

### ***Sanisafe & Associates Wins Syllabus Approval for Foodservice Sanitation Certification Course***

Sanisafe & Associates, Inc. is pleased to announce State of Illinois Health Department approval of its syllabus for the Foodservice Sanitation Certification Course. Paulette A. Gardner, President of Sanisafe, indicated, "Our certification course will more than meet requirements for the State of Illinois. We will also offer coverage of the City of Chicago regulations for those wishing Chicago certification. In addition our course can be easily adapted for foodservice sanitation anywhere. We will use demonstrations, case studies, and a homework assignment featuring self-inspection. We will train the trainer, so that he can return to his facility and instruct those working with him. Our intent is for the student to learn food safety, and not to just pass a test at the end of the course." Gardner indicated that courses will begin in the Chicago area in June. Interested parties should call Sanisafe & Associates, Inc. at (312)272-0508.

Gardner is a Certified Professional Food Sanitarian and a State of Illinois-certified instructor in foodservice sanitation. Sanisafe & Associates is a consulting group to the food industry in government regulation compliance, sanitation, and quality control.

### ***Free Processor Seminars Compliment Food & Dairy Expo '89***

More than 20,000 top industry executives, including manufacturing managers, engineers, researchers, and marketing/sales personnel from 90 countries, will gather to see "The Industry's Best" and take advantage of a new seminar program offered free to processors, this November 11-15, when Dairy and Food Industries Supply Association, (DFISA) will host Food & Dairy EXPO '89 in Chicago, Illinois, USA.

For the first time in EXPO's 70 year history a free seminar program will be offered to processors. Food & Dairy EXPO '89 will feature "Preparing for the 90's" with 20 sessions covering an array of topics relating to food ingredients and formulation, plant engineering, packaging, sanitation, processing, distribution, marketing, management, technology and new products.

The free seminar program is managed by Bill LeMaire of *Packaging Strategies*, an industry newsletter and seminar producer. Most of the sessions will be sponsored by leading dairy and food industry trade publications.

"The addition of the free processor seminar program to Food & Dairy EXPO '89's events offer a total educational and buying experience for the processing industries," said DFISA President Edward W. Rhawn of B-Bar-B, Inc.

"Since its inception in 1917, EXPO has provided processors with a single forum to compare, analyze and become familiar with the products and talents available to them. The seminar program reinforces the commitment Food & Dairy EXPO has to the betterment of the industry, by providing processors with the knowledge to make smart buying decisions on the show floor," Rhawn added.

With more than 500 firms on almost 300,000 net square feet of exhibit space, Food & Dairy EXPO '89 will be DFISA's largest show ever. Industry leaders exhibiting at Food & Dairy EXPO '89 include (with exhibit space in square feet); Tetra Pak (13,000); Cherry-Burrell (6,150); Pure-Pak (5,625); Processing Machinery & Supply Co., Inc. (3,000); Liquipak (3,000); Niro Atomizer Group (2,800); and Paul Mueller (2,700).

Chicago, the host city for EXPO '89 is an international metropolis, rich in culture, the arts, commerce and industry. Chicago offers first-class hotels, an array of cuisine from around the world, excellent museums, and exciting nightlife. The city has become a world-renowned convention center and is served by O'Hare Airport, the busiest airport in the world.

DFISA will greet visitors with a special International Registration Center and Business Lounge with a multilingual staff to assist them in finding specific systems, ingredients and technology among the more than 500 exhibits at Food & Dairy EXPO '89. Pre-registered



visitors will have badge credentials and EXPO materials awaiting them at the Center.

Food & Dairy EXPO is one of the only 15 exhibitions selected to participate in the United States Government's Foreign Buyer Program. The Foreign Buyer Program will assist international visitors by providing financial, export and language assistance at EXPO and by offering pre-registration information at American Embassies and Consulates around the world.

More information may also be obtained by contacting: Dairy and Food Industries Supply Association, Inc., (DFISA), 6245 Executive Boulevard, Rockville, Maryland 20852-3938; Telephone (301) 984-144, Telex: 908706, FAX: (301) 881-7832.

## *Foodservice Industry Faults Process Behind New Report on Drunk Driving*

National Restaurant Association President Harris "Bud" Rusitzky expressed deep disappointment in a report on drunk driving released by the office of the U.S. Surgeon General.

"The foodservice industry has had a sweeping program aimed at reducing drunk driving in effect for several years and sells one-quarter of the beverage alcohol consumed in the country. Yet we were excluded from the discussions that led to the report. This report contains a few good recommendations and many that are both misdirected and destructive," said Rusitzky.

Rusitzky pointed out that the National Restaurant Association introduced its anti-drunk driving program in 1984 in response to the report of a Presidential Commission. The program involves training of alcoholic beverage servers, public education, and revision of in-house practices such as the introduction of alternative modes of transportation and bar food to be eaten with beverages as well as the elimination of multiple drink offers.

Despite its long-term involvement in this area, Rusitzky said, the association was not informed about or invited to the 1988 workshop that led to the first draft of the report. In February, 1989, long before the final draft of the report was completed, the association wrote the Surgeon General requesting a meeting to discuss drunk driving issues, but that letter was never answered. Repeated follow up letters also received no response.

"The process that led to the report was not fair, balanced or complete. As a result, the report is flawed in many ways," Rusitzky said.

As an example of the problems involved in the report, Rusitzky alluded to the recommendation that "happy hours" be prohibited. "There is nothing wrong with people getting together after work and having some food and a drink. Happy hours are not harmful in themselves."

"It is the multiple drink promotions such as two-for-

ones or all-you-can-drink offers that may foster over-consumption," the Association President said. "The National Restaurant Association called for the elimination of multiple drink offers in 1984 and has continued to advocate their elimination ever since. This kind of industry self-discipline is a far more effective means of handling the problem than a ban on after-work gatherings."

"When the right people are not involved in issues faulty conclusions are reached. That's what happened here," he added.

The foodservice industry spokesman said that there were many recommendations in the report that the association could and would endorse, but the majority of the recommendations attempt to reduce the availability of wine, beer and spirits to responsible drinkers--an approach that the association believes is, like total prohibition, counter-productive.

"To reduce incidents of drunk driving," said Rusitzky, "we need programs aimed at educating successive generations on responsible use of alcohol and programs aimed at rehabilitating abusers."

The National Restaurant Association is the leading trade association for the foodservice industry, representing 15,000 companies with over 100,000 individual establishments.

## *IFFA Conference Targets Pacific Rim Market*

The greatest new opportunities for enterprise will be in the more rapidly expanding Western Pacific economies, according to Edward J.R. Scott, keynote speaker at the International Frozen Food Association's (IFFA) second international conference in April.

Scott, chairman of the International Association of Refrigerated Warehouses (IARW) and chairman of John Swire & Sons Pty. Ltd., was one of 16 industry experts who discussed the emerging marketing opportunities for frozen foods with Pacific Rim countries at the conference in Honolulu, Hawaii. Approximately 150 representatives from all aspects of the industry attended the event.

"The mammoth projected growth in this area presents challenges and opportunities from all over the world," stated Scott, "and this applies equally and specifically to producers, suppliers and transporters of frozen and perishable products."

As for economic growth, Scott said the first 70 years of development centered in Europe and America, and a shift in economic trends will continue to change significantly.

"In 1984, for the first time trade across the Atlantic was surpassed by trade across the Pacific" he asserted. "That confirms that the trend will be reinforced as we move toward the 21st century."

Other expert speakers at the two-day conference discussed such topics as the state of various markets with respect to frozen foods; sea and air transport; the status of chilled and frozen storage availability; the development of food irradiation; the demise of CFCs; and approaches to trading with Japan, Singapore and Taiwan.

Newly-elected IFFA President Ed Coale, president of Readi-Bake, Inc., said the impressive turnout indicates that the Pacific Rim is of growing importance to traders in both refrigerated and frozen foods.

The International Frozen Food Association was established in 1973 to serve the unique, growing needs of the frozen food industry in world markets.

## **Seafood Industry Requests Mandatory Federal Inspection**

The seafood industry's largest trade association, the National Fisheries Institute (NFI), has urged Congress to legislate a mandatory seafood inspection program.

In testimony to the oversight subcommittee of the House Energy and Commerce Committee, NFI said legislation is needed to establish a separate, dedicated inspection program specifically designed for fish and seafood, consolidate federal responsibility and accountability in one agency and increase public awareness of proper handling and preparation of seafood products.

Lee Weddig, Executive Vice President of NFI stated, "Seafood consumption has been growing steadily and dramatically for the past 20 years, an indication of the consumers' confidence in the wholesomeness and nutritional benefits of the seafood supply."

"We want to see this growth continue and believe improvements in the regulatory system are necessary to maintain and strengthen consumer confidence. The problem today is not that there is no inspection system, but rather that the present system is inconsistent and incomplete."

Weddig also stated, "We do not wish to minimize or discount any problems currently affecting very small percentages of our products. However, our basic position is that a new system is needed to anticipate rather than react to problems. Such a proactive program is needed because of significant changes occurring in our industry." These new changes include the emergence of new species in the market place, emergence of processing operations in developing countries, emergence of aquaculture as a major source of products, new processing technology, growth in fully processed, ready-to-eat seafood, processing at sea, recognition of new bacteria and viruses, and continued environmental concerns.

"The industry has been working to establish an improved inspection system for several years," said Weddig. In 1985, NFI asked Congress to mandate the design of a seafood inspection system based on the Hazard Analysis Critical Control Point (HACCP) concept recommended by the National Academy of Sciences

(NAS). The design of this seafood surveillance program has been underway for the past two years.

With hundreds of industry professionals devoting thousands of days in government workshops and meetings, the industry is contributing massive time and effort to see that this study is completed as soon as possible. The HACCP concept is a safety-quality assurance system that monitors the critical control points, those steps in a processing operation which have the potential of causing hazards.

NFI believes that the HACCP system should be mandated as the key regulatory tool of a comprehensive inspection system, which also includes: certification of plants, surveillance of operations and imports, increased molluscan growing water monitoring and enforcement, toxic substance monitoring, and economic violation enforcement.

"In summary," added Weddig, "We see an improved regulatory system combining a series of new or expanded inspection and monitoring efforts. The mandatory system would be developed and implemented consistent with the risk based HACCP concept."

The National Fisheries Institute is the largest seafood industry trade association representing over 1,000 member companies involved in all aspects of the seafood industry.

For more information contact the National Fisheries Institute, Communications Department, 2000 M Street, NW, Suite 580, Washington, D.C. 20036. (202)296-3428



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# Food and Environmental Hazards To Health

## Testicular Cancer in Leather Workers-- Fulton County, New York

Between 1982 and 1984, three cases of testicular cancer were diagnosed in workers at a leather tannery in Fulton County, New York. The occurrence of this cluster of cases in association with exposure to suspected etiologic agents prompted an investigation by representatives of the Amalgamated Clothing and Textile Workers Union, the Mount Sinai School of Medicine, the New York State Department of Health, and the National Institute for Occupational Safety and Health (NIOSH). The investigation included medical assessment of the three index patients, an environmental assessment of the tannery, and epidemiologic studies of the tannery workforce.

### Medical and Occupational Assessment of Index Patients

The first case occurred in 1982, when embryonal cell carcinoma was diagnosed in a 31-year-old worker who had begun work in leather tanning 13 years earlier. A second case of combined seminoma and embryonal cell carcinoma was diagnosed in 1984 in a 36-year-old worker who had begun work in this industry 19 years earlier. The third case of embryonal cell carcinoma was also diagnosed in 1984 in a 25-year-old worker who had worked in tanning for 8 years. All three employees had worked together on the finishing line during the night shift at the index tannery from approximately January 1978 to June 1979. The workers had become aware of each other's illnesses in the course of their medical care and subsequently brought the cluster of cases to the attention of investigators.

### Environmental Exposure Assessment

The index tannery, in operation since the late 1800s, completes the tanning process for partially processed hides received from domestic and international sources, then finishes the hides by applying dyes and other surface coatings. In the finishing process, hides on a series of conveyors pass under banks of nozzles that spray the hides with coating materials consisting of numerous solvents and pigments. The finish is then dried by gas-fired heaters, and the hides are subsequently dried in a room-sized oven. Hides are transferred to and from conveyors manually. The three index patients worked alongside the first process conveyor directly beyond the spray nozzles; they smoothed the coat-

\*With "skin notation," indicating the potential for significant skin absorption.

ing materials onto the leather surface with hand-held felt applicators.

NIOSH reviewed descriptions of the tanning process and collected air and bulk samples in the finishing room of the tannery where the three index patients had been employed. The sampling detected a wide range of hydrocarbons, ketones, metals and alcohols. The compounds detected in the highest concentrations included several glycol ethers known to be testicular toxins (noncarcinogenic agents that cause testicular dysfunction in animals): 2-ethoxyethanol, 0.3-0.5 ppm (Occupational Safety and Health Administration [OSHA] permissible exposure limit [PEL] 200 ppm\*); 2-ethoxyethyl acetate, 0.2-1.5 ppm (OSHA PEL 100 ppm\*); and 2-butoxyethanol, 0.5-10.9 ppm (OSHA PEL 50 ppm\*). However, no documented testicular carcinogens were found in the samples.

In addition to air and bulk sampling, the investigation included observation of the current process, review of Material Safety Data Sheets for previously used materials, and descriptions of past work practices and engineering controls. This procedure determined that the solvent dimethylformamide (DMF) had been used in the finishing line process until recently. The company had discontinued using materials containing DMF because the initial investigators of the cluster had reported potentially substantial exposures to DMF for finishing line workers and had identified reports of other clusters of testicular cancer in association with exposures to DMF. DMF was not detected by NIOSH in any air or bulk samples taken at the time of this investigation.

### Epidemiologic Studies

**Case-Referent Study.** Many leather-processing operations use the same chemicals, and Fulton County is the focus of this industry in New York to determine whether there was evidence for an association of testicular cancer with work in the leather industry (and, by extension, with chemical exposures common to that industry), Fulton County was used as the population base for a case-referent study. A case-patient was defined as "any male resident between age 20 and 54 in Fulton county who developed testicular cancer between January 1974 and March 1987." Cases were identified by review of the New York State Cancer Registry. Information on all three index cases was found in this registry, and seven additional cases of testicular cancer were identified. The registry was also used to select a control group, consisting of 129 men of similar age who lived in Fulton County and who developed any other type of cancer between 1974 and March 1987. Usual occupation and industry at the time of diagnosis (as provided by the reporting physician) for both case-patients and controls were

determined from registry records and were characterized as being leather- or nonleather-related (according to whether the registry information included "leather" or related terms).

Five of the 10 case-patients and 17 of the 129 controls (for whom occupation could be determined) had been employed in leather-related occupations (odds ratio of 5.8 [95% CI 1.5-22.0]). Follow-up interviews were conducted with nine of these 10 persons with testicular cancer; one person was not interviewed. The occupational histories derived from cancer registry files for the five case-patients with leather-related occupations were confirmed by direct interview. Three of those interviewed had no occupational experience in the leather industry. These interviews also identified a sixth person with testicular cancer who had worked on a leather-finishing line and as a textile dyer, although this information was not included in the above statistical analysis.

**Cohort Incidence Study.** Because the three index patients all worked on the finishing line at the tannery, a cohort study was conducted of the tannery workforce to determine whether the occurrence of these cases represented an unexpectedly high rate of testicular cancer. Company-provided records identified 80 persons who had worked in the finishing department of the Fulton County tannery at any time between 1974 and 1987. Data on age and first year of employment were used to calculate person-years at risk. The expected number of cases of testicular cancer for this population was determined by multiplying the age- and calendar-year--specific incidence rates for New York State (excluding New York City) compiled from registry data for 1976-1985 by the person-years at risk. Three cases in this population represent a standardized incidence ratio (observed cases/expected cases) of 40.5 (95% CI 8.1-118.4), which indicates an elevated risk for testicular cancer among finishing line workers.

**Editorial Note:** Public health agencies are often requested to investigate small clusters of disease among groups of workers. In this report, the detection of a cluster of malignancies prompted a series of investigations and resulted in a response by the New York State Department of Health that was based on prudent public health practice. This investigation illustrates problems commonly encountered in cluster studies: the small number of workers involved and the nature of the potential exposures made it difficult to interpret the results of the investigations and to reach unequivocal conclusions. Despite these limitations, however, a public health response to the situation was required.

The epidemiologic studies in Fulton County suggested an association of testicular cancer with employment in tanneries. Although these studies did not identify a definite causative exposure, two previous clusters of testicular cancer have been linked to occupational exposure to DMF, a substance that had been widely used in the index tannery and other tanneries. Animal studies also have shown certain glycol ethers to be testicular toxins but have not shown carcinogenicity.

Epidemiologic evidence for an association of DMF with testicular cancer is inconsistent. In 1986, a study of three

cases of testicular cancer in workers employed in the repair and overhaul of F-4 jet aircraft found that these workers had been exposed to several heavy metals, including cadmium, and to several solvents, including DMF. Follow-up investigation at two similar facilities revealed four cases at a second F-4 aircraft repair facility where DMF was used but no cases at a facility where F-15 aircraft were refurbished without DMF use. In contrast, an epidemiologic study of an industrial cohort exposed to DMF in the manufacture of synthetic fibers detected no excess of testicular cancer.

Several animal studies have not demonstrated that DMF is mutagenic or carcinogenic, although a malignant testicular tumor was found in one of 18 rats exposed to DMF by intraperitoneal injection. Further study is needed to assess DMF more fully for carcinogenic and mutagenic potential. DMF is currently in test status in the long-term bioassay program conducted by the National Toxicology Program.

OSHA now regulates DMF at a PEL of 10 ppm (and recommends avoidance of dermal exposure) because of its hepatotoxicity. Based on available process descriptions, exposures to DMF in the index tannery and in aircraft repair facilities were probably higher than 10 ppm. Because of concerns generated by the cases reported here, the tannery replaced the DMF-containing dyes with other finishing materials that do not contain DMF. Similar facilities in Fulton County are taking or considering similar action. These actions are consistent with prudent public health practice given the accumulating information on health risks associated with DMF. Because DMF is readily absorbed through the skin, proper work practices and use of protective clothing should be emphasized in programs when other solvents cannot be substituted. Workers should be advised of the chemical composition of solvents to which they are exposed and made aware of possible health hazards.

Approximately 94,000 U.S. workers are potentially exposed to DMF (NIOSH, unpublished data). The risk of testicular cancer in DMF-exposed populations and other tannery workers, and the occupational exposure to DMF and other solvents in other clusters of testicular cancer, requires further evaluation with epidemiologic and toxicologic methods. The New York State Department of Health supports the decision of the index tannery and others in the region to eliminate the use of DMF and urges the improvement of work processes to reduce exposures to all hazardous chemical substances. The department also recommends that tannery workers consult their physicians for medical examinations. NIOSH concurs with the state health department's action.

MMWR 2/24/89

## A Botulism Case Study on Smoked/Cured Fish

A firm located in Brooklyn, NY was a manufacturer of "rybetz" a dry, salt cured unviscerated whitefish, ethnically popular in the Russian sections of New York City.

The fish was implicated in an outbreak of Botulism during 1987.

The following traces the history of the fish processor starting in 1986. New York State Department of Agriculture & Markets, Food Inspection Services and Food & Drug Administration inspectors discussed methods of preparation of the whitefish during a plant inspection. It was learned operations had started one (1) month prior to the initial April, '86 inspection. The initial inspection resulted in an embargo of five thousand (5,000) lbs., of Whitefish in various stages of processing. The firm was notified to discontinue all operations requiring a license.

Through a plan of embargoing and sampling of the Whitefish, satisfactory water phase salt results were necessary to release the embargoed Whitefish.

Inadequate procedures in preparing the fish for process, quality control procedures, sampling, record keeping and handling of the finished product were pointed out to the firm management. The procedures had to be corrected prior to licensing the plant for processing.

In August, 1986, firm management agreed to standard operating procedures and processing again started.

In October, 1986, inspectors observed product temperature abuse during processing. An administrative hearing was requested by NY State Department of Agriculture & Markets. No processing could begin without the installation of recording thermometer with a thermocoupling.

In January, 1987, an administrative hearing was held in Albany, NY. Based on that hearing no processing of Whitefish occurred until August, 1987 when a recommended thermocoupling with recording thermometer was installed. A Food Processing License was issued.

In November, 1987, an outbreak of Botulism associated with rybetz resulted in an embargo of all fish in processing and finished product at an associated distributor.

In January, 1988, an administrative hearing resulted in license revocation, destruction of embargoed Whitefish, penalty action and the ceasing of further processing of unviscerated Whitefish.

## Botulism Associated With Processed Fish

### BACKGROUND:

Since 1981 there have been 3 outbreaks of botulinum intoxication due to ready-to-eat, raw, salt-cured, air-dried, whole, unviscerated whitefish. This type of product is an ethnic food and is referred to as "Kapchunka".

Outbreaks of botulism due to Kapchunka produced in New York City occurred in 1981, 1985 and 1987. These outbreaks were responsible for 11 known illnesses, many serious, and 3 deaths.

In the 1981 and 1985 outbreaks, the toxic Kapchunka were found to have water phase salt levels too low to prevent outgrowth of *Clostridium botulinum* spores when the fish was not refrigerated.

In 1987, botulinum caused 8 illnesses, including 1 death.

These occurred in 3 separate incidents, 1 in New York City and 2 in Israel (the Kapchunka were transported by several consumers from New York city to Israel). The water phase salt levels of these fish were above 10%, enough to inhibit the outgrowth of *C. Botulinum* spores. It is obvious that the toxin was formed before the salt reached this level.

In 1970, the Food and Drug Administration promulgated a Current Good Manufacturing Practice Regulation (CGMP's) for the processing of hot smoked and smoke-flavored fish. This regulation was published in the *Federal Register* as Part 122. This regulation set forth processing parameters to control the health hazard from *C. botulinum* in this type of processed fish. After several court trials, the U.S. Court of Appeals for the Second Circuit in 1977 ruled that "the CGMPR was promulgated in an arbitrary manner and was therefore invalid." Because of the Kapchunka outbreaks and the continued concern by FDA regarding the botulism hazard from other processed fish, action steps are being taken.

### CURRENT STATUS:

1. The Agency is going to publish, in the *Federal Register*, a Compliance Policy Guide which states that the Agency considers Kapchunka-type products to be adulterated under section 402 (a)(4) of the Act and will take regulatory action against any Kapchunka-type product in interstate commerce.
2. The Agency is going to promulgate a new CGMPR for hot and cold smoked fish and salted fish.

## "The Unicode: A Dynamic Food Safety System"

The proposed Food Protection Unicode will provide retail food establishments and their regulators with a dynamic system for assuring food safety, preventing foodborne illness and applying sound environmental health principles. FDA developed this proposed model code in cooperation with thirteen regulatory, trade and professional organizations, including IAMFES.

Food safety experts were consulted and scientific literature was reviewed on all substantive issues to determine the most current optimum requirements for food protection. Though many of the fundamental public health principles found in the three existing model food codes are incorporated in the proposed Unicode, several major changes are very apparent. These include a HACCP-based approach to food safety which can be used in all types of food service, retail food store and vending operations and changes in format and regulatory requirements.

The proposed Unicode will be a computer-based system of requirements which can be easily updated as the industry and technology change or new public health issues emerge. A new software package will link the Unicode requirements to establishment inspections by providing detailed reports of the violations and a series of program management reports. The compliance programs will be strengthened in the local and state jurisdictions which adopt the dynamic Food Protection Unicode.

## Quality Control for Added Fruits in Dairy Products

The quality control for fruits added to dairy products begins with effective raw material and processing specifications for purchasing, receiving, in-plant handling and processing, and finished products. The effectiveness of the quality control program depends on identifying the process critical control points of the operation, including physical, chemical and microbiological factors.

Fruit composition and the method of preservation are critical factors which will affect product handling, and the subsequent quality of dairy products. Although fruit flavor, color and texture are important ingredient characteristics, the microbiological integrity of the fruit becomes most critical when added to pasteurized dairy products. Post pasteurization contamination by microorganisms, both pathogenic and non pathogenic, continue to be of concern to the dairy industry.

Where aseptically packed fruits are used, post pasteurization contamination of products by the fruit is minimal. However, improper handling and sanitation of the fruit packages prior to use can contribute to higher microbiological counts. Use of frozen fruit, without preservatives or pasteurization, while providing superior flavor, color and texture, may contribute to the overall microbiological quality of dairy products. Therefore, the Quality Control Department needs to monitor not only the microbiological quality of the fruit, but also the sanitation associated with the handling process of the fruit. Controlled defrosting of frozen fruit will assure consistent fruit color, flavor, texture and microbiological control, thereby providing continual high quality finished dairy products.

In addition to the proper thawing and handling of fruit, an effective plant sanitation program needs to be monitored by the Quality Control Department. Your company's product quality can also be monitored by the frequency of consumer complaints. These complaint trends may then be used to determine the need for supplier, process or personnel changes or modifications.

### Report of the Hepatitis Outbreak in Onondaga County

Onondaga County's endemic level of Hepatitis A cases previously ranged from 12-24 cases/year. Thirty-eight confirmed cases were reported in June 1987 alone. This outbreak has persisted with 209 confirmed cases being reported between May of 1987 and October 1988.

The impact on the foodservice industry within Onondaga County has been devastating. Sixteen food handlers have been diagnosed with Hepatitis A since June 1987, which has affected fifteen foodservice establishments.

The first five of these affected establishments was identified between June 12, 1987-July 6, 1987. As a result, it was necessary to offer gamma globulin inoculations to

affected patrons of these establishments. Public clinics were set up, sometimes concurrently, with approximately 10,000 inoculations being administered during this period.

The Onondaga County Health Department's response to stem the tide of this outbreak was to issue a Commissioner's Order mandating all food handling employees in restaurants to wear clean plastic gloves when handling foods which did not require further cooking. This order began on July 7, 1987 and continues to date. The foodservice industry was notified of the glove order by mail, intensive media coverage and informational seminars. They were advised their employees must wear plastic gloves when handling food not requiring further cooking except in situations where a safety hazard would exist; i.e. hot preparation areas where gloves would melt and while operating machinery. However, they were also advised that while in these situations, gloveless employees could not touch these foods. Proper use of utensils would be necessary when faced with this problem.

The initial response by the industry was very good. After two days of scrambling to find plastic gloves, their use was well established. Food Protection Section's enforcement stance was to issue a written warning when non-compliance was observed, with a twenty-four hour re-inspection scheduled and conducted to assure compliance.

As the outbreak continued into the early fall of 1987, its impact on this industry diminished. A six week lag in cases was partially responsible for increased non-compliance with this order. With an upswing in cases observed in late September and early October, along with a large amount of observed non-compliance, it became necessary to change our enforcement stance. The industry was notified by mail in mid-October that a Commissioner's Hearing would be scheduled for any observed non-compliance with the plastic glove order. They were further advised that fines would be assessed during these hearings.

To date, 121 hearings have been held or scheduled for non-compliance with this order. Fines assessed range from \$50.00 to \$1,000.00 with an average of \$250.00 per violation. This enforcement response did serve to increase compliance within the industry.

The public's response to this outbreak and the glove order has been overwhelming. People began to consume more meals at home, especially after a foodservice case was announced. Concurrently, they have responded with 1,546 complaints of food handlers not wearing gloves since July 1987. Additionally, several complainants reported they had refused foods served to them after they observed it being prepared by gloveless food handlers.

This outbreak has certainly increased consumer's knowledge of proper food handling procedures. They are now complaining about food handlers using soiled gloves to prepare their food. What they are actually observing is what food handlers have been doing with their bare hands for years. Yet, when they saw this before, they rarely complained! The glove or silhouette that has been placed over the individual's hands has focused the attention to this problem.



The impact on Onondaga County's Food Protection program has been significant. Personnel within this program were forced into a complaint investigation mode as a result of the overwhelming number of complaints previously mentioned. This affected the normal surveillance program dramatically as the number of routine inspections fell to almost a complete standstill. Additional personnel were subsequently moved from other duties and trained to investigate "no glove" complaints in early 1988. This allowed the program to once again maintain routine surveillance inspections.

There are several concerns about the use of plastic gloves that need to be addressed. Of primary importance, the foodservice industry and the consuming public had to realize that glove use was not a panacea. Proper handwashing when necessary was still the most important issue. Additionally, the industry had to be educated to use gloves in a manner which would prevent cross-contamination. This has proved to be difficult as a large number of consumer complaints indicate this continues to occur. One notable complaint indicated a gloved food handler was observed petting a dog in a parking lot while smoking a cigarette. When the customer entered the facility, this employee followed and proceeded to prepare his food using the same gloves.

Currently, this Hepatitis A outbreak appears to be subsiding. While it remains to be seen if it's over, a number of issues need to be addressed.

The most important issue is handwashing. It remains to be seen if the foodservice industry within Onondaga County will wash their hands as needed after the plastic glove order is rescinded. Since handwashing was at a minimum prior to this outbreak, it will be a challenge to the industry and the Food Protection program to increase and maintain handwashing among food handlers in the future. Plans for adequate and responsible enforcement of adequate handwashing and the facilities required to allow such are currently being formulated.

Another critical issue is where do plastic gloves fit into food handling activities in the future? Onondaga County's glove mandate has clearly shown that the use of plastic gloves serves to stop the transmission of disease. This has been shown by three food handlers that contracted Hepatitis A while working. Extensive investigation indicated proper glove use. As a result, no gamma globulin inoculations were offered and no cases were reported among patrons of these establishments. This information notwithstanding, the use of plastic gloves in high risk areas such as salad and cold sandwich preparation, etc. can serve to reduce the amount of bacterial and viral illnesses currently being observed across the state; not to mention the increased consumer confidence when glove use in food preparation is observed.

NYSAMFS Newsletter-Annual Report Issue 1/89

## Toxigenic *Vibrio cholerae* 01 Infection Acquired in Colorado

On August 17, 1988, a 42-year old man was treated for profuse watery diarrhea, vomiting, and dehydration at an emergency room in Rifle, Colorado. On August 15, he had eaten approximately 12 raw oysters from a new oyster-processing plant in Rifle. Approximately 36 hours after eating the oysters, he had sudden onset of symptoms and passed 20 stools during the day before seeking medical attention. Stool culture subsequently yielded toxigenic *Vibrio cholerae* 01, biotype E1 Tor, serotype Inaba. The patient had no underlying illness, was not taking medications, and had not traveled outside the region during the month before onset.

The oysters had been harvested on August 8, 1988, in a bay off the coast of Louisiana. Approximately 1000 bushels (200,000) arrived by refrigerator truck at the plant in Rifle on August 11. The patient purchased three dozen of these oysters on August 15.

During a 6-day period, eight other persons shared the oysters purchased by the patient. None became ill. Although one of seven tested had a vibriocidal antibody titer of 1:1640, none had elevated antitoxic antibody titers, and none had *V. cholerae* 01 isolated from stool. Physician and local health departments were asked to notify the Colorado Department of Health about similar cases, but none were reported.

The oyster-processing plant in Rifle began operation in May 1988 and functioned as a wet-storage unit. The Gulf oysters were reportedly harvested from approved waters, trucked to Colorado, and placed in recirculating disinfected artificial seawater baths for a variable number of days before packaging for market. These oysters were probably the vehicle of infection for the case of cholera.

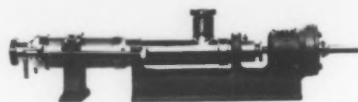
**Editorial Note:** VcA-3 phage typing showed that the organism is identical to all others associated with an endemic focus known to have been present in the Gulf of Mexico since 1973. This is the third reported case of toxigenic *V. cholerae* 01 apparently acquired from oysters shipped interstate in the United States and is the first case known to have been acquired in Colorado during this century.

This report suggests that *Vibrio cholerae* may persist in oysters for many days after harvest. Several different *Vibrio* species previously have been associated with infections related to consumption of raw oysters. Since this case occurred, five additional oyster-related cases of cholera have been reported by five other states from August to October 1988. Thorough cooking remains the best method to prevent acquisition of infectious diseases from raw shellfish.

MMWR 1/10/89



# Industry Products



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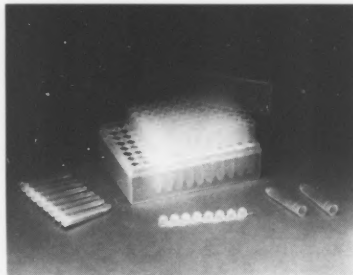
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## **New Racked Micro Test Tubes**

New 1 ml Titertube<sup>®</sup> micro test tubes, from Bio-Rad Laboratories, come in disposable racks of 96 tubes, matching the spacing of multi-channel pipets, microtitration plates, and MTP racked tips. The racked micro test tubes are ideal for procedures such as ELISA, where high volume demands efficient storage. These versatile racked tubes allow transfer of sample in either direction between tubes and plates without extra handling. Procedures such as ELISA can be performed directly in the tubes, and serial dilutions are simplified. The efficient racking system allows 5,800 samples to be stored per cubic foot, and tubes and racks are freezable to -80°C. Titertube racked micro test tubes are available presterilized or autoclavable. Bulk replacement tubes are also available.

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### Northfield Freezing Systems introduces new "Spiralview Window" Control Panel

Northfield Freezing Systems, Inc., an industry leader in spiral freezing technology, continues a tradition of engineering innovation with its new SpiralView Window™ control panel.

The trouble-sensing circuitry of the SpiralView Window™ safeguards Northfield's custom-designed systems through a series of operator meters and safety indicators, including automatic notification and shutdown features. The prewired control panel, housed outside the freezer system for easy operator access, provides low-tension stop/start and automatic cold and warm start options as standard equipment.

A programmable controller, which can be linked into existing communication networks at automated plants, allows maximum flexibility in application and operation of Northfield's spiral freezing and cooling systems. The Northfield, Minnesota - based company also offers custom programming service.

The space-saving spiral conveyor is easy to maintain, since it utilizes no cams or gears as the rotating force. Instead, a low-tension capstan drive moves an endless belt through the freezer unit. An automatic washing system cleans, rinses and dries the belt, and an unique rinse system assists in defrosting the coils.

Northfield's spiral freezing system combines vertical coil arrangement with horizontal airflow design. The result is constantly changing angles of air contacts assuring uniform product freezing. Pressure equalization shrouding at product entrance and exit ports conserves energy by minimizing infiltration of plant air into the freezer.

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### Shields Manufacturing Introduces a Versatile Line of Hazardous Materials Storage Facilities

Responding to a recent mandate (the Resource Conservation Recovery Act (RCRA)) calling for the proper storage of all types of hazardous materials, Shields Mfg. Co., Inc. has introduced a versatile line of storage facilities designed for hazardous materials containment.

According to Shields' President, Steve Van Valkenburgh, "businesses need to take this mandate seriously. Our products offer the protection a business needs...protection against contamination due to spills, leaks or explosions. In addition, our facilities provide a high level of security from fire and other potentially catastrophic events."

Optional product features include exclusive designs such as the one-piece secondary containment sump floor construction, assuring the integrity of containment, and the Programmable Atmospheric Controller (PAC) system designed to monitor the internal temperature and vapor level of the facility and respond in the event of an emergency.

Other product features include the explosion relief roof, a high-gloss anti-corrosive urethane outside paint (the same coating used by NASA), forklift mobility, security provisions to protect against vandalism and theft, bifold full-opening doors, and more.

All facilities manufactured by Shields have been engineered to exceed industry standards and meets all government regulations.

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### New Product: Sanitary Bin Fluidizer for the Food and Pharmaceutical Industries

Fluidizer Inc. has announced their new--FLO-ALL "S" sanitary bin fluidizer, designed specifically for applications in the Food and Pharmaceutical industries. The FLO-ALL "S" provides a series of timed air bursts, in a rotary pattern to eliminate clogging problems like: Arching, Bridging and Rat-Holing in bins, hoppers and storage tanks.

The patented design of the FLO-ALL and the use of a flexible O-ring seal provides a safer, more effective seal, that prevents blow back. The rubber O-ring also helps absorb shocks and vibration.

These units are compact enough to fit into the tightest areas. They install in minutes, snap together, and require no tools for assembly or disassembly, for fast and easy cleaning and maintenance.

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### Portable Fogger

The FOGMASTER Tri-Jet (Model 6208) is an efficient and economical way to control insects, kill germs and bacteria, and deodorize or sanitize buildings, hospitals, hotels, barns, kennels, etc. It has emerged as one of America's most efficient, economic and durable means of exterminating insects and pests in restaurants and food processing areas, for fly control with livestock, and reducing airborne dust in mining, milling or asbestos removal. Virtually any liquid chemical -- including water-and oil-base insecticides, pesticides, mildewcides, germicides and fumigants -- can be dispersed through FOGMASTER's specially-designed, no-clog nozzle. An adjustable output knob calibrates the dispensing rate, and the fogger's aerodynamic head pivots to achieve desired direction flow.

Designed for years of dependable, trouble-free use, FOGMASTER's durable polished aluminum bodies and tanks are constructed to resist industrial abuse, weathering and chemicals. In addition to its effectiveness in pest control, many food processors and restaurants use FOGMASTER to eliminate unpleasant odors and sanitize equipment and food prep areas.

FOGMASTER foggers are made in the United States and carry a 5-year warranty.

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### **New Retail Sizes Added to Mammoth Containers' Injection Molded Dairy Carton Line**

Mammoth Containers' two new sizes, a semi-tall 8 oz. and a tall 16 oz., utilize a common lid approach for ease in filling and capping.

These packages were designed for sour cream, yogurt and dips. They are molded of durable high density polyethylene.

These two sizes round out Mammoth's cultured products packaging line, which includes the 7500 series squat 8 oz., 12 oz., 16 oz., 24oz. and 32 oz. All sizes take a common lid. Two yogurt styles, a standard 8 oz. and a false-bottom 8 oz. yogurt carton, and a squat 32 oz. for sour cream, cottage cheese, and yogurt. All sizes are adaptable to tamper evident innerseals, shrink bands or a complete overwrap. Mammoth produces a flush or recessed lid for all sizes.

High quality graphics help give your retail packages excellent shelf appeal. These containers and lids are dishwasher, microwave and freezer safe for consumer reuse.

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### **CX-1 Water Activity System**

Because of a system developed by Decagon Devices, quality and shelf-life of dairy products, and other foods, can now be improved and prolonged through the use of data gained from Water Activity measurements. The CX-1 Water Activity System from Decagon Devices displays  $A_w$  (Water Activity) and Temperature of most samples in less than 5 minutes. No temperature equilibration is required. The CX-1 provides highly accurate readings +/- .003 from .03 to 1.0  $A_w$ . Data from the CX-1 can be analyzed and printed by an IBM compatible computer. The CX-1 has low cost, fast sample throughput, and very accurate results.

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### **What Should One Look For in a Metal Detector?**

The metal detector's housing should provide sufficient electro-magnetic shielding to keep radio frequency energy inside and stray fields out.

The door should completely cover and seal all electronics within the unit's housing.

Digital circuitry on today's advanced metal detectors gives them higher sensitivity, higher reliability, and allows them to efficiently monitor for metallic contamination at very slow (1 ft./min.) and very fast (100 miles/hour) process rates.

New circuitry designs, such as that on Eriez Magnetics' E-Z TEC III<sup>®</sup> metal detector, allow accurate monitoring of materials on pneumatic conveyors moving as fast as 8800 ft./min. The unit also features a crystal oscillator for a stable, drift-free frequency reference.

For flexibility in conjunction with auto-reject mechanisms which divert contaminated product downstream of the detector's location, you'll want to look for variable-delay triggering, tachometer devices which allow for variable product speeds, and computer-memory storage of multiple detections for precise rejections. Also look for auto-restart switches which eliminate manual restarting and, consequently, downtime.

Reputable manufacturers are usually willing to work closely with you to help select the metal detector that's right for the job. Eriez Magnetics, for example, offers complete testing and analysis of products and materials under simulated operating conditions prior to recommending a metal detector model. Start-up assistance also can be provided.

Once properly installed, today's new generation of metal detection equipment needs only a commitment to periodic maintenance and inspection in order to satisfactorily control metal contamination.

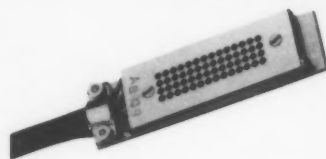
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### **Chr. Hansen's Laboratory Issues New Catalog on Custom, Cultures, Colors & Specialty Ingredients for Dairy Processors.**

Custom Cultures, Colors & Specialty Ingredients for dairy processors is the subject of a new catalog announced by Chr. Hansen's Laboratory, Inc. of Milwaukee, Wis. The catalog covers product descriptions and application data for fluid milk, buttermilk, sour cream, ice cream, yogurt and cottage cheese.

Among the Chr. Hansen cultures, media and ingredients featured are DVS<sup>®</sup>, Redi-Set<sup>®</sup>, Nu-trish<sup>®</sup>a/B, Americana<sup>™</sup>, Bri-Vac<sup>®</sup>, Cal-Sol<sup>®</sup> and DS-G-1<sup>™</sup>.

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### **Electrolyte Sensors**

Beckman Industrial has announced a series of Hygroline<sup>®</sup> Electrolyte Sensors in which the mechanical configuration can vary considerably but the principle of sensor operation is common to all.

The internal members consist of two small, low mass components which correspond to measuring and reference functions. The measuring element consists of a glass support that is coated with a proprietary formulation of electrolytes, binders, and absorbed water. The coating is collectively hygroscopic and the impedance of the element changes rapidly as changes in absorbed water level take place to match the element's surrounding environment. The reference component corrects for whatever influence may be exerted by temperature variations on the performance characteristic of the measuring element. Together, the measuring and reference elements can be regarded as a sensor of relative humidity.

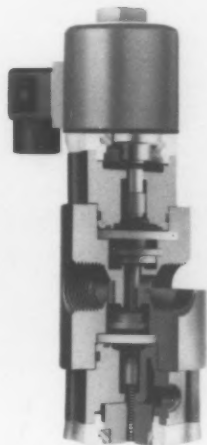
Typical specifications include Accuracy Limit: rel. humidity (20 to 80%) +/-1%, (5 to 100%), +/-1%; temperature (10 to 30°C), +/-0.3°C, (0 to 50°C), +/-0.4°C; dewpoint (at 50% r.h. nominal), +/-0.6°C; Repeatability, +/-0.3% r.h., +/-0.2°C.

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### **Protective Epoxy Coating Lowers Maintenance Costs, Adds Years of Life**

From Garon Products, Inc. comes Tigerbond 221, an epoxy maintenance that gives maximum protection against moisture, chemicals (including acids, alkalis and caustics) corrosion, and heavy-duty abrasion. Even stands up to steel wheels. Forms a durable, porcelain-like finish that cleans easily and reduces long-term maintenance. Mistake-proof 1-to-1 mix ratio: quick and easy application with brush, roller or spray. Bonds with metal, wood, or concrete. Suitable for interior and exterior walls and floors, dozens of other applications. USDA approved for food processing plants. Five colors plus clear finish.

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### **DL200 Continuous Tube Flowmeter Introduced by Micro Motion, Inc.**

Micro Motion, Inc., known worldwide for their state-of-the-art Coriolis-based direct mass flowmeters, has unveiled the sanitary DL200 2-inch continuous tube mass flowmeter. Constructed of high-quality stainless steel, the DL200 meets 3A sanitary standards for flowmeters (28-01) for milk and milk products.

The DL200 is the second sanitary meter to be introduced by Micro Motion; the 1-inch DL100 has been successfully used in industrial applications for several years. The DL200 continuous flow tube is expected to fill an existing void--particularly in milk and dairy plants where 2-inch fittings are commonly found--for a sanitary mass flowmeter.

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### **Eliminate Indoor Pollution with Smokemaster Electronic Air Cleaners**

Smokemaster electronic air cleaners, introduced by Air Quality Engineering, Inc., eliminate indoor pollution in a variety of industrial applications. It cleans the air of welding fumes, smoke, dust, dirt and other causes of unhealthy air.

The Smokemaster F66 teamed with an optional source capture plenum is the most effective way to capture airborne contaminants. For background air cleaning, multiple F66's can be positioned in a plant or shop to create effective airflow patterns.

Models are available with an additional electronic cell module for more efficient air cleaning. This converts the air cleaner into a "double pass" unit, i.e., air gets cleaned twice for greater capacity and efficiency.

The Smokemaster F66 lowers your energy costs. Smokemaster air cleaners clean and recirculate the air in most industrial applications without exhaust fans which blow expensive heated or cooled air outside - a real energy waste.

The Smokemaster F66 Air Cleaner helps industries meet air quality standards of OSHA, insurers and state agencies. Electronic air cleaning from Smokemaster is often the most effective and economical way to clean the air in industrial applications.

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### **New Corrosion-Resistant Three-Way Solenoid Valve For Back Pressure Ratings to 100 PSI**

Plast-O-Matic Valves, Inc. announces the development of a three-way thermoplastic solenoid valve which operates in situations involving high inlet and high back pressures in sizes 1/4" and 1/2" NPT.

Designated Series THP, this compact direct acting solenoid valve is designed to handle corrosives such as acids, caustics, and ultra pure liquids.

A double rolling diaphragm and balanced shaft design permits inlet and back pressure ratings up to 100 PSI. This makes it ideal for sprayhead & filter installations and other applications where high back pressures are experienced.

Series THP valves also incorporate the patented Fail-Dry™ safety design which provides visual warning of primary seal failure while permitting the valve to continue functioning.

The three-way solenoid valves are used to deliver flows from a common inlet to either of two outlets or in reverse to feed flows from two lines into a common outlet. The THP can also be used as a 2-way valve with backpressure ratings of 60 PSI by simply plugging one of the outlet ports to make the valve either normally open or normally closed.

Materials of construction are PVC, Polypropylene, Teflon® and Kynar® (PVDF) with seals available in EPDM or Viton® and with no wetted parts made of metal.

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### **New Electric Drive Rotary Tank Washer Introduced by Spraying Systems Co.**

Spraying Systems Co. announces an electrically driven version of the 190 series rotary tank washers ideal for many tank or vessel cleaning jobs encountered in Food Processing applications. Until now, the 190E tank washers were only available with an air motor drive. With the new 190E electric version, these popular tank washers can be conveniently installed in a wider range of tank cleaning operations. Just plug them in to start the orbital cleaning action.

The entire drive unit on both models is located outside the tank. Where electricity can be used safely, the 190E tank washer is a natural choice. The 190A is designed for areas where spark hazards exist or an air motor drive is desired.

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## New Device Speeds and Simplifies Solids Sampling for Food Chemists

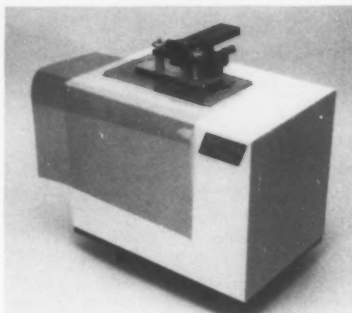
Spectra-Tech has developed the Solids Sampling Station™ for quick, trouble-free, repetitive solids analysis with FT-IR Spectroscopy. The device is designed to be versatile and helpful in various areas of food chemistry, and to improve the analysis of a wide range of liquid samples, powders, pastes and gels as well as harder solids.

The newest member of Spectra-Tech's family of ATR products, The Solids Sampling Station, can meet the needs of measurement laboratories which perform dedicated QC/QA solids analysis for the food industry.

The units remain mounted, aligned and ready to use at all times. Gels, pastes or viscous fluids are simply poured or spread directly into a sampling trough. Sheet materials can be analyzed without cutting by placing the sample directly on a flat sampling plate and holding the material in position with a built-in pressure device. After analysis, both the trough and the plate can be removed for easy cleaning.

In addition to speed and convenience, Spectra-Tech points out that The Solids Sampling Station provides high-sensitivity IR measurements and superior signal-to-noise performance.

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## Newport's Model 558A Current Loop Indicator Requires No Separate Power Connection and is Intrinsic Safety Certified by Fm and Cenelec

Newport Electronics, Inc. announces the availability of the Model 558A two-wire current loop indicator. The 558A is an intrinsically-safe meter which accepts 4-20 or 10-50 mA process signals and digitally displays the process variable in percent or engineering units of pressure, flow, temperature and level.

No separate power connection is required. This reduces field wiring costs and provides

immunity from most electrical noise encountered in process control environments. The 558A obtains its operating power directly from the current loop with a voltage drop of 2.5 V and can tolerate current overdrives up to 200 mA forward, 1000 mA reverse.

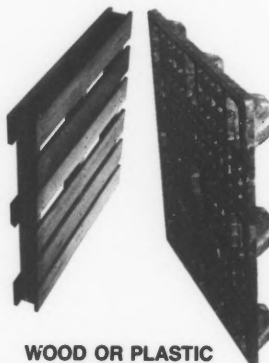
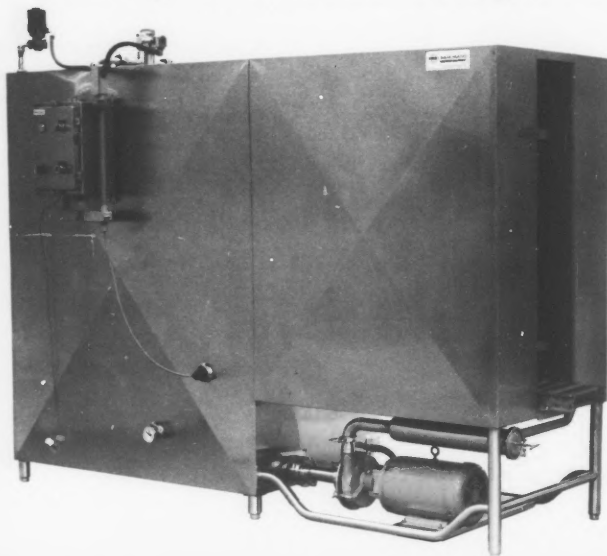
The 558A has been certified intrinsically safe by FM (Factory Mutual) and by BASEEFA to level EEx ia IIC T4 in accordance with CENELEC standards EN 50 014 (1977) + A1 to 4 and EN 50 020 (1977) + A1. EEx ia intrinsic safety certification allows the 558A to be used in Zone 0 (worst case) hazardous environments with no need for an external explosion-proof housing, provided that an external intrinsic safety barrier is used to limit the voltage and current which can be applied to the meter. FM and CENELEC intrinsic safety certification labeling is optional.

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# Food Service Code Interpretations

by

Homer Emery

IAMFES Food Service Interpretations Committee

Congratulations to everyone on the IAMFES staff and executive board for an outstanding annual conference. The breadth and depth of technical presentations were incredible. Ranging from the "Ripening Coefficient for Pickled White Cheese" to the "Survival of Listeria in Aerosols" technical sessions provided a wealth of information on current research activities. Scientific papers were well balanced with a number of symposia and presentations on current and emerging food safety and environmental health issues.

During the FDA Interpretation Committee meeting IAMFES members were invited to submit material for publication in this column. Members wishing to voice a code interpretation question, concern, or viewpoint are invited to do so. Submissions may be typed or hand written. We look forward to hearing more from the field.

A number of interpretation issues were discussed during the committee meeting. Results of these discussions will be provided through this column in a month or two. A major goal of the FDA Interpretation committee is to develop food safety issues for submission to the 1990 Food Protection Conference.

**OFF THE CLIPBOARD:** From 1984-87 eleven job site deaths were caused by the abuse of nitrous oxide. Six of the deaths occurred in young food service workers attempting to get "high" on nitrous oxide used to power whipped-cream dispensers. In most cases the nitrous oxide is collected in a plastic bag and breathed in by the victim. Nitrous oxide results in death from

asphyxiation. Field sanitarians are urged to alert food managers to this potential hazard.

- Last June CDC reported that seven persons, including one child, developed acute lead poisoning from using a ceramic jug for beverages. FDA has recently proposed to reduce the amount of lead permissible in ceramic housewares and to increase their surveillance of these items. It appears that more department stores are now selling hand made and hand painted ceramic housewares with a high potential for releasing hazardous amounts of lead. This writer urges field sanitarians to visit local department stores and check if these items are being sold in your community.

- Committee members recently provided comments to FDA on a draft translation of key food code requirements to be written in several languages. Kudos to FDA on this project. When completed translations will be available in Korean, Chinese, Spanish, and Vietnamese. IAMFES members fluent in these languages are invited to review the final draft when it is available. Let us know your address and language.

- The Occupational Safety and Health Administration (OSHA) now requires food service facilities to meet the requirements of the Hazard Communication Standard. A "Foodservice Operator's Guide to the OSHA HCS" can be obtained from the National Restaurant Association. Send \$9 to NRA Publications Department, 1200 17th St. N.W., Washington, D.C. 20036.

Homer C. Emery, R.S.

## VCH PUBLISHERS

### BIOTEC 2:

**Biosensors and Environmental Biotechnology**

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# Affiliate News

## Pennsylvania Affiliate Holds Program and Meeting

The Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts held their annual conference, meeting and awards banquet May 15-17, 1989. More than 40 speakers presented information on a wide variety of topics to the more than 230 participants.

Mr. Elwood Hench was presented with the Dairy Sanitarians Award. While employed as a fieldman by Atlantic Dairy Cooperative he served the progression of officers leading to President. He has chaired the Rural Water and Waste Committee for years.

Mr. Joseph Gilbert received the Dairy Laboratory Directors Award. He has been the Laboratory Director for Dean Foods for the past few years after serving two previous companies in his more than 30 years.

Mr. Gene Flory was presented with the Distinguished Service plaque for his efforts with the Milk Haulers and Samplers Committee. While employed by J.S. Ewell, Inc., a major contract milk hauler, he led the effort to develop a chart on steps to sample and collect milk. One of these has been placed on nearly every PA farm.

The merged association will present three scholarships, up from the previous two, of \$500 each to qualified Penn State students in dairy and food science starting in the Fall of 1989. The membership committee led by Sam McClay provided a new members directory to all who attended the conference. The program committee developed a list of topics and speakers which led to another successful conference. The Farm Practices Committee remains very active dealing with farm inspection and equipment installation concerns. Mr. Gene Lauver, the committee chairman and a past officer recently passed away of a heart attack.

The 1990 conference is scheduled for May 14-16 at the Keller Conference Center at Penn State University.



Gerald Shick presenting the Distinguished Service Award to Gene Flory, J.S. Ewell Trucking.

## Upcoming IAMFES Affilaite Meetings

1989

### SEPTEMBER

**14-15, 13th Annual Wisconsin Laboratory Education Conference** will be held at the Oshkosh Hilton and Convention Centre in Oshkosh, Wisconsin. For registration information, contact: Laura Rauschl, Program Chairman, c/o Schreiber Foods, Inc., PO Box 19010, Green Bay, WI 54307-9010 (414) 437-7601.

**19-21, New York State Association of Milk and Food Sanitarians**, to be held in Buffalo, New York, at the Sheraton-Buffalo Airport Hotel. For more information, contact: Paul Dersam, 27 Sullivan Rd, Alden, NY 14004, 716/937-3432.

**20-21, Wisconsin Association of Milk and Food Sanitarians Annual Meeting**, will be held at the Holiday Inn East, Madison, WI. Contact: Neil Vassau, PO Box 7883, Madison, WI 53707 608/267-3504.

**25-27, Indiana Environmental Health Association Fall Conference** to be held at the Howard Johnson, Lafayette, IN. For further information call Tammy Barrett, IN State Board of Health (317) 633-0173.

### OCTOBER

**18-19, Iowa Association of Milk, Food and Environmental Sanitarians**, will hold its annual conference at the Holiday Inn, Waterloo, Iowa. For information, contact: Dale Cooper, Box 69, Manchester, IA 52057 (319) 927-3212.

1990

### FEBRUARY

**26-27, Kentucky Association of Milk, Food and Environmental Sanitarians' Annual Conference** will be held at the Holiday Inn Convention Center, Louisville, Kentucky. For more information, contact: Debbie Pierce, Secretary, KAMFES, PO Box 1464, Frankfort, KY 40602 (502) 564-3340.



Gerald Shick presenting Dairy Sanitarian's Award to Elwood Hench, Atlantic Dairy Coop. Hench is accompanied by his wife and daughter.

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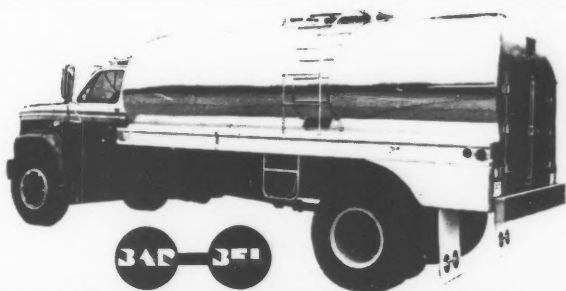
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CIRCLE READER SERVICE NO. 359

## Holders of 3-A Symbol Council Authorization on August 15, 1989

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Robert F. Wolf, Administrative Officer, 3-A Symbol Council, W255 N477 Grandview Blvd., Suite 100, Waukesha, Wisconsin 53188.

### 01-06 Storage Tanks for Milk and Milk Products

115	A-L Stainless Inc. (Not available in USA) 113 Park St., South Peterborough, Ontario, Canada K9J 3R8	(9/28/58)	
2	APV Crepaco, Inc. 100 South CP Ave. Lake Mills, Wisconsin 53551	(5/1/56)	
28	Cherry-Burrell Corporation (A Unit of AMCA Int'l., Inc.) 575 E. Mill St. Little Falls, New York 13365	(10/3/56)	
102	Chester-Jensen Co., Inc. 5th & Tilghman Sts., P.O. Box 908 Chester, Pennsylvania 19016	(6/6/58)	
117	DCI, Inc. P.O. Box 1227, 600 No. 54th Ave. St. Cloud, Minnesota 56301	(10/28/59)	
76	Damrow Company (A Div. of DEC Int'l., Inc.) 196 Western Ave., P.O. Box 750 Fond du Lac, Wisconsin 54935-0750	(10/31/57)	
172	Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801	(6/29/60)	
440	Scherping Systems 801 Kingsley St. Winsted, Minnesota 55395	(3/1/85)	
432	TCI-Superior 611 Sugar Creek Rd. Delavan, Wisconsin 53115-0953 Mississauga, Ontario, Canada L4V 1K4	(11/8/84)	
31	Walker Stainless Equipment Co., Inc. Elroy, Wisconsin 53929	(10/4/56)	
			Dairy Systems Division 1400 West Gale Galesville, Wisconsin 54630
29R	Cherry-Burrell Corp. (A Unit of AMCA Int'l., Inc.) 2400-6th St. SW, P.O. Box 3000 Cedar Rapids, Iowa 52406	(10/3/56)	
205R	Dairy Equipment Co. 1919 S. Stoughton Rd., P.O. Box 8050 Madison, Wisconsin 53716	(5/22/69)	
377	Energy Service Co. (Mfg. by Lederle, Germany) B200 Walker Bldg., 734 15th St., NW Washington, DC 20005	(2/4/83)	
462	Enprotech Corporation 335 Madison Avenue New York, New York 10017	(12/5/85)	
466	Fluid Metering Inc. 29 Orchard St. Oyster Bay, New York 11771	(1/10/86)	
306	Fristam Pumps, Inc. 2410 Parview Road Middleton, Wisconsin 53562	(5/2/78)	
65R	G & H Products Corp. 7600-57th Avenue P.O. Box 1199 Kenosha, Wisconsin 53141	(5/22/57)	
492	A. Gusmer Inc. (Mfg. by Philip Hilge GmbH) 27 North Avenue East Cranford, New Jersey 07016	(1/15/87)	
145R	ITT Jabsco Products (Mfg. by ITT Jabsco, England) 1485 Dale Way Costa Mesa, California 92626	(11/20/63)	
502	INOXPA, S.A. (not available in USA) c/. Telers, 54 17820 Banyoles (Verona) Spain	(4/27/87)	
314	Len E. Ivarsson, Inc. 3100 W. Green Tree Rd. Milwaukee, Wisconsin 53209	(12/22/78)	
373	Luwa Corporation (Mfg. by MAAG Gear, Switzerland) P.O. Box 16348 Charlotte, North Carolina 28297-6348	(12/27/82)	
319	MGI Pumps Inc. (Mfg. by SSP Pumps, England) 847 Industrial Dr. Bensenville, Illinois 60106	(3/21/79)	
148R	Moyno Industrial Products of Robins & Meyers, Inc. 1895 Jefferson St. Springfield, Ohio 45506	(4/22/64)	
400	Netzsch Incorporated	(8/15/83)	

### 02-08 Pumps for Milk and Milk Products

63R	AVP Crepaco, Inc. 100 South CP Ave. Lake Mills, Wisconsin 53551	(4/29/57)	
325	Albin Pump, Inc. (Mfg. by Albin Motor, Sweden) 120 Interstate N. Pkwy. E. #208 Atlanta, Georgia 30339-2103	(12/19/79)	
214R	Ben H. Anderson Manufactures Morrisonville, Wisconsin 53571	(5/20/70)	
212R	Babson Brothers Company	(2/20/70)	



- 119 Pickering Way  
Exton, Pennsylvania 19341-1393
- 375 Niro Atomizer Food & Dairy Inc. (1/25/83)  
(Mfg. by Pasilac, Denmark)  
1600 County Road F  
Hudson, Wisconsin 54016
- 241 Puriti, S.A. de C.V. (9/12/72)  
(Not available in USA)  
Alfredo Nobel 39  
Industrial Puente de Vigas  
Tlalnepantla, Mexico
- 364 Roper Pump Company (7/28/82)  
P.O. Box 269  
Commerce, Georgia 30529
- 568 Shanley Pump & Equipment, Inc. (5/15/89)  
(Mfg. by Allweiler, West Germany)  
2255-1 Lois Dr.  
Rolling Meadows, Illinois 60008
- 507 Sine Pump (7/21/87)  
Division of The Kontro Co., Inc.  
500 West River Street  
Orange, Massachusetts 01364
- 332 TCI-Superior (12/1080)  
611 Sugar Creek Rd.  
Delavan, Wisconsin 53115-0953
- 567 Stainless Products, Inc. (4/4/89)  
1649-72nd Ave.  
P.O. Box 169  
Somers, Wisconsin 53171
- 72R L.C. Thomsen Inc. (9/14/57)  
1303-43rd St.  
Kenosha, Wisconsin 53140
- 26R Tri-Clover, Inc. (9/29/56)  
9201 Wilnot Road  
Kenosha, Wisconsin 53141
- 175R Universal Cooperatives, Dairy (10/25/56)  
Dairy Division  
U.S. Hwy 33 East/Box 115  
Goshen, Indiana 46526
- 471 VNE Corporation (4/27/86)  
(Mfg. by Pumpen-Und Maschinebau  
West Germany)  
1415 Johnson Street  
Janesville, Wisconsin 53545
- 329 Valex Products Corp. (6/10/80)  
6080 Leland Street  
Ventura, California 93003
- 52R Viking Pump, Inc. (12/31/56)  
A Unit of IDEX Corporation  
406 State Street  
Cedar Falls, Iowa 50613
- 5R Waukesha Pumps (5/6/56)  
(A Unit of AMCA Int'l. Inc.)  
1250 Lincoln Ave.  
Waukesha, Wisconsin 53186
- 408 Westfalia Systemat (10/18/83)  
(Mfg. by Westfalia, West Germany)  
1862 Brummel Drive  
Elk Grove Village, Illinois 60007
- 517 Westmoor Ltd./Conde Dairy Equipment (9/23/87)  
P.O. Box 99  
West Hamilton Avenue  
Sherrill, New York 13461

**04-03 Homogenizers and High Pressure  
Pumps of the Plunger Type**

- 37 AVP Crepaco, INC. (10/19/56)  
100 South CP Ave.  
Lake Mills, Wisconsin 53551
- 75 APV Gaulin, Inc. (9/26/57)  
44 Garden St.  
Everett, Massachusetts 02149
- 390 American Lewa, Inc. (6/9/83)  
(Mfg. by Lewa, Germany)  
132 Hopping Brook Road  
Holliston, Massachusetts 01760
- 247 Bran & Luebbe, Inc. (4/14/73)  
1025 Busch Parkway  
Buffalo Grove, Illinois 60015
- 87 Cherry-Burrell Corp. (12/20/57)  
(A Unit of AMCA Int'l., Inc.)  
2400-6th St., SW, P.O. Box 3000  
Cedar Rapids, Iowa 52406
- 486 Fowler Products Company (11/18/86)  
150 Collins Industrial Blvd.  
P.O. Box 1706  
Athens, Georgia 30613-1706
- 309 Niro Atomizer Food & Dairy Inc. (7/19/78)  
(Mfg. by Masinfabriken, Denmark)  
1600 County Road F  
Hudson, Wisconsin 54016
- 558 SOAVI B. & FIGLI S.p.A. (1/3/89)  
(not available in USA)  
43100 Parma (Italy)  
VIA M. Da Erba Edoari, 29A
- 425 TCI-Superior (8/31/84)  
611 Sugar Creek Rd.  
Delavan, Wisconsin 53115-0953

**05-13 Stainless Steel Automotive Milk Transportation  
Tanks for Bulk Delivery and/or Farm Pick-up Service**

- 379 Bar-Bell Fabricating Co., Inc. (3/15/83)  
RR 2  
Mauston, Wisconsin 53948
- 70R Brenner Tank, Inc. (8/5/57)  
450 Arlington Ave., P.O. Box 670  
Fond du Lac, Wisconsin 54935
- 45 The Heil Company (10/26/56)  
1125 Congress Pkwy.  
P.O. Box 160  
Athens, Tennessee 37303-0160
- 40 Hills Stainless Steel & Equipment Co., Inc. (10/20/56)  
505 W. Koehn Street  
Luverne, Minnesota 56156
- 66 Kari-Kool Transports, Inc. (5/29/57)  
P.O. Box 538  
Beaver Dam, Wisconsin 53916
- 201 Paul Krohnert Mfg. Ltd. (4/1/68)  
(not available in USA)  
811 Steeles Ave., P.O. Box 126  
Milton, Ontario, Canada L9T 2Y3
- 513 Nova Fabricating Inc. (8/24/87)  
Jct. I-94 & Co Road 9  
P.O. Box 231

	Avon, Minnesota 56310		333 West First Street	
85	Polar Tank Trailer, Inc.	(12/20/57)	Dayton, Ohio 45402-3042	
	Holdingford, Minnesota 56340		376 Defontaine Inc.	(1/25/83)
521	R & D Stainless		(Mfg. by Defontaine, France)	
	409 S. Hampton		563 A. J. Allen Circle	
	Republic, Missouri 65738		Wales, Wisconsin 53183	
189	A & L Tougas, Ltee	(10/3/66)	509 Fitting Speciality	(8/7/87)
	(not available in USA)		1303 35th Street	
	1 Tougas St.		Kenosha, Wisconsin 53140	
	Iberville, Quebec, Canada		455 Flowtech Inc.	(9/17/85)
25	Walker Stainless Equip. Co., Inc.	(9/28/68)	120 Interstate N. Parkway. E. #208	
	618 State St.		Atlanta, Georgia 30339-2103	
	New Lisbon, Wisconsin 53950		271 The Foxboro Company	(3/8/76)
437	West-Mark	(11/30/84)	33 Commercial Street	
	2704 Railroad Ave., P.O. Box 418		Foxboro, Massachusetts 02035	
	Ceres, California 95307		67R G & H Products Corp.	(6/10/57)
			7600-57th Avenue	
			P.O. Box 1199	
			Kenosha, Wisconsin 53141	
			287 Hackman-MKT, Inc.	(1/14/77)
			(Mfg. by Koltech, Finland)	
			100 Pinnacle Way, Suite 165	
			Norcross, Georgia 30071	
349	APN, Inc.	(12/15/81)	369 IMEX, Inc.	(11/3/82)
	400 W. Lincoln		(Mfg. by Lube Corp., Japan)	
	Caledonia, Minnesota 55921		4040 Del Ray Ave. Unit 9	
260	APV Crepaco, Inc. (08-17 A&B)	(5/21/75)	Marina del Rey, California 90292	
	100 South CP Avenue		454 Jensen Fittings Corp.	(9/11/85)
	Lake Mills, Wisconsin 53551		107-111 Goundry St.	
450	APV International Limited	(8/22/85)	North Tonawanda, New York 14120-5998	
	(Not available in USA)		389 Lee Industries, Inc.	(5/31/83)
	P.O. Box 4, Manor Royal		P.O. Box 688	
	Crawley		Philipsburg, Pennsylvania 16866	
	West Sussex RH10 2QB		239 Lumaco, Inc.	(6/30/72)
	England		P.O. Box 688	
484	APV Rosista, Inc.	(10/22/86)	Teaneck, New Jersey 07666	
	(08-17REV)		200R Paul Mueller Co.	(3/5/68)
	(08-17B)		1600 W. Phelps St., Box 828	
	1325 Samuelson Road		Springfield, Missouri 65801	
	Rockford, Illinois 61109		242 Puriti, S.A. de C.V.	(9/12/72)
470	Advance Stainless Mfg. Corp.	(3/30/86)	(Not available in USA)	
	218 West Centralia Street		Alfredo Nobel 39	
	Elkhorn, Wisconsin 53121		Industrial Puente de Vigas	
380	Allegheny Bradford Corp.	(3/21/83)	Tlalnepantla, Mexico	
	P.O. Box 200 Route 219 South		149R Q Controls Subsid. of Cesco Magnetics	(5/18/64)
	Bradford, Pennsylvania 16701		93 Utility Court	
79R	Alloy Products Corp.	(11/23/57)	Rohnert Park, California 94928	
	1045 Perkins Ave., P.O. Box 529		424 Robert-James Sales, Inc.	(8/31/84)
	Waukesha, Wisconsin 53187		P.O. Box 1672, 269 Hinman Ave.	
245	Babson Brothers Company	(2/12/73)	Buffalo, New York 14216-0672	
	Dairy Systems Division		334 Stainless Products, Inc.	(12/18/80)
	1400 West Gale		1649-72nd Ave., Box 169	
	Galesville, Wisconsin 54630		Somers, Wisconsin 53171	
443	Badger Meter, Inc.	(5/1/85)	391 Stork Food Machinery, Inc.	(6/9/83)
	6116 East 15th Street		(Mfg. by Stork Amsterdam, Netherlands)	
	Tulsa, Oklahoma 74158		P.O. Box 1258/Airport Parkway	
82R	Cherry-Burrell Corp.	(12/11/57)	Gainesville, Georgia 30503	
	(A Unit of AMCA Int'l. Corp.)		300 Superior Stainless, Inc.	(11/22/77)
	2400-6th St. SW, P.O. Box 3000		611 Sugar Creek Rd.	
	Cedar Rapids, Iowa 52406		Delavan, Wisconsin 53115	
478	Ciprianai, Inc.	(7/31/86)	357 Tanaco Products	(4/16/82)
	(Mfg. by Fratelli Tassalini, Italy)		3860 Loomis Trail Rd.	
	25201 East La Paz Road		Blaine, Washington 98230	
	Laguna Hills, California 92653			
528	Dayco Products Inc.	(3/16/88)		

73R	L.C. Thomsen, Inc. 1303-43rd. St. Kenosha, Wisconsin 53140	(8/31/57)	(Not available in USA) Alfredo Nobel 39 Fracc. Ind. Puente de Vigas Tlalnepantla, Mexico	
34R	Tri-Clover, Inc. 9201 Wilmot Rd. Kenosha, Wisconsin 53141	(10/15/56)	149R Q-Controls Subsidiary of Cesco Magnetics 93 Utility Court Rohnert Park, California 94928	(5/18/64)
304	VNE Corporation (Mfg. by Egmo, Israel) 1415 Johnson St., P.O. Box 187 Janesville, Wisconsin 53547	(3/16/78)	542 L.C. Thomsen Inc. 1303-43rd. St. Kenosha, Wisconsin 53140	((8/31/57)
278	Valex Products Corp. 6080 Leland Street Ventura, California 93003	(8/30/76)	34A Tri-Clover, Inc. 9201 Wilmot Rd. Kenosha, Wisconsin 53141	(10/15/56)
86R	Waukesha Specialty Co., Inc. Hwy 14 Darien, Wisconsin 53144	(12/20/57)	467 Tuchenhausen North America Inc. (Mfg. by Otto Tuchenhausen, West Germany) 4119 W. Greentree Road Milwaukee, Wisconsin 53209	(1/13/86)

#### 08-17A Compression Type Valves

533	APV Crepaco, Inc. 100 S. CP Ave. Lake Mills, Wisconsin 53551	(5/21/75)	561 VACU-PURG, Inc. 214 West Main St. P.O. Box 272 Fredericksburg, Iowa 50630	(1/26/89)
484	APV Rosista, Inc. (Mfg. by APV Rosista, Inc. W. Germany & Denmark) 1325 Samuelson Rd. Rockford, Illinois 61109	(10/22/86)	543 Valex Corp. 6080 Leland St. Ventura, California 93003	(8/30/76)
566	Advance Fittings Corp. 218 Centralia St. Elkhorn, Wisconsin 53121	(3/31/86)	86R Waukesha Specialty Co., Inc. P.O. Box 160, Hwy 14 Darien, Wisconsin 53144	(12/20/57)

#### 08-17B Diaphragm-Type Valves

552	Alloy Products Corp. 1045 Perkins Ave. P.O. Box 529 Waukesha, Wisconsin 53187	(11/23/57)	565 APV Rosista, Inc. (Mfg. by APV Rosista, Inc. W. Germany & Denmark) 1325 Samuelson Rd. Rockford, Illinois 61109	(10/22/86)
245	Babson Brothers Company Dairy System Division 1400 West Gale Ave. Galesville, Wisconsin 54630	(2/12/73)	514 H. D. Bauman Assoc., Ltd. 35 Mirona Road Portsmouth, New Hampshire 03801	(8/24/87)
555	Cherry-Burrell Corp. 2400 6th Street S.W. Cedar Rapids, Iowa 52406	(12/11/57)	203R ITT Grinnell Valve Co., Inc. Dia-Flo Division 33 Centerville Rd. Lancaster, Pennsylvania 17603	(11/27/68)
538	Cipriani, Inc. (Mfg. by Fratelli Tassalini, Italy) 25201 La Paz Rd. Laguna Hills, California 92653	(7/31/86)	494 Saunders Valve, Inc. 15760 W. Hardy, #440 Houston, TX 77060	(2/10/87)
376	Defontaine, Inc. (Mfg. by Defontaine, France) 563 A.J. Allen circle Wales, Wisconsin 53183	(1/25/83)	544 Valex Corp. 6080 Leland St. Ventura, California 93003	(8/30/76)

#### 08-17C Boot-Seal Type Valves

530	G & H Products Corp. 7600-57th Ave. P.O. Box 1199 Kenosha, Wisconsin 53141	(6/10/57)	545 Valex Corp. 6080 Leland St. Ventura, California 93003	(8/30/76)
480	GEA Food and Process Systems Corp. 8940 Route 108 Columbia, Maryland 21045	(8/8/86)		

#### 08-17D Automatic Positive Displacement Sampler

559	Hackman-MKT. Inc. (Mfg. by Koltech, Finland) 100 Pinnacle Way, Suite 165 Norcross, Georgia 30071	(1/6/89)	291 Accurate Metering Systems Inc. (Mfg. by Diessel, Germany) 1650 Wilkening Ct. Schaumburg, Illinois 60173	(6/22/77)
483	On-Line Instrumentation, Inc. Rt. 376, P.O. Box 541 Hopewell Junction, New York 12533	(10/15/86)	284 Bristol Engineering Co. 210 Beaver St. P.O. Box 696	(11/18/76)
551	Puriti, S.A. de C.V.	(9/12/72)		

- Yorkville, Illinois 60560  
 546 Valex Corp. (8/30/76)  
 6080 Leland St.  
 Ventura, California 93003
- 08-17E Inlet and Outlet Leak-Protector Plug Valve**
- 556 Cherry-Burrell Corp. (12/11/57)  
 2400 6th Street S.W.  
 Cedar Rapids, Iowa 52406
- 553 Alloy Products Corp. (11/23/57)  
 1045 Perkins Ave.  
 P.O. Box 529  
 Waukesha, Wisconsin 53187
- 34E Tri-Clover, Inc. (10/15/56)  
 9201 Wilmot Rd.  
 Kenosha, Wisconsin 53141
- 547 Valex Corp.  
 6080 Leland St.  
 Ventura, California 93003
- 08-17F Tank Outlet Valve**
- 539 Cipriani, Inc. (7/31/86)  
 (Mfg. by Fratelli Tassalini, Italy)  
 25201 La Paz Rd.  
 Laguna Hills, California 92653
- 531 G & H Products Corp. (6/10/57)  
 7600-57th Ave.  
 P.O. Box 1199  
 Kenosha, Wisconsin 53141
- 534 Lumaco (6/30/72)  
 9-11 East Broadway  
 Hackensack, New Jersey 07601
- 548 Valex Corp. (8/30/76)  
 6080 Leland St.  
 Ventura, California 93003
- 08-17G Rupture Discs**
- 422 BS & B Safety Systems, Inc. (6/12/84)  
 7455 E. 46th St.  
 Tulsa, Oklahoma 74133
- 407 Continental Disc Corp. (10/14/83)  
 4103 Riverside NW  
 Kansas City, Missouri 64150
- 549 Valex Corp. (8/30/76)  
 6080 Leland St.  
 Ventura, California 93003
- 08-17I Steam Injected Heaters**
- 560 Pick Heaters, Inc. (1/19/89)  
 P.O. Box 516  
 West Bend, Wisconsin 53095
- 09-07 Instrument Fittings and Connections Used on Milk and Milk Products Equipment**
- 428 ARI Industries, Inc. (9/12/84)  
 381 ARI Court  
 Addison, Illinois 60101
- 321 Anderson Instrument Co., Inc. (6/14/79)  
 RD #1  
 Fultonville, New York 12072
- 315 Burns Engineering, Inc. (2/5/79)  
 10201 Bren Rd., East  
 Minnetonka, Minnesota 55343
- 206 The Foxboro Company (8/11/69)  
 33 Commercial Street  
 Foxboro, Massachusetts 02035
- 418 Niro Atomizer Food & Dairy Inc. (4/2/84)  
 1600 County Road F  
 Hudson, Wisconsin 54016
- 487 Pyromation, Incorporated (12/16/86)  
 5211 Industrial Road  
 Fort Wayne, Indiana 46825
- 367 RDF Corporation (10/2/82)  
 23 Elm Ave.  
 Hudson, New Hampshire 03051
- 495 Rosemount Analytical Division (2/13/87)  
 2400 Barranca Pkwy.  
 Irvine, California 92714
- 420 Stork Food Machinery, Inc. (4/17/84)  
 P.O. Box 1258/Airport Parkway  
 Gainesville, Georgia 30503
- 32 Taylor Instrument (10/4/56)  
 Combustion Engineering, Inc.  
 400 West Avenue, P.O. Box 110  
 Rochester, New York 14692
- 444 Tuchenhausen North America, Inc. (6/17/85)  
 4119 Green Tree Road  
 Milwaukee, Wisconsin 53209
- 522 Weed Instrument Company, Inc. (12/28/87)  
 707 Jeffrey Way  
 Round Rock, Texas 78664
- 10-03 Milk and Milk Products Filters Using Disposable Filter Media, as Amended**
- 371 Alloy Products Corp. (12/10/82)  
 1045 Perkins Ave., P.O. Box 529  
 Waukesha, Wisconsin 53187
- 435 Sermia Equipment Limited (11/27/84)  
 (Not available in USA)  
 2511 Barbe Avenue  
 Chomedey, Laval, Quebec, Canada H7T 2A2
- 296 L. C. Thomsen, Inc. (8/25/77)  
 1303 43rd St.  
 Kenosha, Wisconsin 53140
- 35 Tri-Clover, Inc. (10/15/56)  
 9201 Wilmot Road  
 Kenosha, Wisconsin 53141
- 11-04 Plate-type Heat Exchangers for Milk and Milk Products**
- 365 APV Baker AS (9/8/82)  
 (not available in USA)  
 Platinvej, 8  
 P.O. Box 329  
 DK-6000 Kolding  
 Denmark
- 38 APV Crepaco, INC. (10/19/56)  
 100 South CP Ave.



	Lake Mills, Wisconsin 53551			Bradford, Pennsylvania 16701	
20	APV Crepaco, INC. 395 Fillmore Ave. Tonawanda, New York 14150	(9/4/56)	243	Babson Brothers Company Dairy Systems Division 140 West Gale Galesville, Wisconsin 54630	(10/31/72)
458	APV International Limited (Not available in USA) P.O. Box 4, Manor Royal Crawley West Sussex RH10 2QB England	(10/15/85)	103	Chester-Jensen Co., Inc. 5th & Tilghman Sts., P.O. Box 908 Chester, Pennsylvania 19016	(6/6/58)
17	Alfa-Laval Food & Dairy Co. (Div. of Alfa-Laval Inc.) 2115 Linwood Ave. Fort Lee, New Jersey 07024	(7/28/82)	298	Feldmeier Equipment, Inc. 6800 Town Line Road P.O. Box 474 Syracuse, New York 13211	(1/28/85)
120	Alfa-Laval, Inc. (DeLaval Agric. Div.) 11100 No. Congress Ave. Kansas City, Missouri 64153	(12/3/59)	307	G & H Products Corp. 7600-57th Avenue P.O. Box 1199 Kenosha, Wisconsin 53141	(5/2/78)
326	Karbate Vicarb Inc. (Mfg. by vicarb, France) 21945 Drake Rd. Strongsville, Ohio 44136	(2/4/80)	217	Girton Manufacturing Co. Millville, Pennsylvania 17846	(1/31/71)
30	Cherry-Burrell Corp. (A Unit of AMCA Int'l. Inc.) 2400-6th St. SW, P.O. Box 3000 Cedar Rapids, Iowa 52406	(10/2/56)	238	Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801	(6/28/72)
14	Chester-Jensen Co., Inc. 5th & Tilghman Sts., P.O. Box 908 Chester, Pennsylvania 19016	(8/15/56)	96	C. E. Rogers Co. So. Hwy #65, P.O. Box 118 Mora, Minnesota 55051	(3/31/64)
468	GEA Food and Process Systems Corp. 8940 Route 108 Columbia, Maryland 21045	(2/2/86)	532	Scherping Systems 801 Kingsley St. Winsted, Minnesota 55395	(6/8/88)
15	Kusel Equipment Co. 820 West St., P.O. Box 87 Watertown, Wisconsin 53094	(8/15/56)	392	Stork Food Machinery, Inc. (Mfg. by Stork, Netherlands) P.O. Box 1258/Airport Parkway Gainesville, Georgia 30503	(6/9/83)
360	Laffranchi Wholesale Co. P.O. Box 698 Ferndale, California 95536	(7/12/82)	<b>13-08 Farm Milk Cooling and Holding Tanks</b>		
414	Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801	(12/13/83)	49R	A-L Stainless Inc. (Not available in USA) 113 Park St., South Peterborough, Ontario, Canada K9J 3R8	(12/5/56)
491	On-Line Instrumentation, Inc. P.O. Box 541 Hopewell Junction, New York 12533	(1/2/87)	240	Babson Brothers Company Dairy Systems Division 1400 West Gale Galesville, Wisconsin 54630	(9/6/72)
279	The Schlueter Company (Mfg. by Samuel Parker, New Zealand) 216 Center Ave. Janesville, Wisconsin 53547	(8/30/76)	4R	Dairy Equipment Co. 1919 So. Stoughton Rd. Madison, Wisconsin 53716	(6/15/56)
472	Schmidt-Bretten Inc. 1612 Locust Avenue Bohemia, New York 11716	(5/7/86)	179R	Heavy Duty Products (Preston) Ltd. (Not available in USA) 1261 Industrial Rd. Cambridge (Preston) Ontario, Canada N3H 4W3	(3/8/66)
426	TCI-Superior 611 Sugar Creek Rd. Delavan, Wisconsin 53115-0953	(8/31/84)	12R	Paul Mueller Co. 1600 W. Phelps, P.O. Box 828 Springfield, Missouri 65801	(7/31/56)

**12-05 Tubular Heat Exchangers for Milk  
and Milk Products**

438	APV Crepaco, INC. 395 Fillmore Avenue Tonawanda, New York 14150	(12/10/84)
248	Allegheny Bradford Corp. P.O. Box 200 Route 219 South	(4/16/73)

**16-05 Evaporators and Vacuum Pans for Milk and  
Milk Products**

254	APV Crepaco, Inc. 165 John L. Dietsch Square Attleboro Fall, Massachusetts 02763	(1/7/74)
132	APV Crepaco, INC. 395 Fillmore Ave. Tonawanda, New York 14150	(10/26/60)

277	Alfa-Laval, Inc. Contherm Division P.O. Box 352, 111 Parker St. Newburyport, Massachusetts 01950	(8/19/76)	Research Triangle Park, North Carolina 27709	
500	Dedert Corporation 20000 Governors Drive Olympia Fields, Illinois 60461	(4/9/87)	452 Jagenberg Inc. Freshwater Blvd. P.O. Box 188 Enfield, Connecticut	(9/3/85)
311	GEA Food and Process Systems Corp. (Mfg. by Gebruder, West Germany) 8940 Route 108 Columbia, Maryland 21045	(8/28/79)	516 Leifeld + Lemke USA (Mfg. by Leifeld + Lemke, West Germany) 25 Whitney Road Mahwah, New Jersey 07430	(9/18/87)
273	Niro Atomizer Food & Dairy, Inc. 1600 County Rd F Hudson, Wisconsin 54016	(5/20/76)	220 Liquipak International, Inc. 2285 University Ave. St. Paul, Minnesota 55114	(4/24/71)
107R	C.E. Rogers Co. So. Hwy #65, P.O. Box 118 Mora, Minnesota 55051	(7/31/58)	330 Milliken Packaging (Mfg. by Chubukkikai, Japan) White Stone, South Carolina 29353	(8/26/80)
299	Stork Food Machinery, Inc. (Mfg. by Stork, Holland) P.O. Box 1258/Airport Parkway Gainesville, Georgia 30503	(11/17/77)	442 Milliken Packaging White Stone, South Carolina 29386	(2/21/85)
427	TCI-Superior 611 Sugar Creek Rd. Delavan, Wisconsin 53115-0953	(8/31/84)	137 Pure-Pak, Inc. 850 Ladd Road Walled Lake, Michigan 48088	(10/17/62)
186R	Marriott Walker Corp. 925 E. Maple Rd. Birmingham, Michigan 48011	(9/6/66)	281 Purity Packaging Corp. 800 Kaderly Dr. Columbus, Ohio 43228	(11/8/76)
<b>17-06 Fillers and Sealers of Single Service Containers for Milk and Milk Products</b>				
366	Autoprod, Inc. 12 So. Denton Ave. New Hyde Park, New York 11040	(9/15/82)	511 E. P. Remy (Mfg. by E. P. Remy, France) 2096 Gaither Road Rockville, Maryland 20850	(8/14/87)
346	B-Bar-B, Inc. E. 10th & McBeth, P.O. Box 909 New Albany, New York 47150	(10/21/81)	482 Serac Inc. 1209 Capitol Drive Addison, Illinois	(8/25/86)
192	Cherry-Burrell Corp. (A Unit of AMCA Int'l., Inc.) 2400-6th St. SW, P.O. Box 3000 Cedar Rapids, Iowa 52406	(1/3/67)	351 Tetra Pak Inc. (Mfg. by A. B. Tetra, Italy) 889 Bridgeport Ave. P.O. Box 807 Shelton, Connecticut 06484-0807	(1/7/82)
382	Combibloc, Inc. (Mfg. by Jagenberg, West Germany) 4800 Roberts Rd. Columbus, Ohio 43228	(4/15/83)	211 Twinpak, Inc. (Canada) (Not available in USA) 1840 Route Trans-Canada Dorval, Quebec, Canada H9P 1J8	(2/4/70)
452	Combibloc, Inc. (Mfg. by Gasti, Germany) 4800 Roberts Rd. Columbus, Ohio 43228	(9/4/85)	<b>19-03 Batch Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amended</b>	
324	Conoffast (Mfg. by ERCA, France) 1600 Harvester Road West Chicago, Illinois 60185	(11/29/79)	141 APV Crepaco, INC. 100 South CP Ave. Lake Mills, Wisconsin 53551	(4/15/63)
352	GMS Engineering 1936 Sherwood St. Clearwater, Florida 33515	(1/12/82)	146 Cherry-Burrell Corp. (A Unit of AMCA Int'l., Inc.) 2400-6th St. SW, P.O. Box 3000 Cedar Rapids, Iowa 52406	(12/10/63)
488	Holmatic Inc. 6691 Jimmy Carter Blvd. Norcross, Georgia 30071	(12/22/86)	286 O. G. Hoyer, Inc. (Mfg. by O. G. Hoyer A/S, Denmark) 201 Broad Street Lake Geneva, Wisconsin 53147	(12/8/76)
473	International Paper Company Extended Shelf Life Division 4020 Stirrup Creed Drive Bldg. 200 P.O. Box 13318	(6/12/86)	401 Coldelite Corp. of America Robinson Rd. & Rt. 17 So. Lodi, New Jersey 07644-3897	(8/22/82)
			465 Leon's Frozen Custard 3131 S. 27th Street Milwaukee, Wisconsin 53151	(12/17/85)
			412 Sani Mark, Inc. 2020 Production Drive Indianapolis, Indiana 46241	(11/28/83)

355	Emery Thompson Machine & Supply Co. 1349 Inwood Ave. Bronx, New York 10452	(3/9/82)	222	Fort Howard Packaging Corporation P.O. Box 19130 Green Bay, Wisconsin 54307-9130	(11/15/71)
<b>22-04 Silo-type Storage Tanks for Milk and Milk Products</b>			499	Holmatic Inc. 6691 Jimmy Carter Blvd. Norcross, Georgia 30071	(3/19/87)
262	A-L Stainless Inc. (Not available in USA) 113 Park St., South Peterborough, Ontario, Canada K9J 3R8	(11/11/74)	343	O.G. Hoyer, Inc. (Mfg. by Alfa Hoyer, Denmark) 201 Broad St. Lake Geneva, Wisconsin 53147	(7/6/81)
154	APV Crepaco, Inc. 100 South CP Ave. Lake Mills, Wisconsin 53551	(2/10/65)	447	Mateer-Burt Co., Inc. (Mfg. by Trustpak, England) 436 Devon Park Drive Wayne, Pennsylvania 19087	(7/22/85)
168	Cherry-Burrell Corp. (A Unit of AMCA Int'l, Inc.) 575 E. Mill Street Little Falls, New York 13365	(6/16/65)	537	Osgood Industries, Inc. 601 Burbank Rd. Oldsmar, Florida 34677	(7/19/88)
160	DCI, Inc. P.O. Box 1227, 600 No. 54th Ave St. Cloud, Minnesota 56301	(4/5/65)	<b>24-01 Non-coil Type Batch Pasteurizers</b>		
181	Damrow Co. (Div. of DEC Int'l, Inc.) 196 Western Ave., P.O. Box 750 Fond du Lac, Wisconsin 54935-0750	(5/18/66)	158	APV Crepaco, INC. 100 South CP Ave. Lake Mills, Wisconsin 53551	(3/24/65)
312	Feldmeier Equipment, Inc. 6800 Town Line Road P.O. Box 474 Syracuse, New York 13211	(9/15/78)	161	Cherry-Burrell Corp. (A Unit of AMCA Int'l, Inc.) 575 E. Mill St. Little Falls, New York 13365	(4/5/65)
439	JV Northwest Inc. 28120 SW Boberg Rd. Wilsonville, Oregon 97070	(1/22/85)	187	DCI, Inc. P.O. Box 1227, 600 No. 54th Ave. St. Cloud, Minnesota 56301	(9/26/66)
155	Paul Mueller Co. 1600 W. Phelps, P.O. Box 828 Springfield, Missouri 65801	(2/10/65)	519	Feldmeier Equipment, Inc. 6800 Town Line Road P.O. Box 474 Syracuse, New York 13211	(10/22/87)
460	Niro Atomizer Food & Dairy Inc. 1600 County Road F Hudson, Wisconsin 54016	(11/4/85)	166	Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801	(4/26/65)
503	Ripley Stainless Ltd. (Not available in USA) RR #3, Site 41 Summerland, British Columbia V0H 1Z0	(5/1/87)	<b>25-01 Non-coil Type Batch Processors for Milk and Milk Products</b>		
479	Scherping Systems 801 Kingsley Street Winsted, Minnesota 55395	(8/3/86)	159	APV Crepaco, INC. 100 South CP Ave. Lake Mills, Wisconsin 53551	(3/24/65)
536	Stainless Fabrication, Inc. 620 N. Prince Lane Springfield, Missouri 65802	(7/14/88)	162	Cherry-Burrell Corp. (A Unit of AMCA Int'l, Inc.) 575 E. Mill St. Little Falls, New York 13365	(4/5/65)
434	TCI-Superior 611 Sugar Creek Rd. Delavan, Wisconsin 53115-0953	(11/8/84)	188	DCI, Inc. P.O. Box 1227, 600 No. 54th Ave. St. Cloud, Minnesota 56301	(9/26/66)
165	Walker Stainless Equipment Co., Inc. Elroy, Wisconsin 53929	(4/26/65)	167	Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801	(4/26/65)
<b>23-01 Equipment for Packaging Frozen Desserts, Cottage Cheese, and Similar Milk Products, as Amended</b>			564	Precision Stainless, Inc. 501 N. Belcrest St. P.O. Box 668 Springfield, Missouri 65801	(2/27/89)
174	APV Crepaco, Inc. Filling & Wrapping Systems Div. 1303 Samuelson Rd. Rockford, Illinois 61109	(9/28/65)	448	Scherping Systems 801 Kingsley Street Winsted, Minnesota 55395	(8/1/85)
209	Doboy Packaging Machinery Incorp. 869 S. Knowles Ave. New Richmond, Wisconsin 54017	(7/23/69)	520	Stainless Fabrication, Inc. 633 N. Prince Lane	(12/8/87)

- Springfield, Missouri 65802  
 202 Walker Stainless Equip. Co., Inc. (9/24/68)  
 618 State St.  
 New Lisbon, Wisconsin 53950
- 26-02 Sifters for Dry Milk and Dry Milk Products**
- 173 Blaw-Knox Food & Chemical Equip. Co. (9/20/65)  
 P.O. Box 1041  
 Buffalo, New York 14240
- 363 Kason Corp. (7/28/82)  
 1301 East Linden Ave.  
 Linden, New Jersey 07036
- 430 Midwestern Industries, Inc. (10/11/84)  
 915 Oberlin Rd., P.O. Box 810  
 Massillon, Ohio 44648-0810
- 185 Rotex, Inc. (8/10/66)  
 1230 Knowlton St.  
 Cincinnati, Ohio 45223
- 172 Sweco, Inc. (9/1/65)  
 8029 U.S. Hwy. 25  
 Florence, New York 41042
- 176 Sprout-Bauer Inc. (1/4/66)  
 (Subsidiary of Combustion Engineering)  
 Muncy, Pennsylvania 17756
- 27-01 Equipment for Packaging Dry Milk and Dry Milk Products**
- 353 All-Fill, Inc. (3/2/82)  
 40 Great Valley Pkwy.  
 Malvern, Pennsylvania 19355
- 409 Mateer-Burt Co. (10/31/83)  
 436 Devon Park Dr.  
 Wayne, Pennsylvania 19087
- 476 Stone Container Corporation (7/17/86)  
 1881 West North Temple  
 Salt Lake City, Utah 84116-2097
- 497 Triangle Package Machinery Co. (2/26/87)  
 6655 West Diversey Ave.  
 Chicago, Illinois 60635
- 28-01 Flow Meters for Milk and Milk Products**
- 272 Accurate Metering Systems, Inc. (4/2/76)  
 1651 Wilkening Court  
 Schaumburg, Illinois 60173
- 253 Badger Meter, Inc. (1/2/74)  
 4545 W. Brown Deer Rd.  
 P.O. Box 23099  
 Milwaukee, Wisconsin 53223
- 518 Bailey Controls Company (10/16/87)  
 29801 Euclid Avenue  
 Wickliffe, Ohio 44092
- 265 Electronic Flo-Meters, Inc. (3/10/75)  
 P.O. Box 38269  
 Dallas, Texas 75238
- 359 Emerson Elec. Co. (6/11/82)  
 Brooks Instrument Div.  
 P.O. Box 450, North 301  
 Statesboro, Georgia 30458
- 469 Endress + Hauser, Inc. (3/3/86)
- 2350 Endress Place  
 Greenwood, Indiana 46142
- 540 EXAC Corporation (8/12/88)  
 6410 Via Del Oro  
 San Jose, California 95119
- 226 Fischer & Porter Co. (12/9/71)  
 County Line Rd.  
 Warminster, Pennsylvania 18974
- 477 Flowdata Inc. (7/31/86)  
 15510 Wright Bros. Drive  
 Dallas, Texas 75244-2137
- 506 Flow Technology, Inc. (6/17/87)  
 4250 East Broadway Road  
 Phoenix, Arizona 85040
- 224 The Foxboro Company (11/16/71)  
 33 Commercial Street  
 Foxboro, Massachusetts 02035
- 562 Great Lakes Instruments, Inc. (2/6/89)  
 8855 North 55th Street  
 Milwaukee, Wisconsin 53223
- 475 Hackman-MKT, Inc. (7/15/86)  
 (Mfg. by Koltech, Finland)  
 100 Pinnacle Way, Suite 165  
 Norcross, Georgia 30071
- 512 Hoffer Flow Controls, Inc. (8/17/87)  
 149 Highway 26  
 Port Monmouth, New Jersey 07758
- 474 Hydril Production (6/30/86)  
 Technology Division  
 3300 North Belt East  
 P.O. Box 60458  
 Houston, Texas 77205-0458
- 399 E. Johnson Engineering & Sales (8/3/83)  
 11 N. Grant St.  
 Hinsdale, Illinois 60521
- 529 Krohne America, Inc. (5/18/88)  
 (Mfg. by Altometer, Holland)  
 One Intercontinental Way  
 Peabody, Massachusetts 01960
- 320 Max Machinery, Inc. (3/28/79)  
 1420 Healdsburg Ave.  
 Healdsburg, California 95448
- 378 Micro Motion, Inc. (2/16/83)  
 7070 Winchester Circle  
 Boulder, Colorado 80301
- 490 Rosemount Inc. (1/8/87)  
 12001 Technology Dr.  
 Eden Prairie, Minnesota
- 493 Sarasota Automation Inc. (2/2/87)  
 1500 N. Washington Blvd.  
 Sarasota, Florida 33577
- 550 Sparling Instruments Co., Inc. (10/26/88)  
 4097 N. Temple City Blvd.  
 P.O. Box 5988  
 El Monte, California 91731
- 270 Taylor Instrument (2/9/76)  
 Combustion Engineering, Inc.  
 400 West Avenue, P.O. Box 110  
 Rochester, New York 14692
- 535 Tulsa Fluid Measurement, Inc. (7/12/88)  
 P.O. Box 35159  
 Tulsa, Oklahoma 74153-0159
- 386 Turbo Instruments, Inc. (5/11/83)



(Mfg. by Turowerk, West Germany)  
4 Vashell Way  
Orinda, California 94563

### 29-00 Air Eliminators for Milk and Fluid Milk Products

- 340 Accurate Metering Systems, Inc. (6/2/81)  
1651 Wilkening Court  
Schaumburg, Illinois 60173
- 485 Hackman-Mkt, Inc. (11/18/86)  
(Mfg. by Koltech, Finland)  
100 Pinnacle Way, Suite 165  
Norcross, GA 30071
- 436 Scherping Systems (11/27/84)  
801 Kingsley Street  
Winsted, Minnesota 55395

### 30-01 Farm Milk Storage Tanks

- 421 Paul Mueller Co. (4/17/84)  
P.O. Box 828  
Springfield, Missouri 65801

### 31-01 Scraped Surface Heat Exchangers, as Amended

- 290 APV Crepaco, INC. (6/15/77)  
100 South CP Ave.  
Lake Mills, Wisconsin 53551
- 274 Alfa-Laval, Inc. (6/25/76)  
Contherm Div.  
P.O. Box 352, 111 Parker St.  
Newburyport, Massachusetts 01950
- 361 N.V. Terlet (7/12/82)  
(U.S. Agent BFM Machinery, WI)  
P.O. Box 62  
7200 AB Zutphen  
Netherlands
- 323 Cherry-Burrell Corp. (7/26/79)  
(A Unit of AMCA Int'l., Inc.)  
2400-6th St., SW, P.O. Box 3000  
Cedar Rapids, Iowa 52406
- 496 FranRica Mfg. Corp. (2/23/87)  
2807 South Highway 99  
Stockton, California 95202

### 32-00 Uninsulated Tanks for Milk and Milk Products

- 397 APV Crepaco, INC. (6/21/83)  
100 South CP Ave.  
Lake Mills, Wisconsin 53551
- 264 Cherry-Burrell Corp. (1/27/75)  
(A Unit of AMCA Int'l., Inc.)  
575 E. Mill St.  
Little Falls, New York 13365
- 268 DCI, Inc. (11/21/75)  
600 No. 54th Ave., P.O. Box 1227  
St. Cloud, Minnesota 56301
- 354 C.E. Rogers Co. (3/3/82)  
S. Hwy #65, P.O. Box 118  
Mora, Minnesota 55051
- 441 Scherping Systems (3/1/85)

- 801 Kingsley St.  
Winsted, Minnesota 55395
- 433 TCI-Superior (11/8/84)  
611 Sugar Creek Rd.  
Delavan, Wisconsin 53115-0953
- 339 Walker Stainless Equip. Co., Inc. (6/2/81)  
618 State St.  
New Lisbon, Wisconsin 53950

### 33-00 Polished Metal Tubing for Dairy Products

- 310 Allegheny Bradford Corp. (7/19/78)  
P.O. Box 200 Route 219 South  
Bradford, Pennsylvania 16701
- 413 Azco, Inc. (12/8/83)  
P.O. Box 567  
Appleton, Wisconsin 54912
- 308 Rath Manufacturing Co., Inc. (6/20/78)  
2505 Foster Ave.  
Janesville, Wisconsin 53545
- 368 Rodger Industries Inc. (10/7/82)  
(Not available in USA)  
P.O. Box 186, RR1  
Blenheim, Ontario  
Canada N0P 1A0
- 335 Stainless Products, Inc. (12/18/80)  
1649-72nd Ave., Box 169  
Somers, Wisconsin 53171
- 289 Tri-Clover, Inc. (1/21/77)  
9201 Wilmot Road  
Kenosha, Wisconsin 53141
- 331 United Industries, Inc. (10/23/80)  
1546 Henry Ave.  
Beloit, Wisconsin 53511

### 35-00 Continuous Blenders

- 527 Arde Barinco, Inc. (3/15/88)  
500 Walnut Street  
Norwood, New Jersey 07648
- 417 Cherry-Burrell (2/7/84)  
Anco/Votator Division  
P.O. Box 35600  
Louisville, Kentucky 40232
- 464 Dairy Service Mfg., Inc. (12/12/85)  
4630 W. Florissant Ave.  
St. Louis, Missouri 63115
- 415 Luwa Corporation (1/5/84)  
P.O. Box 16348  
Charlotte, North Carolina 28297-6348
- 526 Schugi Process Engineers (3/15/88)  
(Mfg. by Lelystad, The Netherlands)  
41 Tamarack Circle  
Skillman, New Jersey 08558

### 36-00 Colloid Mills

- 293 Waukesha Pumps (8/25/77)  
(A Unit of AMCA Int'l., Inc.)  
1250 Lincoln Ave.  
Waukesha, Wisconsin 53186

- 37-01 Liquid Pressure and Level Sensing Devices**
- 318 Anderson Instrument Co., Inc. (4/9/79)  
R.D. #1  
Fultonville, New York 12072
- 481 Computer Instruments Corp. (8/14/86)  
100 Madison Ave.  
Hempstead, L.I., New York 11550
- 405 Drexelbrook Engineering Co. (9/27/83)  
205 Keith Valley Rd.  
Horsham, Pennsylvania 19044
- 423 Dynisco (6/15/84)  
Ten Oceana Way  
Norwood, Massachusetts 02062
- 459 Endress + Hauser, Inc. (10/17/85)  
2350 Endress Place  
Greenwood, Indiana 46142
- 524 Flow Technology, Inc. (1/14/88)  
4250 E. Broadway Road  
Phoenix, Arizona 85040
- 463 The Foxboro Company (12/6/85)  
33 Commercial Street  
Foxboro, Massachusetts 02035
- 557 Honeywell, Inc. (12/21/88)  
Industrial Controls Div.  
1100 Virginia Drive  
Fort Washington, Pennsylvania 19034
- 396 King Engineering Corp. (6/13/83)  
P.O. Box 1228  
Ann Arbor, Michigan 48106
- 501 Lumenite Electronic Company (4/27/87)  
2331 N. 17th Avenue  
Franklin Park, Illinois 60131
- 419 Niro Atomizer Food & Dairy Inc. (4/2/84)  
1600 County Road F  
Hudson, Wisconsin 54016
- 523 Paper Machine Components, Inc. (1/3/88)  
Miry Brook Road  
Danbury, Connecticut 06810
- 554 Par Sonics, Inc. (11/30/88)  
P.O. Box 1127  
State College, Pennsylvania 16804
- 563 PI Components Corp. (2/13/89)  
10825 Barely Lane, Suite H  
Houston, Texas 77070
- 328 Rosemount Inc. (5/22/80)  
12001 Technology Dr.  
Eden Prairie, Minnesota
- 515 Setra Systems, Inc. (9/14/87)  
45 Nagag Park  
Acton, Massachusetts 01720
- 498 Statham Division of Solartron Transducers (3/5/87)  
2230 Stratham Blvd.  
Oxnard, California 93033
- 285 Tank Mate Div/Monitor Mfg. Co. (12/7/76)  
P.O. Box AL  
Elburn, Illinois 60119
- 317 Taylor Instrument (2/26/79)  
Combustion Engineering, Inc.  
400 West Avenue  
Rochester, New York 14692
- 410 Viatran Corporation (11/1/83)  
300 Industrial Drive  
Grand Island, New York 14072
- 569 WEISS Instruments, Inc. (5/24/89)  
(Mfg. by Nuova-Fima, Italy)  
85 Bell St.  
West Babylon, New York 11704
- 525 Zantel Instrument (3/4/88)  
P.O. Box 81248  
Lafayette, LA 70598
- 38-00 Cottage Cheese Vats (In Press)**
- 541 Kusel Equipment Company (9/16/88)  
820 West St.  
Watertown, Wisconsin 53094
- 385 Stoelting, Inc. (5/5/83)  
P.O. Box 127  
Kiel, Wisconsin 53042-0127
- 40-01 Bag Collectors for Dry Milk and Dry Milk Products**
- 504 General Resource Corporation (5/15/87)  
201 3rd Street South  
Hopkins, Minnesota 55343
- 381 Marriott Walker Corp. (4/12/83)  
925 E. Maple Rd.  
Birmingham, Michigan 48011
- 453 MikroPul Corporation (9/4/85)  
10 Chatham Road  
Summit, New Jersey 07901
- 456 C. E. Rogers Company (9/25/85)  
P.O. Box 118  
Mora, Minnesota 55051

# Coming Events

1989

## SEPTEMBER

- **11, Pesticide Applicator Certification Seminar**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.
- **11-15, Food Microbiology Short Course**. Sponsored by the University of California and University Extension. To be held at the Dept. of Food Science and Technology, Cruess Hall, UC Davis Campus. For further information, contact: Kathryn J. Boor, Food Science and Technology, University of California, Davis, CA 95616 (916)752-1478.
- **12-14, Basic Pasteurization Course**, to be held at Howard Johnson, 8887 Gateway West, El Paso. For more information, contact: Ms. Janie F. Park, TAMFES, PO Box 2363, Cedar Park, TX 78641-2363 512/458-7281.
- **13-15, Sensory Evaluation of Foods**, sponsored by the American Association of Cereal Chemists will be held in St. Paul, MN. For more information, contact: AAOCC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.
- **14-15, 13th Annual Wisconsin Laboratory Association Education Conference** will be held at the Oshkosh Hilton and Convention Centre in Oshkosh, Wisconsin. For registration information, contact: Laura Rauschl, Program Chairman, c/o Schreiber Foods, Inc. PO Box 19010, Green Bay, WI 54307-9010 (414) 437-7601.
- **18-21, Sensory Descriptive Flavor Analysis** sponsored by the Center for Professional Advancement will be held in New Brunswick, NJ. For more information, contact: Registrar, PO Box 964, East Brunswick, NJ 08816-0964.
- **18-22, Food Protection and Quality Assurance Technology Short Course**. Sponsored by the Food Sanitation Institute, EMA, and Michigan State University, East Lansing, MI. Contact: Dr. William Haines, Food Industry Institute, Michigan State University (517) 355-8295.
- **19-20, Biotechnology of Cereal Products**, sponsored by the American Association of Cereal Chemists, will be held in St. Paul, MN. For more information, contact AACC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.
- **19-21, New York Association of Milk and Food Sanitarians**, will hold its annual meeting in Buffalo at the Sheraton-Buffalo Airport Hotel. For information concerning the meeting, contact: Paul Dersam, 27 Sullivan Rd., Alden, NY 14004, 716/937-3432.
- **25-27, Acceptance Testing**. Developing a product acceptance capability; qualification of employees and consumers; procedures for laboratory, central location, and

home-use testing; design and analysis of acceptance tests. For more information contact: Marjorie Sterling Stone 415/365-1833.

- **25-27, Indiana Environmental Health Association Fall Conference** will be held at the Howard Johnson, Lafayette, Indiana. For more information, contact: Tammy Barrett, IN State Board of Health, (317) 633-0173.
- **25-28, 103rd AOAC Annual International Meeting and Exposition** to be held in St. Louis, Missouri. For more information contact: Margaret Ridgell, AOAC, Suite 400, 2200 Wilson Blvd, Arlington, VA 22201-3301. 703/522-3032.
- **27-28, The 1989 Annual Convention of the South Dakota Dairy Association** will be held at the Ramkota Inn, Sioux Falls, SD. For information, contact: Dr. John Parsons, Dairy Science Dept., SDSU, Box 2104, Brookings, SD 57007 605/688-4116.
- **27-29, Colonization Control of Human Bacterial Enteropathogens in Poultry**, will be held in Atlanta, Georgia. It is sponsored by the USDA, Agricultural Research Service. For more information, contact: Dr. L.C. Blankenship, USDA, ARS, Russell Research Center, PO Box 5677, Athens, GA 30613 (404) 546-3152.
- **27-29, Liquitex Expo '89**. For more information contact: Carolyn Mesce, Marketing Manager, Liquitex Expo Inc., PO Box 630, West Paterson, New Jersey 07424 201/256-0011.

## OCTOBER

- **1-4, Fourteenth Annual Tropical and Subtropical Fisheries Technological Conference of the Americas**. To be held at Buckhead Holiday Inn, Atlanta, GA. For more information, contact: Keith Gates, The University of Georgia Marine Extension Service, PO Box Z, Brunswick, GA 31523 (912) 264-7268.
- **11-13, Food Preservation**, sponsored by the American Association of Cereal Chemists will be held in San Diego, CA. For more information, contact: AACC, 3340 Pilot Knob Rd., St. Paul, MN (612) 454-7250.
- **17-18, AIB Food Plant Sanitation Workshop for Food Plant Employees**, will be held at the Red Lion Inn, San Jose, California. For more information contact: The Registrar at (913) 537-4750 or 1-800-633-5137.
- **22-24, National Frozen Food Convention and Exposition** to be held at the Hilton, Atlanta, GA. For information on the convention, contact: National Frozen Food Association, PO Box 398, Hershey, PA 17033 (717) 534-1601, or the American Frozen Food Institute, 1764 Old Meadow Lane, Suite 350, McLean, VA 22102 (703) 821-0770.
- **23-24, Pests Associated with Food Industry and Envi-**

**ronmental Sanitation Seminar**, Okumura Biological Institute, Holiday Inn, Elk Grove Village, IL. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

•**23-25, Quality Control and Stability and Testing**. Organizational approaches to establishing product quality monitoring systems within manufacturing and R&D: methods for measuring product quality and stability, including design and analysis. For more information, contact: Marjorie Sterling Stone 415/365-1833.

•**23-25, California Association of Dairy & Milk Sanitarians** will be held at the Holiday Inn, Visalia, CA. For more information, contact: Jack Coppes (213) 699-4313.

•**25-26, Advanced Course on Pest Recognition and Food Industry Problems**, Okumura Biological Institute, Holiday Inn, Elk Grove Village, IL. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

## NOVEMBER

•**4-9, EMA 1989 National Educational Conference and Trade Show** to be held in Clearwater Beach, Florida at the Holiday Inn Surfside. For more information, contact EMA headquarters at 1019 Highland Ave., Largo, FL 34640 (813) 586-5710.

•**6-8, 1989 Food Processing Waste Conference**, will be held at the Omni International Hotel, Atlanta, GA. For more information, contact: Edd Valentine or Chuck Ross, Georgia Tech Research Institute, Economics Development Laboratory, Environment, Health and Safety Division, O'Keefe Bldg, Atlanta, GA 30332 (404) 894-3412.

•**9-10, Water Activity**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.

•**11-15, Dairy and Food Industries Supply Assoc., Inc.** McCormick Place, Chicago, Illinois.

•**13-14, Tailoring Dairy Packaging & Distribution - Tomorrow's Needs** sponsored by the International Dairy Federation and the U.S. National Committee of the International Dairy Federation. This Seminar will be held in conjunction with the DIFSA Expo in Chicago. For more information, contact: Harold Wainess, Secretary, U.S. National Committee of the IDF, 464 Central Ave., Northfield, IL 60093 (312) 446-2402.

•**15-17, Gum Chemistry and Technology**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.

## DECEMBER

•**4, Pesticide Applicator Certification Seminar**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

•**5-6, Pests Associated with Food Industry and Environmental Sanitation Seminar**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

•**6-7, Starch: Structure, Properties, and Food Uses**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd, St. Paul, MN 55121 (612) 454-7250.

•**7-8, Advanced Course on Pest Recognition and Food Industry Problems**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

## 1990

## FEBRUARY

•**26-27, Kentucky Association of Milk, Food and Environmental Sanitarians' Annual Conference** to be held at the Holiday Inn Convention Center, Louisville, KY. For more information, contact Debbie Pierce, Secretary, KAMFES, PO Box 1464, Frankfort, KY 40602 (502) 564-3340.

## AUGUST

•**15-18, FOOD PACIFIC, 1990** will be held at Vancouver's domed stadium, B.C. Place. Those wishing to attend may obtain further information by contacting: B.C. Food Exhibitions Ltd., 190-10651 Shellbridge Way, Richmond, B.C., Canada V6X 2W8 (604) 660-2288.

## SEPTEMBER

•**10-13, 104th AOAC Annual International Meeting & Exposition**, to be held at the Clarion Hotel, New Orleans, Louisiana. For more information, contact: Margaret Ridgell, AOAC, Suite 400, 2200 Wilson Blvd., Arlington, VA 22201-3301 (703) 522-3032.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, PO Box 701, Ames, IA 50010.

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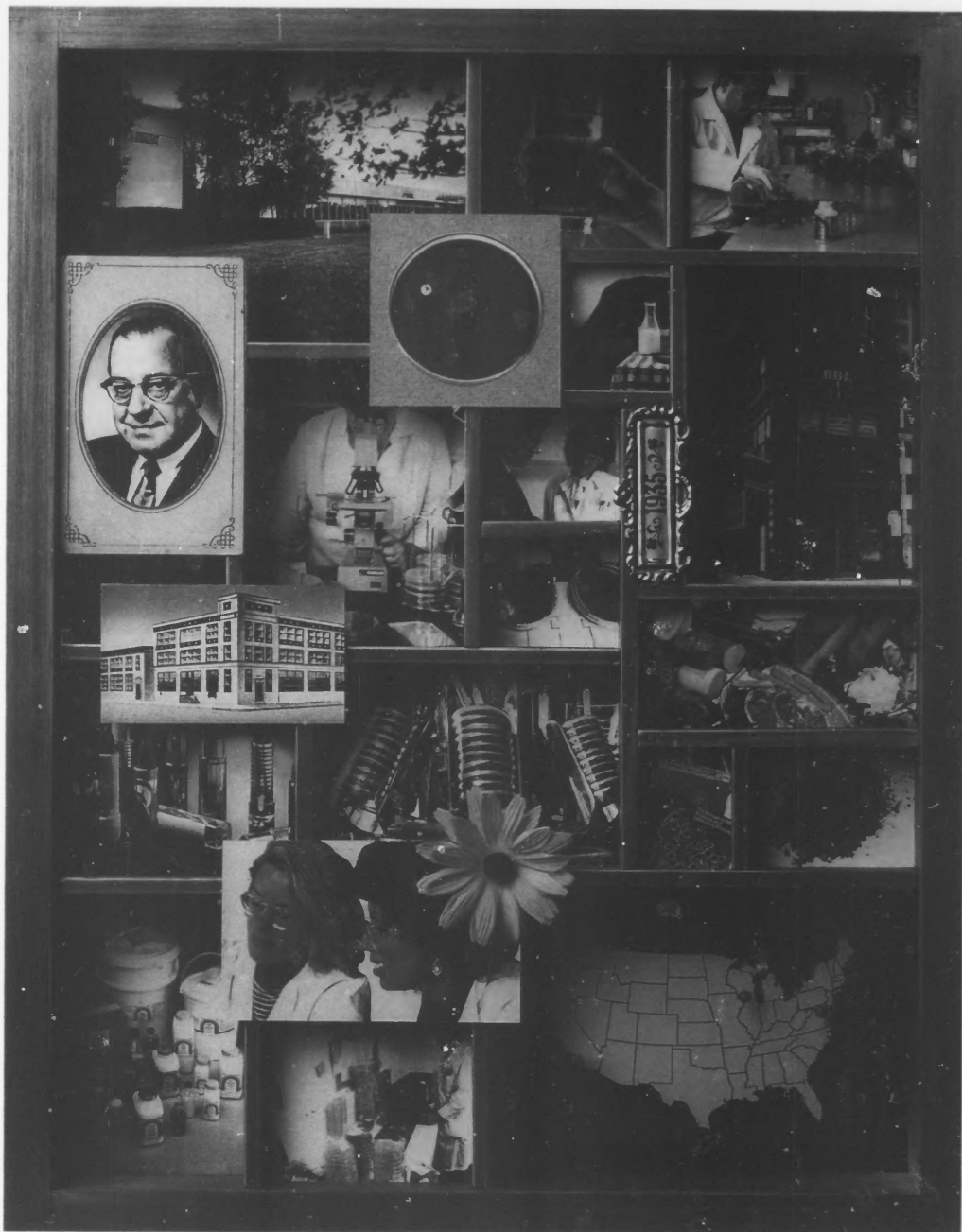
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