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Sanitation


PUBLICATION OF THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION, INC.

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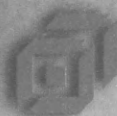
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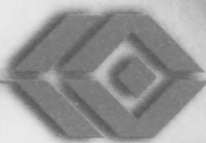
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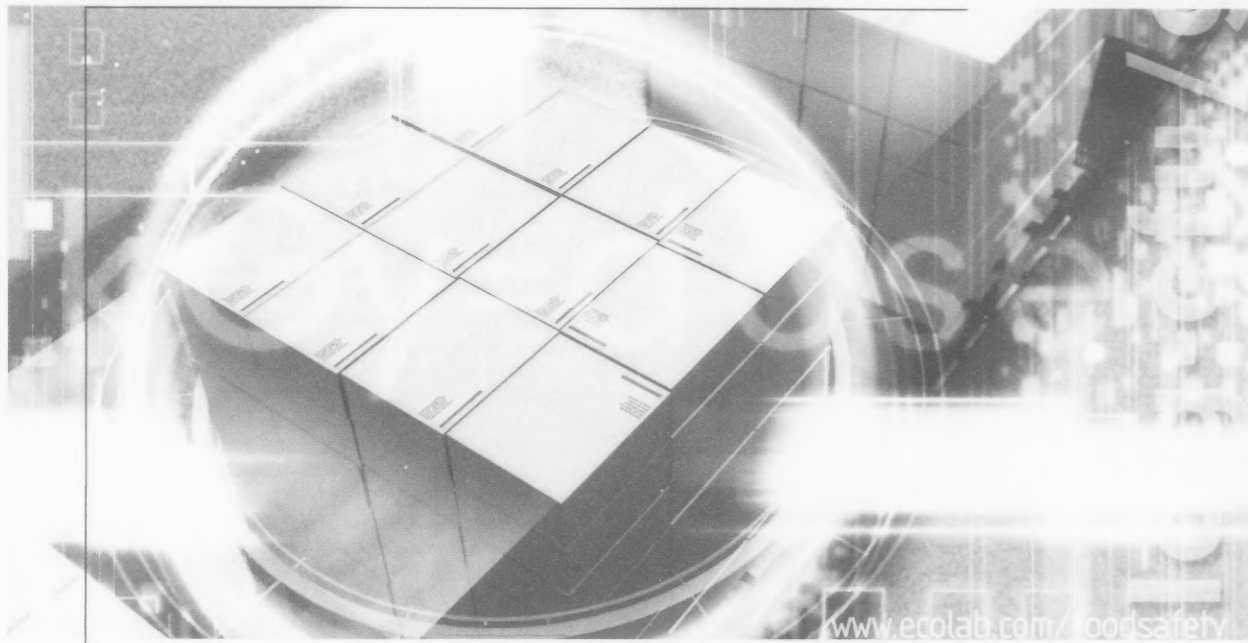
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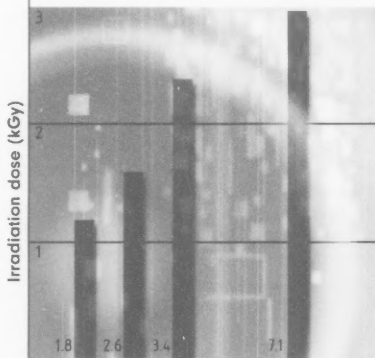
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THOUGHTS FROM THE PRESIDENT

"TIMING IS EVERYTHING"



By ANNA M. LAMMERDING
President

"I am sure many of you are aware of our Foundation Fund and what our objectives are for these monies"

I grew up on a dairy farm in southwestern Ontario. My brother still runs the farm, not far from the city of Guelph where I live now, and my mom and dad have a home on the farm property.

At the end of August this year, I received an exciting phone call from the home place ... "The aliens have landed!"... What the heck?

Apparently, that day my dad and my brother had started to combine a field of wheat and were astonished to see, in the middle of the field, an unusual bunch of circles where the grain had been completely flattened.

You've probably heard about them (and I'm told there is a recently released movie... have not seen it yet)... these are 'crop circles'. The ones at the farm were described to me in detail over the phone, several times, by several family members. My brother e-mailed pictures he had taken while standing on top of the combine. 'Wind phenomena', I said. At least, that is what I'd heard regarding the cause of such things. Not something I was going to get excited about.

Well, of course, it wouldn't do unless I came to see these for myself.

I have to admit, a first-hand view, observing the near-perfect circles of flattened wheat within the swaying stalks of grain all around, was not quite the same as hearing the description over the phone, or even seeing the photos sent by computer. One large circular flattened patch, about 60 feet in diameter, and outside of it, three smaller circles of flattened

wheat, each about 22 feet in diameter, placed in irregular spacing around the perimeter of the larger one. Most curious were three small circular patches, each about 6 feet in diameter, of untouched grain still standing within the larger circle. Intriguing patterns, quite precise, somewhat amazing! Upon a quick Web search, I found that crop circles are not that uncommon, about 80,000 have been reported throughout the world, recorded over a century or two. The local newspaper was notified, and the reporter who came out to take pictures pulled together a story about the background on crop circles. It seems that in the past and even now, such crop circle phenomena are perceived as somewhat mystical and that they are messages from "higher beings", although the messages remain undecipherable at this time. We are talking about "real" crop circles, not the hoaxes. (How can you tell? Apparently, 'hoax' circles are those where the grain has been flattened with a physical object, like a board, breaking the stalks at ground level. In the "real" ones, the grain stalks are bent, not broken ...which I did think was peculiar in what I saw). In some investigations (yes, there are organizations that investigate crop circles!), attributes such as balls of light, malfunctioning field machinery and cell phones in the vicinity, and changes in bird flocking patterns overhead are associated with crop circles. No one theory seems to be able to explain how crop circles created. I am now not

sure about the wind theory, but am not entirely convinced about aliens either!

What do crop circles have to do with food safety? Nothing really. I suppose one could philosophize that: what we hear about versus what we experience first-hand, and the beliefs we create in the absence of knowledge of underlying truths can be quite different. Be it food safety or crop circles.

This next bit is definitely about food safety. Wednesday, September 18, 2002, saw the official opening of the Canadian Research Institute for Food Safety (CRIFS) in Guelph, Ontario, Canada.

The Director of CRIFS, Mansel Griffiths, and recipient of the IAFP 2002 Maurice Weber Laboratorian Award, explained that ... "the work of the Institute is to provide multidisciplinary research committed to developing and implementing strategies that will have measurable health and economic benefits through the production of safe food with enhanced quality".

Doug Powell's FSNet team, also located in Guelph, organized a welcoming golf tournament prior to the CRIFS official opening. An impressive slate of speakers were invited for the inaugural symposium, all of who provided a great platform for discussion and debate. Not surprisingly, two IAFP Past Presidents were guest speakers: Jenny Scott (US National Food

Processor's Association) and Robert Brackett (US-FDA Center for Food Safety and Applied Nutrition). Other guest speakers included past president of the Canadian Food Inspection Agency, Ron Doering; Health Canada's Jeff Farber (who is also the current IAFP Secretary); USDA-FSIS's Danielle Schor spoke on the importance of effective risk communication, and, on the stimulating topic of "Food Safety: An Irish Solution to the Global Problem", Raymond Ellard, director of audit and compliance with the Food Safety Authority of Ireland.

The day was topped off with a tour of the CRIFS facilities, including a new Level 3 laboratory, located on the University of Guelph premises. Watch out, folks... CRIFS promises to be a major player in food safety research and food safety management.

Okay. Crop circles, CRIFS, and now, finally a third and final item: our IAFP Foundation Fund.

I am sure many of you are aware of our Foundation Fund and what our objectives are for these monies. In brief, the Foundation Fund supports external speakers for our Annual Meeting, and, more importantly, provides the financing needed to disseminate food safety information to individuals in all parts of the world. This includes providing IAFP journals to libraries and institutions in developing countries through the help of the

United Nation's Food and Agriculture Organization (FAO). The Foundation Fund also supports our IAFP Audiovisual Library, which is used by many instructors including academic and industry resource people in North America and around the world. At our Annual Meeting, we do fundraising through our Silent Auction, which is supported by individuals and by our affiliate associations. We also "let loose" the founder and chair of the Fund, Harry Haverland, to go for the personal donations that help this fund grow.

It is increasingly important for individuals to support society through giving charitable contributions. In our case, it is the society of food safety professionals around the world whom we support. As the IAFP Foundation Fund grows, we can seek new ways to best to utilize this money to support the objectives of our association and to support our colleagues, wherever they may be. IAFP President-Elect Paul Hall of Kraft Foods is spearheading a very successful corporate challenge campaign to help this fund grow. Nevertheless, you and I, as individuals, can make a difference too. As the calendar year comes to an end, remember: "Good Guys Win." When you send a tax-deductible contribution to help support the work of the IAFP Foundation Fund, you can be proud that you have helped support your profession in more ways than you can imagine.

COMMENTARY

From the Executive Director



By DAVID W. THARP, CAE
Executive Director

“The lifeblood of the Association depends on IAFP adapting to the ever-changing needs of our Membership”

This is an exciting time to be a Member of the International Association for Food Protection! This month, allow me to update you about a few of the major initiatives that we presently have underway.

European Symposium – We have discussed holding a symposium in Europe sometime later in 2003. You may have read about this in prior reports or heard about this exciting opportunity at previous Annual Meetings. What we have in mind is a 1 and 1/2 day to 2 and 1/2 day symposium focusing on one or two topics affecting food safety and food science. We are attempting to provide a forum for our European Members to gather around the IAFP banner to network and discuss food safety. It is important to note that this symposium is not intended to replace the IAFP Annual Meeting, but it is intended to supplement our mission. For those Members not residing in Europe let it be known that everyone is welcome to attend! Watch for more details as time progresses, we are tentatively scheduling this symposium for October of 2003.

International Food Safety Icons – The Retail Food Safety Professional Development Group is about to launch a series of icons that can be used to assist employees in safe food handling practices in many retail establishments preparing and serving food. It is projected that these icons will be available during the first quarter of 2003. We anticipate providing

the icons for free download at the IAFP Web site along with having a package of stickers and posters available at a reasonable cost. These icons will help remind employees of safe food handling and the best part is that they are easily interpreted by all nationalities (i.e., you do not need to speak or understand English to understand the icons).

JFP Online – By the end of the year, our current project of adding the 2001 volume of the *Journal of Food Protection* to our online offerings should be completed. We are excited to have two complete volumes of the *Journal of Food Protection* available for your online use. *JFP Online* offers searchable articles, free access to abstracts, access to articles (for Members opting for this service), and linked references for easy reference researching. This is a service that many Members have asked for and now have the opportunity to use. Please contact our office if you have any questions about *JFP Online*.

Food Protection Trends – As we have discussed, *Dairy, Food and Environmental Sanitation* will change names to *Food Protection Trends* with the January 2003 issue. This change will offer IAFP expanded opportunity to extend our audience of Members and readers. It became even more obvious to me recently at the USDA conference for food safety educators. Bev Corron and I were there to display IAFP's journals and information and to visit with attendees about the

services offered by IAFP. When we showed *DFES*, we had to explain the contents to attendees with long explanations. After concluding the explanation, we mentioned that the journal name was changing to *Food Protection Trends*, their level of interest magnified. I don't think that

either Bev or I were prepared for this reaction. We were also impressed by the interest that attendees had in IAFP's materials and hope to see many new Members from this conference.

So there you have a synopsis of some of the major projects and undertakings. We are moving

forward but also must be very cautious of our budget constraints. The lifeblood of the Association depends on IAFP adapting to the ever-changing needs of our Membership. We must continually be flexible enough to add new services that our Members want.

How to Keep in Touch with Food Safety Education Information — Other Resources

EdNet — a monthly electronic newsletter for food safety educators. To subscribe, send an E-mail message to: Listserv@foodsafety.gov. Send the message: Subscribe EDNET-L firstname lastname

foodsafe — an online electronic discussion group. To join, go to: <http://www.nal.usda.gov/fnic/foodborne>

Toll-free — USDA's Meat and Poultry Hotline — 1.800.535.4555

Food and Drug Administration's Outreach and Information Center — 1.888.SAFEFOOD

HACCP Plan Assessment of Virginia Meat and Poultry Processing Plants

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SUMMARY

The HACCP plans of fifty-eight meat and poultry plants in Virginia were assessed in the presence of state inspection personnel. These audits, which were designated non-regulatory, consisted of a tour of the facility and a review of SSOPs, pre-shipment reviews, and other HACCP-related documentation. To assist with these HACCP audits, a check sheet was incorporated to indicate suggestions or deficiencies. Overall, the plants had a basic understanding of how to implement HACCP properly. A majority of the suggestions concerned the legality of a HACCP document rather than the HACCP concept. The most frequently noted deficiency was improper corrections. With respect to the HACCP plan, most deficiencies were related to the hazards and the critical control points. During these audits, two microbial determination methods (Standard Plate Count and Bioluminescence) were used to evaluate processing equipment. Typically, three pieces of equipment were tested at each plant. Statistical analysis revealed that correlation was poor with 48.9% agreement between the two methods used in this research.

INTRODUCTION

Hazard Analysis Critical Control Points (HACCP) is a food safety system that was developed in the late 1960s. Originally designed for NASA and the space program, to ensure a safe product by attempting to eliminate or reduce end point testing after processing, HACCP is composed of several checks within the process to ensure a safe final product.

Many food industries have implemented HACCP since its inception. Some have done so voluntarily, whereas others have been ordered to do so. Industries currently mandated are seafood (since 1997) and juices (2002). The meat and poultry industry were put under the HACCP mandate in 1998 (for large plants; small and very small plants followed in 1999 and 2000, respectively). The smaller plants were given more time to develop their HACCP plans because

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they had fewer resources and personnel than larger plants had (6). In the canned food industries, HACCP is not mandatory, but it is highly recommended. The major reason that some canning companies have implemented HACCP is to control *Clostridium botulinum* (11).

HACCP ASSESSMENT

Although HACCP assessment (auditing) can be included in verification, it is not one of the seven principles. Even though both regulators and processors have the same goal of producing safe products, their views differ on how effectiveness should be measured (15). The main purpose of HACCP assessment is to establish whether a processor is capable of producing or distributing safe products consistently, i.e. to ensure that the HACCP program is effective in maintaining product safety (2). Assessment should include review of the HACCP manual and an on-site verification to establish whether the HACCP plan is properly implemented (1).

Check sheets that can be used to make the assessment more effective have proven to be an effective tool in assessing HACCP plans. However, check sheets alone will not suffice. It is important that the auditor have adequate knowledge to identify any deficiencies and address them properly (1).

Following arrival at a plant, the auditors should meet with plant representatives. Agreement should be obtained from both parties, so it is important that the auditors indicate their intent and identify the format that will be used to conduct the audit (2). Plant management may take the auditors on a tour of their facility to allow an observation of the actual process. The auditors should observe and determine deficiencies in the process. Any questions about the process that are not understood by the auditors should be asked during this tour (17).

The auditors should gather all of the HACCP-related documentation and assess its competency. It is essential to review all of the SSOPs and the entire HACCP plan(s). Evaluation of the HACCP documentation will include verification that all seven principles are included and accurate, that a HACCP team is identified, and that a description of the product with intended use is listed (2). The auditor is encouraged to take notes and ask questions during the actual review of the documentation.

When the assessment is complete, the auditor should conduct a final meeting with the management team. Here the auditor will present deficiencies found and suggestions for improvement. If a regulatory audit is conducted, all non-compliances should be discussed with the management team. The auditor should ensure that the management team clearly comprehends the deficiencies.

MICROBIAL TESTING

According to Kvenberg & Schwalm (14), the purpose of microbial testing is to confirm that all possible sources of contamination have been identified and are being controlled. The purposes of microbial testing are to determine safety, adhere to GMPs, and predict product stability (7). In the meat and poultry industry, it is important to test carcasses periodically to determine that HACCP is working. Testing for generic *E. coli* on carcasses is one method that is required in meat and poultry processing plants (10). Furthermore, microbial testing is important to determine that prerequisite programs such as GMPs and SSOPs are effective.

Microbial testing

Kvenberg and Schwalm (14) suggested that processing equipment should be regularly tested to verify that sanitation practices are being followed. One method often used in such testing is the Standard Plate Count Method (SPC) of the Approved Methods of the Ameri-

can Association of Cereal Chemists (3).

Another viable microbial method is a rapid bioluminescence technique, in which a bioluminometer is used to measure light. Although bioluminescence methods have been readily available for several years, their use may not be as widespread as SPC use, because of their high costs and poor reagent stability. According to Kyriakides and Patel (16), this method can be effective because of its very rapid assessment of hygiene and sanitation efficacy.

As opposed to the SPC method, this technique measures all organic matter on a surface, instead of only microbial contaminants (13). It is not based on counting actual colonies, but rather on detecting relative light units (RLUs); therefore, this method is less specific than the SPC. The bioluminescence technique provides an indication of cleanliness because it is capable of detecting meat residues that the SPC method does not detect (8). Readings on the bio-luminometer can range from 0 to 500,000. Preference values may be set as "acceptable" or "unacceptable."

The purpose of this research was to evaluate the HACCP plans of all Virginia state inspected meat and poultry plants and to determine if they were functioning properly through the prevention of hazards. During the assessment of HACCP plans, microbial testing was conducted to provide important baseline data on how well plants were maintaining their sanitation practices. In addition, comparison of the Standard Plate Count and Bioluminescence methods was conducted to provide information to identify which microbial determination method should be used with certain applications.

MATERIALS AND METHODS

HACCP plan assessment development

The HACCP plan assessments were conducted at the request of Virginia State Meat Inspection. A check sheet, adopted as a tool for

Figure 1. Check sheet used in assessing Virginia meat and poultry processing plants

HACCP PLAN EVALUATION CHECK LIST

Plant: _____ Region: _____
 Date: _____ HACCP plan: _____

Plant Meets Regulatory Requirements				
Category	Yes	No	Needs modifications	Suggested Comments
Sanitation SOP Plan (Pre-HACCP)				
Meets Basic Requirements				
Records (maintained)				
HACCP Plan(s)				
List Team Member(s)				
Product Description				
List of Ingredients				
Flow Diagram				
Hazard Analysis				
Critical Control Points				
Critical Limits				
Monitoring Procedures				
Corrective Actions				
Verification Procedures				
Record Keeping Procedures				
Pre-shipment Review				
Forms for each CCP				
Maintenance of Current Records				
Maintenance of Accurate Records				
Evidence of Plan Execution				
Evidence that the Plan is Working				
Other:				

Evaluated by: _____

assessment of HACCP plans, may be utilized by an auditor to verify that certain aspects of HACCP plans, exist and to determine if the plan is being followed. If any modifications are in order, space is available to record suggested modifications. Prior to use, the check sheet was reviewed with state inspection personnel and agreed upon. Figure 1 shows the sheet used for Virginia plant assessments.

A schedule for HACCP plan assessments was developed to identify when specific plants would be visited. Plant visits were scheduled according to meat inspection regions. Within these regions, state inspectors were called upon to meet at a specific plant at a designated time. Times and dates were

agreed upon by the assessment team, state inspection, and plant management to ensure a mutually convenient schedule.

HACCP audits

A series of plant audits were conducted independent of state inspection. While assessing individual HACCP plan(s), any suggestions or modifications were noted on the check sheet. The audits included a thorough review of necessary prerequisite programs and all HACCP plan(s). Other minor details were also addressed. For instance, HACCP plans and related documents must be completed in pen, or typed; because these are considered legal documents, pen-

ciled information is not acceptable. Another small detail is the manner in which errors were corrected; which errors must be marked through once, corrected, and initialed.

Upon arrival at each plant, the assessment team met with representatives from state inspection and plant management. Plant management provided a brief tour of the facility and discussed the type of food products that they slaughter or process. This tour provided a general idea of how well the employees followed sanitation guidelines and familiarized the review team with the processing operation(s), to facilitate a more effective HACCP plan assessment.

Following the plant tour, all of the SSOP and HACCP-related documentation was requested. The SSOPs and records were reviewed to ensure that sanitation procedures were being performed and that the plant maintained records of the procedures. Once the SSOPs were thoroughly reviewed and suggestions were noted, all HACCP plans and pre-shipment reviews were assessed. If a plant had several plans, each plan was reviewed separately. Starting with the HACCP team and continuing to the pre-shipment review, each area was assessed for accuracy and adherence to requirements. It was considered important to identify all regulatory components of the HACCP plan and ensure that they had been implemented correctly.

Upon completing the review of the HACCP plan(s), the assessment team presented suggestions to the management concerning the assessment. Any major deficiencies discovered were clearly explained to the management team, and it was strongly recommended that the plant take prompt action concerning any deficiency. All other suggestions were explained to the management team at this time.

After the team had left the plant, a one-page report was written, summarizing any observations that were made about the plant or its HACCP

TABLE 1. Pass/fail bands for the Biotrace Hygiene Management System

Band	Pass Level (RLU*)	Fail Level (RLU)
A	1000	2000
B	750	1500
C	500	1000
D	400	800
E	300	600
F	250	500
G	200	400
H	150	300

*RLU = Relative Light Units measured by bioluminescence

documentation. Positive observations were cited, but the focus was clearly the negative observations. If any major problems had been observed, they were noted clearly. This report and the check sheet were sent to the Consumer Program Protection Manager of the Virginia Department of Agriculture and Consumer Services.

Microbial testing

For the monitoring aspect of this study, dilution blanks were made to determine Standard Plate Counts. These dilution blanks were a 2% peptone solution made with Bacto® Peptone powder (9). The agar preparation procedure used was similar to that described in the Approved Methods of the American Association of Cereal Chemists (3).

The microbial tests were conducted during the plant audit on equipment that had been cleaned recently. Only equipment that was used regularly, but not in operation at the time, was tested. The equipment pieces tested included table surfaces, grinder throats, and saw wheels. If one of these was not present or was currently in use, alternate pieces were selected. Other pieces included a bowl, a cleaver, a portion stuffer, slicers, split-saws, and a wok. These microbial samples were stored in a cooler

until the plant visit was completed. Next, the same area on that location (although not the exact 10 cm × 10 cm spot) was tested with the bioluminescence method.

Sveum et al. (21) suggested that dilutions and plating should be completed within 24 hours after the samples were taken and placed into the peptone water. However, some of the audits required an overnight stay, in which case the SPC method could not be conducted within 24 hours. Immediately upon return to Virginia Polytechnic Institute and State University, the SPC method was performed.

After the plates were incubated for 48 hours at 35°C, they were removed and the colonies were counted. The procedure for counting the plates and determining colony-forming units is outlined in the Compendium of Methods for the Microbiological Examination of Foods (22).

Data analysis

The log values of the Standard Plate Counts and the readings from the bioluminescence assay were analyzed for correlation, using the corr procedure in a SAS program (196) (19). SAS provided results indicating the correlation of the SPC results with the bioluminescence data. The alpha level was set at 0.05.

Another analysis was conducted to compare the two methods. Instead of determining a correlation, agreement of the methods was assessed on the basis of whether both methods passed, or both methods failed; the methods were not in agreement if one passed and the other failed. A pass/fail level for the bioluminometer was determined by the procedure provided by the manufacturers, who outlined a protocol for determining which acceptance band to choose. Table 1 presents the bands that can be chosen (5). The bands range from band A to band H.

For the Standard Plate Count, adequately cleaned and sanitized processing equipment should not have more than 100 CFU/cm² (21). Therefore, SPC results above 100 are considered unacceptable, whereas those less than or equal to 100 are passing. A percentage of the frequency with which the two methods agree on passing or failing was determined.

RESULTS AND DISCUSSION

Because these assessments had the support of state inspection, there was a state meat inspection representative present at each plant throughout the audit. Even though the audits were independent of state inspection, the investigation required a representative at each audit, and state inspection personnel seemed pleased to be indirectly included in this project. State inspection personnel served to verify that the plant audit was legitimate. If there were any concerns about the authority of these audits, the state inspection representative would intervene and verify the authority.

State inspection also served as a liaison between plant management and the auditors. In some instances, the employees spoke very little or no English. Therefore, the state inspection representative kept notes of any suggestions offered, and relayed those to management. There was some discussion

Figure 2. HACCP plan evaluation check list summary

HACCP PLAN EVALUATION CHECK LIST SUMMARY

Plant: Composite Region: _____
 Date: _____ HACCP plan: _____

Plant Meets Regulatory Requirements				
Category	%		% Needs modifications	Suggested Comments
	Yes	No		
Sanitation SOP Plan (Pre-HACCP)				
Meets Basic Requirements	93	7		SSOPs not on file
Records (maintained)	95	5		
HACCP Plan(s)				
List Team Member(s)	95	5		
Product Description	45		55	More specific information needed
List of Ingredients	90	10		
Flow Diagram	100			
Hazard Analysis	90		10	Improper identification
Critical Control Points	80		20	Too many or too few
Critical Limits	95		5	Improper designation
Monitoring Procedures	95		5	Minor modifications
Corrective Actions	88	12		
Verification Procedures	36		64	Improper calibration and documentation
Record Keeping Procedures	86		14	Incomplete records
Pre-shipment Review	86	5	9	None or incomplete
Forms for each CCP	100			
Maintenance of Current Records	100			
Maintenance of Accurate Records	100			
Evidence of Plan Execution	100			
Evidence that the Plan is Working	100			
Other:	19		81	Improper recording of data

Evaluated by: _____

with state inspection about certain aspects of each plan, but the auditor provided all final suggestions.

The tour provided a method to verify that the plant was following what its HACCP plan indicated. A view of the operation made the assessment of the HACCP plans easier. Conducting observations from the plant and recalling them when reviewing the flow diagram aided in understanding the entire process. A diagram on paper served as a good indication of the process, but seeing it in action clarified the flow diagram. The tour also permitted an opportunity to ask questions about any specific stage of the operation.

At the time that the HACCP plan assessments were conducted, all meat and poultry processing plants were required to have HACCP plans for all products. Each of the 58 plants that were assessed had HACCP plans for every product currently being processed. In a survey conducted in 1994 (20), only 23% of meat, poultry, and seafood processors (219 total responses) had HACCP plans for all products. The difference between 1994 and 2000 is very apparent, with 100% of the plants now having HACCP plans for each product.

Of the 58 plants that were audited, only eight were considered "small" plants; the remaining plants

were "very small." Most of the deficiencies noted did come from the very small plants. However, because there were more "very small" plants audited, it would be difficult to compare the deficiencies between the small and very small plants. Smaller plants may have fewer resources, yet larger plants have many more product lines to maintain. Therefore, it is unlikely that deficiencies could be accurately compared based on plant size.

During the assessments, many observations were made on the different aspects of each HACCP plan and they offered as suggestions for improvements of their HACCP plans, rather than as regulatory mandates. Because of the various interpretations of HACCP, the plants that were assessed had the right to accept or disregard the suggestions. If a major problem was identified within the HACCP plan, it was strongly recommended that action be taken.

Most of the plants appeared to be receptive to the evaluation of their HACCP plans. However, for some it appeared to be a slight inconvenience, because these plants were very busy at the time of the assessment. Some of the companies and employees had negative opinions of HACCP, but understood that assessments were required. On three occasions, the management was not pleased to have their plans assessed. They insisted that these plans were confidential and questioned the authority of the audit.

It is understandable that angst existed with the new HACCP program and having it assessed; HACCP requires extra training, extra paperwork, and more time and effort than the previous practices. The management at some plants seemed concerned that something that might be found in their HACCP plan could result in regulatory action. It was suggested that management should realize that this assessment was for their benefit and not a regulatory audit.

SSOPs

The study was conducted more than three years after SSOPs were required; therefore, all of the plants were expected to have SSOPs currently implemented. Most of the Virginia state-inspected plants (93%) had a copy of their SSOPs on-site for review. On four occasions, plants were unable to produce the proper documentation, and one company mentioned that it had been misplaced. Each of these four plants maintained that sanitation procedures were being carried out, despite the lack of appropriate documentation. These plants were informed that, even though sanitation practices may have been performed, documentation was necessary.

The remaining processing plants (with SSOPs on-site) in Virginia appeared to have little difficulty in developing and maintaining their SSOPs. Of these plants only three did not list the procedures in a step-by-step fashion. All had sufficient details of what procedures took place before and after processing. All plants in Virginia produced records with their SSOPs (i.e., corrective actions, temperature, etc.). Some SSOP deviations were reported, but they were addressed properly and were infrequent. A few very minor suggestions were made concerning these records. Only one plant had records that weren't signed, and one did not note specific deficiencies—only that something was "unacceptable". The most common deficiency was the absence of SSOPs on file. Figure 2 illustrates deficiencies found during the HACCP plan assessments.

HACCP PLANS

Team members

Of those plants assessed in Virginia, only three did not have a list of the team members. Eleven plants did have a HACCP team list, but failed to list titles of the team members. Designation of titles of team

members permits the title to be temporarily shifted to another employee, so that in an employee's absence, his or her title can be given to another employee, who can then execute the duties accompanying that title. Also, two plants did not list the company name on the front of the HACCP plan. Two very minor deficiencies noted were that no date was given for when the plan was started, and the HACCP team list in the front of the plan was not always as it should be.

Product description and ingredients

There was only one major suggestion for product description: Almost 50% of the plants (26 plants) indicated a maximum or minimum temperature with respect to storage, and it would be beneficial if those temperatures were listed as "less than or equal" and "greater than or equal." For example a plan may indicate "store below 0°C," and if the temperature is at 0°C, there is a deviation from the plan. Indicating "store at or below 0°C" allows the plant to adhere to its plan if the temperature is at 0. Two of the slaughter plants failed to provide a product description for their slaughter operation. Each of the other suggestions for product description were very minor and occurred at only one plant.

Although each plant must have a list of ingredients for each product, six plants did not have ingredients listed within their plan. Two indicated that there were no ingredients in their process; in this situation, the ingredients should be noted as "none".

Hazard analysis

Numerous suggestions were made for the hazard analysis portion of the HACCP plans that were assessed. There appeared to be some confusion in determining where major hazards existed in each process. Improper identifica-

tion of hazards occurred six times. Examples are:

1. Slaughter hazards are half hoist and trim rail, not chilling
2. The rail (during slaughter) will address hazards other than temperature
3. Storage is more likely than grinding to cause a hazard

In two instances, the flow diagram and the hazard analysis did not correlate. Each step should be in the same order and be identified as the same step. This may have been a mere typographical error on the part of the plant, or perhaps the personnel did not fully understand how to conduct a hazard analysis. In any instance, the plant was notified about the error.

Critical control points and critical limits

The survey reported by Gombas (12) also asked some questions about the HACCP plan. One question on the survey asked the companies to indicate the problems that they were having with respect to CCPs. Fifty-seven percent of the respondents indicated that "too many CCPs" was a source of difficulty. Only 35% indicated that "too few CCPs" was posing a problem.

In comparison, this study revealed that no plants in Virginia had too few CCPs from a regulatory standpoint. Each HACCP plan contained enough CCPs for the plan to meet regulatory requirements, which is one. Only one plant contained an excessive number of CCPs, in that each step was a CCP. Too many CCPs can result in excessive paperwork for the employees and make it more difficult to administer the plan. It was highly recommended to this plant that they use the decision tree to reduce the number of CCPs.

Too many CCPs present a serious problem, but too few CCPs could be disastrous for a processing plant (18). It is very difficult

to decide what is considered "too many CCPs" or "too few CCPs", because people have different views on what constitutes a CCP. One plant may determine that it is necessary to incorporate a CCP, whereas other plants could indicate otherwise. Several other plants in Virginia arguably included one or two extra CCPs. In 12 instances, CCP modifications were recommended for plants, such as removing a CCP or adding an additional CCP. Of these 12 examples, it was thought that removing a CCP or adding one would help the plant run more efficiently. If the plant felt comfortable with their CCPs, then those suggestions could be disregarded.

An example of a CCP modification would be addition of another CCP if the assessment revealed that the number of current CCPs was not sufficient to have a significant hazard from occurring. One example in which a CCP change was recommended was in one plant that had identified cooler storage as a CCP. It was determined that this particular plant would benefit more by transferring that CCP to a processing step. An example in which a CCP should be removed is when a plan indicates multiple cook steps, each of which is a CCP. The fact that the last cook step will destroy those pathogens present negates the need for previous cook steps to be identified as CCPs. Using the decision tree will alleviate this problem.

At three plants, the CCP names were not consistent with names of each area of the HACCP plan. A CCP would be identified as "grind," then later as "final grind." It is important to keep the names consistent to avoid confusion.

Very few suggestions were made regarding critical limits for the CCPs. A few modifications were suggested. Critical limit modifications include changing the temperature at which something is cooled or cooked. Another is sub-

stitution of "no contamination" for "no visible contamination" as a critical limit.

Three plants did not indicate their critical limits as a maximum or minimum value. Two of the plants used the word "average" when referring to their critical limits.

Monitoring and corrective actions

Only three suggestions were made for monitoring. These suggestions were offered to clarify the plan and make it easier to understand. It was suggested that the term "sanitized" be stated instead of "sterilized" and that the frequency of monitoring be indicated.

Seven of the plants did not have records of any corrective actions to date. This observation may have resulted from some of these plants having implemented HACCP only five months prior to the assessment. These employees may be correcting the problem, but not documenting the actions that were taken. Even if a plant is following all procedures exactly, there will inevitably be a deviation at some point. If the management team claimed that there were no corrective actions, they were given the benefit of the doubt, but the absence of corrective actions was questioned. However, if a follow-up audit is conducted and no corrective actions are documented, a plant investigation could be conducted. One of the miscellaneous corrective action suggestions was to list corrective actions if storage temperature was listed as a CCP.

Responsibility should also be designated for corrective actions. Two plants did not indicate which personnel would be responsible for carrying out the different aspects of the corrective actions. If the employee responsible is not listed, auditors and inspectors will not know whom to speak with regarding the corrective actions.

Verification

A question on a survey by Gombas (12) asked the plants to rank the difficulty level of particular sections of their HACCP plans. Verification ranked as the most difficult to conduct; only 41% of the plants in the survey had no trouble with performing verification. The plants evaluated in Virginia did not reflect much difficulty with verification. One concern was that most plants (37 out of 58) did not indicate that their thermometer was calibrated or did not mention how it was calibrated. Documentation must be provided on how a thermometer is calibrated, e.g., by inserting it into ice water equilibrated to 0°C or into boiling water calibrated to 100°C. With this exception, the verification aspect for the majority of the HACCP plans appeared to be conducted properly, and the management team indicated no other problems. Figure 3 provides a description of the verification deficiencies.

Record keeping

Every plant audited had some type of record keeping system. Most of the suggestions, again, were to help clarify the plan and make it easier to read. Eight plants did not indicate that no production occurred on days when HACCP data were not recorded (Fig. 3); instead, the record sheet was left blank. In the future, the plant should indicate "no production", so that it is clear that the plant did not operate that day. If the record sheet is left blank, it might lead to confusion as to why no records were documented. The three miscellaneous deficiencies were to indicate any revisions, record all temperatures, and keep records separate (i.e., raw ground and raw not-ground).

Pre-shipment review

The pre-shipment review should be signed or initialed each time product is shipped. Also, the

Figure 3. Verification and record keeping
Deficiencies noted from 58 different plants assessed

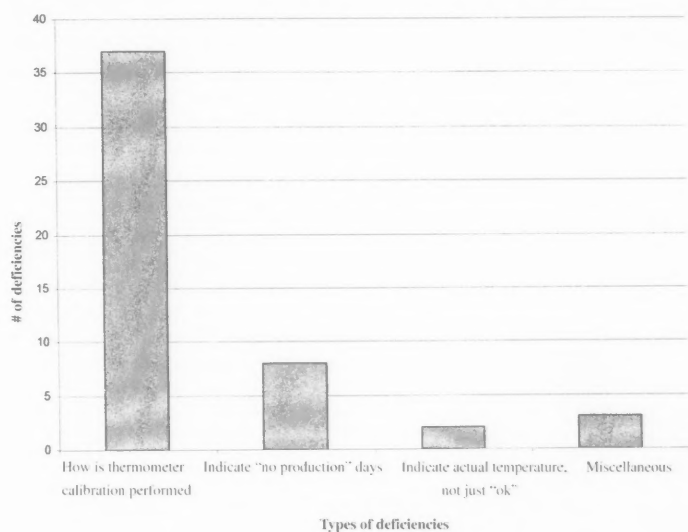
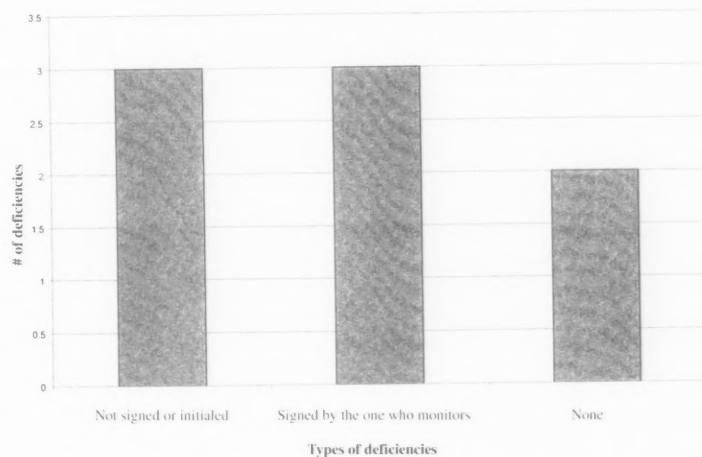


Figure 4. Pre-shipment review
Deficiencies noted from 58 different plants assessed



person who monitors the shipment should not be the one signing the documentation, so as to permit a second individual to ensure that procedures are carried out effectively.

One plant did not have any pre-shipment review documentation. The explanation was that no product had been shipped at the time of the HACCP plan assessment.

Despite this observation, documentation should be available for the first shipment. Figure 4 illustrates pre-shipment review deficiencies.

Miscellaneous

The majority of the deficiencies found were minor details that should nevertheless be corrected for legal reasons. A HACCP plan is

a legal document and must be treated as such. The most common mistake was in how corrections were made to the plan or records. Forty-seven of the plants, at one point or another, did not properly cross out and initial corrections; most plants would merely mark over the error and then rewrite it. The proper way is to mark once through the error, rewrite it, and initial the change, an approach that will ensure that the previous error can still be read and that an employee can be contacted as to why the change was made. If the error is completely marked out, some suspicion may exist as to why there was a change.

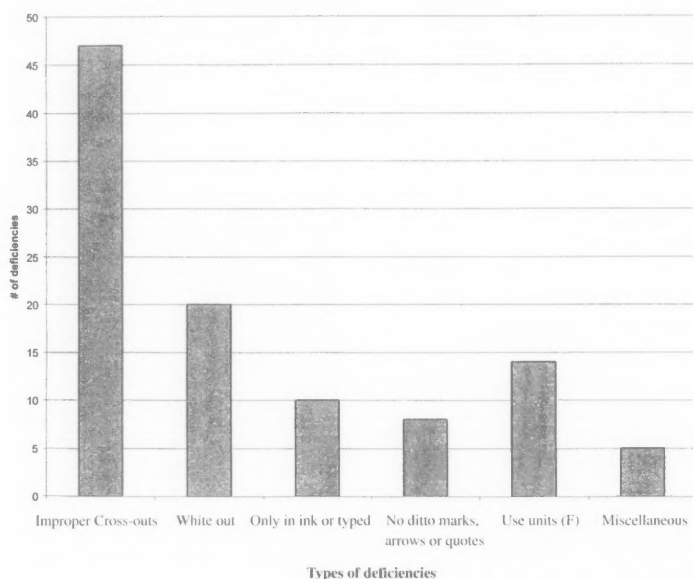
Many other minor deficiencies were noted, including "white out" and use of pencil. "White out" must not be used in a legal document; changes must be made as described previously. Also, legal documents must be in pen or typed, because in a plan written in pencil, changes can be made easily without leaving any record of the change. Other suggestions included naming the HACCP plan, combining duplicate plans, and ensuring that the plan is signed and dated. Figure 5 presents miscellaneous deficiencies.

MICROBIAL DATA COLLECTION

Fifty pieces of equipment were tested: 11 grinder throats, 10 saw wheels, and 18 tables. Prior to analyses, the numbers for relative light units (RLUs) and colony forming units (CFUs) were converted into log values. A perfect correlation (r -value = 1) would be nearly impossible because of random variation and experimental error.

Analysis of the data indicated an r -value of .60817, which suggests a weak positive correlation between these two methods. However, because the value for one of the split saws was significantly (more than three standard deviations), higher than for the others it can be rejected. Removing these values leaves 49 results and produces an r -value of .4478; if all 50

Figure 5. Other deficiencies
Deficiencies noted from 58 different plants assessed



values are included, the results are skewed toward a higher correlation coefficient.

In a correlation study conducted by Illsley et al. (13), there was an increasing trend toward a higher CFU count with an increase in RLU. In another study, by Bautista et al. (4), a high correlation ($r = .85$) was found between the two methods. These other experiments contradict the scattered results obtained in this study. Illsley et al. (13) tested both uncleaned and sanitized equipment, an approach that may have given these workers a broader spectrum of data than would have been obtained from testing only already-sanitized equipment. Most of the values obtained from the Virginia plants were as low as 0. Those SPC values below 25 were considered estimated standard plate counts (ESPC). This will not give a wide range of values and may have been a cause of the correlation coefficient lower than that of Illsley et al. (13).

The second method used to compare these two methods was predicated on a pass/fail basis. After performing the test for the bioluminometer, band H was cho-

sen, which meant that values less than 300 were passing (those in the caution range would be considered passing). There was a 48.9% agreement between the two methods, based on this test. With regard to agreement, both results passed 22 times and both results failed only 2 times. Illsley et al. (13) conducted a similar comparison using SPC and the Biotrace Uni-Lite system. Their results indicated an agreement of 81.6%, a sharp increase from the 48.9% discovered from this study. Although neither comparison of methods had excellent agreement, the results from this study were far below what could be considered even close agreement.

CONCLUSIONS

It may be concluded that the HACCP plans in Virginia are generally working effectively. There were some minor problems of understanding the mechanics and implementation of a HACCP plan. However, because state inspection works closely with processing plants, the assessed HACCP plans were found to have been effectively designed and implemented.

This research indicates that results obtained with the SPC and RLU methods do not correlate well, which is supported by other research results. Each method can estimate general cleanliness and sanitation, but it is difficult to obtain close agreement by comparison of the two methods.

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Vapor Phase Hydrogen Peroxide Decontamination of Food Contact Surfaces

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SUMMARY

Decontamination of food contact surfaces, equipment and general work areas is important for prevention of transmission of foodborne microorganisms. Many liquid-based disinfectants that are widely used for this purpose may not be appropriate for electrical equipment and for relatively large surface areas. Fumigation with vapor phase hydrogen peroxide (VPHP) is an option in these cases and is discussed in this report. VPHP is a dry and rapidly effective antimicrobial vapor. A typical decontamination cycle consists of four phases in a one-step process that is documented and can be validated for a given application. VPHP has been shown to have potent antimicrobial activity against bacteria, viruses, fungi and bacterial spores. Recently, efficacy has been confirmed against known foodborne pathogens, including *Listeria monocytogenes* and *E. coli* O157:H7. Because the VPHP process is dry, it is compatible with many materials, including electronics. In the case study presented, VPHP was shown to be effective in decontaminating a simulative room, including an electrical appliance, in an automated, validated process. VPHP is a possible alternative to liquid-based disinfectants for decontamination of food contact surfaces and equipment.

A peer-reviewed article.

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INTRODUCTION

Hydrogen peroxide (H_2O_2) is a widely used biocide in the food industry because of its rapid antimicrobial efficacy and because it breaks down into environmentally innocuous residues (water and oxygen). First used as an antimicrobial agent in 1880, it is now used for a wide range of applications, including disinfection, odor control, skin antisepsis, bioremediation and paper bleaching (4). In its liquid form, hydrogen peroxide is clear and colorless and has little or no odor. It is widely available in a range of concentrations, from 3 to 90%; 35% food grade is routinely used in the food industry. Liquid hydrogen peroxide solutions have been successfully used for a variety of applications, including sanitization of general food contact surfaces (12), food surfaces (5, 13, 14), and packaging material/equipment (2, 3).

Hydrogen peroxide owes its broad-spectrum antimicrobial efficacy to its activity as a powerful oxidizing agent that is known to damage cellular proteins, lipids and nucleic acids (4). Liquid hydrogen

TABLE 1. Comparison of liquid and vaporized hydrogen peroxide antimicrobial efficacy, based on Block, 1991 (4)

Test Organism (Spores)	D-value (time in minutes for a one-log reduction of test organism)	
	Liquid	Vapor
	H ₂ O ₂ Concentration: 370 mg/l	H ₂ O ₂ Concentration: 1-2 mg/l
	Temperature: 24-25°C	Temperature: 24-25°C
<i>B. stearotherophilus</i>	1.5	1-2
<i>B. subtilis</i>	2.0-7.3	0.5-1
<i>C. sporogenes</i>	0.8	0.5-1

TABLE 2. Effect of VPHP concentration and temperature on antimicrobial efficacy

Temperature (°C)	Concentration (mg/l)	Typical <i>B. stearotherophilus</i> spore D-value
4	0.3-0.5	8-12 mins
25	1-2	1-2 mins
37	3-4	0.5-1 min
55	10-12	1 sec

Note: the condensation point of VPHP increases as temperature increases.

peroxide, either alone or in combination with other antimicrobial agents, has some disadvantages that may limit its use. For example, the higher concentrations required for killing spores (4) may damage a surface with repeated applications. Further, manual application of liquid products for sanitization can be time consuming, hard to control and difficult to validate, especially for larger surface applications. Fogging applications are often used but may also be difficult to control and reproduce. A more recent development is the use of vapor phase hydrogen peroxide (VPHP). VPHP has been widely used for sterilization in pharmaceutical settings, including production filling lines, sterility test-

ing environments, sealable enclosures, production rooms and lyophilizers (7, 10, 15). The vapor is antimicrobial at relatively low concentrations (typically sporicidal at 0.1-2 mg/l at 25°C), in contrast to the liquid hydrogen peroxide (4). Methods of application include both atmospheric and vacuum systems; the latter allows greater active penetration for complex device decontamination/sterilization. Atmospheric systems are widely used for enclosure, isolator, room and equipment decontamination. The most widely used system is the VHP® 1000 Biodecontamination Series. The use of VPHP for the sanitization of food contact surfaces and controlled environments is reviewed in this report.

VPHP cycle description

The VHP® Biodecontamination Systems generate, deliver, control and remove VPHP for an enclosed environment. For example, a single VHP® 1000 is capable of decontaminating a volume of up to 7,500 ft.³ with decontamination of larger volumes made possible by using multiple generators in tandem (Fig. 1). The system is directly linked to any enclosure or room to allow for the continuous generation, circulation and removal of VPHP (a typical room arrangement is shown in Fig. 2).

A typical decontamination cycle consists of 4 phases: dehumidification, conditioning, decontamination and aeration (Fig. 3). During dehumidification, drying reduces the relative humidity to less than 40% as is air circulated in a closed loop. During conditioning, VPHP is produced by vaporization of 35% liquid hydrogen peroxide, which is then introduced into the recirculating air stream to achieve the desired VPHP concentration rapidly. The decontamination phase consists of a steady state injection and recirculation flow rate to maintain the VPHP concentration for the desired exposure time. As hydrogen peroxide can be degraded rapidly to water vapor and oxygen, during a typical decontamination phase, the VPHP concentration is maintained steady by introducing and subsequently removing VPHP. By this means, a set concentration is maintained and breakdown products are not allowed to build up during decontamination. VPHP decontamination is a dry process, as the concentration in the enclosure is maintained below the condensation point. Condensation of hydrogen peroxide should be avoided to prevent surface damage and to ensure efficient decontamination. The vapor is rapidly antimicrobial at relatively low concentrations, with typical use conditions at 0.5-2 mg/l in vapor at 25°C. Finally, during aeration, VPHP is no longer introduced and the residual vapor is catalytically decomposed into water vapor and oxygen. A microprocessor control automatically monitors, con-

TABLE 3. Materials demonstrating compatibility with VPHP. Compatibility is defined as the material's ability to undergo exposure to VPHP with no significant changes in physical or chemical properties (e.g., no changes in strength, flexibility, chemical composition, corrosiveness, etc.)

Metals	
	Aluminum
	Stainless steel (all grades)
	Titanium
	Brass*
	Copper*
Plastics	
	Polycarbonate
	Nylon
	ABS
	PVC
	Polypropylene
Elastomers	
	Viton
	Polyurethane
	EPDM
General	
	Oil and Lotex point
	Olefin blend and polyester blend carpet
	Ceiling tiles, including compressed wood, cellulose-based, fiber glass and plaster-based
	Electronics (including computers, calculators, scanners, equipment)

* Will cause degradation of the hydrogen peroxide and may undergo some color change after extended exposure.

trols and records the process parameters during each cycle.

Because application conditions vary, a cycle development guide is used to develop biodecontamination cycles for different applications. Spores of *B. stearothermophilus*, the most resistant organism (9), are generally used to verify and validate biodecontamination cycles. Typical overall biodecontamination times

will depend on factors such as the VPHP concentration, and the enclosure temperature/volume, but they are generally on the order of 2 to 4 hours.

Antimicrobial efficacy

VPHP is a broad spectrum, fast-acting antimicrobial that demonstrates greater efficacy than liquid peroxide at relatively low concen-

trations (4). A comparison of vapor and liquid is shown in Table 1. The efficacy of VPHP against a wide range of microorganisms has been shown (summarized in Fig. 4), and it is highly sporicidal, even at concentrations as low as 0.1mg/l. All efficacy tests were performed essentially as described by Heckert et al. (6). Overall, bacterial spores (particular by *Bacillus stearothermophilus* spores) have been shown to be the most resistant to VPHP. The sporicidal activity will depend on the enclosure VPHP concentration and temperature (for examples see Table 2).

As is true for any decontamination process, the activity of VPHP can be significantly affected by the presence of gross soil contamination. Therefore, for optimal activity and reproducibility, surfaces should be precleaned of visible contamination prior to decontamination. Testing has shown that the VPHP process can decontaminate in the presence of low levels of soil (5% serum) (8, 9). In addition, the process has been shown to pass the AOAC sporicidal test (1), in which two carrier materials (porcelain penicillinders and silk suture loops) are inoculated with *Clostridium sporogenes* or *Bacillus subtilis* (>10⁵ spores) in the presence of soil and then desiccated. Following exposure to VPHP, no growth was seen in any of the >800 carriers tested in two studies.

More recent experiments have been performed to confirm the efficacy of VPHP against foodborne pathogens, including *Listeria monocytogenes*, *Escherichia coli* O157:H7, *Salmonella choleraesuis*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Bacillus cereus* spores. In addition, a *Legionella pneumoniae* isolate was tested in this series. For all vegetative bacteria, overnight cultures of each organism were centrifuged and resuspended in trypticase soy broth (TSB; Becton Dickinson, Sparks, MD) with 5% serum to obtain concentrations of 10⁸ to 10⁹ CFU/ml. More than 1 × 10⁶ (in 10µl) of each test organism

Figure 1. VHP® 1000 Biodecontamination System



was inoculated onto 1 cm² 304 grade stainless steel coupons and briefly air dried. *Bacillus cereus* spores (Presque Isle Cultures, Erie, PA) were centrifuged, resuspended and inoculated as just described, to obtain samples with 10⁶ spores per coupon. The test system used a VHP1000 that was directly attached to an enclosure and modified with an access tube to allow the coupon to be inserted, exposed to VPHP and removed during the cycle. A typical cycle consisted of dehumidification (20 min), conditioning (20 min), decontamination (1 h at ~1.7mg /l, 95% saturation at 25°C) and aeration (1 h). Coupons were individually exposed to VPHP, during the decontamination phase only, for 10 and 20 min, and immediately placed into a 0.05% catalase/growth media (to neutralize any residual peroxide) and incubated. The growth medium and incubation method varied depending on the test organism. Typical microbiologi-

cal positive (growth promotion) and negative (growth media) controls were performed; in addition, the initial organism population on unexposed coupons were determined. Results indicated a reduction of more than 6-log (complete kill) of each organism for both the 10 min and 20 min contact times.

Material compatibility

Because VPHP decontamination is a "dry" process that uses much lower concentrations than processes that use alternative oxidizing agent-based liquids (e.g., bleach, hydrogen peroxide/peracetic acid combinations), VPHP is compatible with a wide range of materials, including electronics, plastics, metals, and elastomers. Table 3 lists the materials most commonly subjected to decontamination processes and their respective compatibility. Minor changes have been observed with a small number of materials, e.g., colored anodized alu-

minum, titanium and copper, in which slight cosmetic discoloration or bleaching may occur. In addition, materials that absorb hydrogen peroxide (including silicone and cellulose) may require extended cycle time for decontamination and aeration.

Worker health and safety

Of all the gaseous methods currently available for room decontamination, VPHP has probably the best safety and environmental profile. In the United States, OSHA has established a limit of 1 ppm (NIOSH PEL) for an 8-h time weighted average for worker exposure to hydrogen peroxide vapor. The short-term danger level for hydrogen peroxide vapor is 75 ppm for 30 min (IDLH). To reduce the risk of leakage, enclosures are sealed (e.g., by taping around doors and over HVAC vents), and the process is operated at ambient pressure, to prevent flow of gases either into or out of the enclosure. Hand-held and wall-mounted hydrogen peroxide detection systems may be deployed to provide added assurance that the vapor remains contained. In general, personnel can safely work in adjacent monitored areas while a room is being decontaminated with VPHP. The treatment area can be reoccupied only after it has been determined that the concentration of hydrogen peroxide is below the established permissible levels. Removal of VPHP is performed during the aeration phase of the process, after which no further clean-up or conditioning is required. In addition, VPHP is non-flammable and is rapidly degraded in the environment to water vapor and oxygen, both of which are innocuous.

CASE STUDY

A case study was performed in which electrical equipment was decontaminated by use of a Spiromatic ham slicer (Model A-5500, "The Spiral-Viper," Spiral-Matic Corporation, Brighton, MD). Testing was performed on the fully assembled, precleaned slicer with the

Figure 2. Typical room setup with VPHP for decontamination. In other cases the HVAC system may also be fully decontaminated by being used to introduce and circulate VPHP

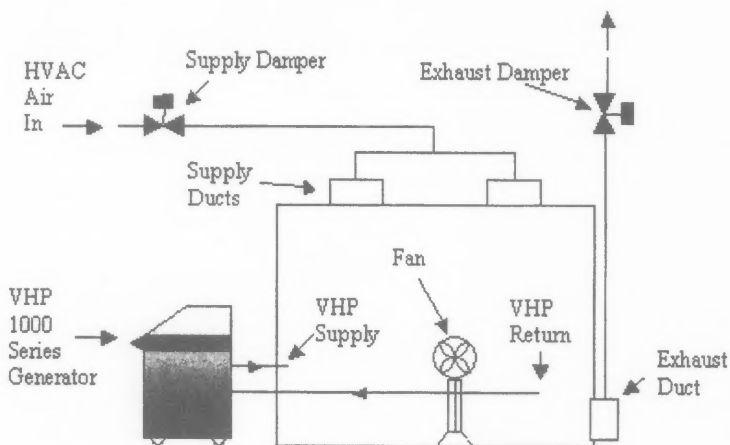
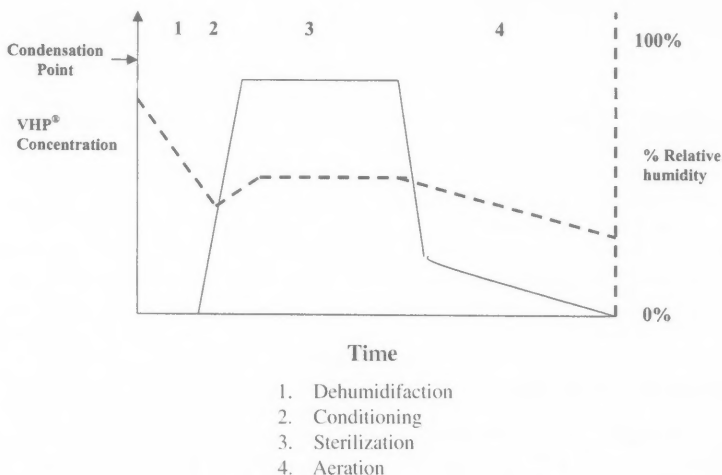


Figure 3. Typical VPHP Biodecontamination cycle



access door to the lower electronics compartment open during the entire decontamination cycle. The decontamination tests were conducted in a 336 ft.³ flexible wall enclosure constructed of polyvinylchloride (PVC) and attached to a VHP 1000 System. The flexible enclosure was designed to simulate an enclosed decontamination area/room for equipment at a processing plant. The slicer was centrally

placed in the enclosure; a 20" circulating fan was used for circulating the peroxide vapor within the enclosure. To test for process effectiveness, VPHP chemical and biological indicators (with 10⁵ *B. stearothermophilus* spores) were directly attached to the slicer at various locations and on the walls, ceiling and floor of the enclosure (a total of 20 test sites) prior to decontamination. The test cycle

consisted of dehumidification (30 min), conditioning (25 min), decontamination (85 mins at ~1.5mg/l, 90% saturation at 20°C) and aeration (120 mins). Immediately upon completion of the aeration phase of the VPHP cycle, the chemical and biological indicators were retrieved. The chemical indicators were examined for the color change (from blue-grey to beige) that indicates the presence of VPHP. The biological indicators were inoculated into TSB, incubated at 56°C for 7 days, and recorded as growth/no growth. Biological positive and negative controls were also performed on the culture media lot used. All chemical indicators signaled the presence of hydrogen peroxide at the various locations. No growth was observed for any exposed biological indicators following incubation, or for the negative controls; all unexposed positive controls demonstrated growth. The slicer and the enclosure had undergone no apparent physical, mechanical, cosmetic or material changes after multiple exposure cycles.

Decontamination may also be performed in any sealed room, whether or not it contains equipment, and can be subsequently validated during cycle development. Typical case studies on room decontamination have previously been published (7, 10, 11).

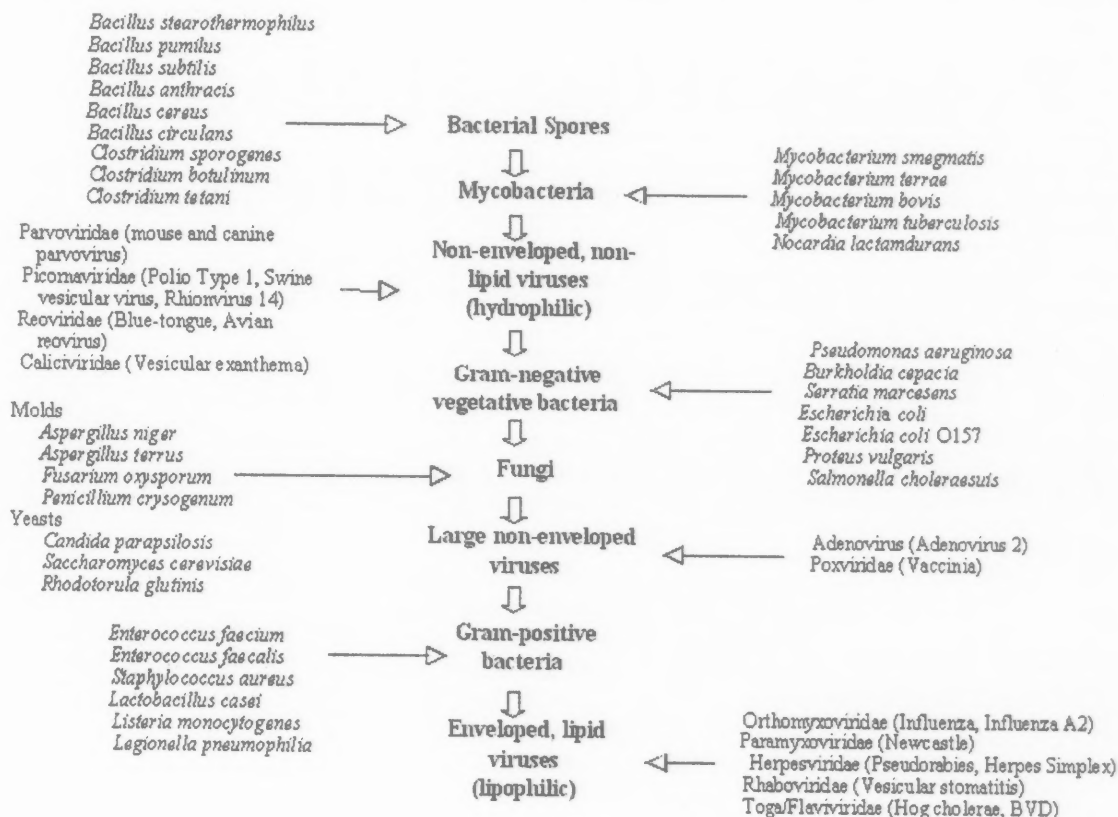
CONCLUSION

VPHP may be used as an alternative to manual and liquid-based decontamination methods for rooms, enclosed areas and food-contact equipment in the food industry. When correctly applied, the technology offers broad-spectrum antimicrobial efficacy, material compatibility and an automated process that can be validated.

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Figure 4. Descending order of microbial resistance to VPHP. Microorganisms are listed from the most resistant (bacterial spores) to the most sensitive (enveloped, lipid viruses) to VPHP



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Potential Use of Staphylococci as Indicators of Hygiene during Manufacture and Ripening of Hard Italian-Type Cheeses

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SUMMARY

This study was done to evaluate the potential use of staphylococci as indicators of direct or indirect manual contamination of hard Italian-type cheeses during post-pasteurization manufacture and ripening. From a cooperating cheese manufacturer, 78 cheese surface and 78 cheese core samples and 27 equipment and personnel hand/glove swab-samples were obtained. Nineteen equipment and personnel swab-samples and 5 cheese surface samples were obtained from a second manufacturer, and 14 core and 14 surface samples were obtained from cheeses purchased at a local grocery. All samples were analyzed for the presence of staphylococci by use of Baird-Parker agar base with added mannitol, phenol red, and potassium tellurite. Confirmed staphylococci were obtained from 7% of cheese core samples, 16% of cheese surface samples, 26% of equipment samples, and 75% of personnel hand/glove samples. Biochemical identification confirmed 63% of presumptive (Gram (+), catalase (+), glucose-fermenting cocci) isolates as staphylococci, with *Staphylococcus epidermidis* making up 27% of confirmed isolates. Presumptive staphylococci were evaluated for survival in 10 ml of skim milk heated in a water bath at 62.8°C for 30 min. Of 110 isolates tested, 71 (65%) decreased by ≥ 3.0 log CFU/ml, and only 6 isolates (5%) decreased by < 2.0 log CFU/ml. The ability of three *S. epidermidis* strains to survive on the surface and in the core of Parmesan cheese was evaluated during different portions of the 10°C ripening period. Counts taken at monthly intervals were 0.7 to 2.4 log CFU lower than initial inoculation levels of ca. 4.0 log CFU per g or 62.25 cm² surface area. Collectively, these results show that staphylococci are an appropriate indicator group for evaluating post-pasteurization manual contamination of hard Italian-type cheeses during manufacture and ripening.

A peer-reviewed article.

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INTRODUCTION

The genus *Staphylococcus* is comprised of Gram-positive, catalase-positive cocci that are generally tolerant of high sodium chloride concentrations. The main pathogenic species in the genus is enterotoxigenic *Staphylococcus aureus*, most strains of which are coagulase-positive (5). *S. aureus* is carried on hands and other skin surfaces by an estimated 5 to 30% of humans (5). *Listeria monocytogenes* and other pathogens may also transiently inhabit human hands. Thus, inappropriate hand-to-food contact may result in the transfer of indigenous or transient pathogenic bacteria to food. Food processors may wish to test previously heated ready-to-eat (RTE) foods for the presence of common skin-borne bacteria to determine whether hand-to-food contact has occurred. Indeed, testing RTE foods for *S. aureus* is relatively common in food industry quality assurance programs and has been recommended for cheese processing plants (3). But the absence of *S. aureus* does not necessarily indicate that hand-to-food contact did not occur, i.e., false-negative results are probable. Consequently, instead of testing for *S. aureus*, processors may wish to test for staphylococci in general, including the coagulase-negative staphylococci, which comprise most species in the genus and are very common on human skin (7). The dominant skin-borne coagulase-negative staphylococcal species is *S. epidermidis*.

For staphylococci to be an effective indicator of post-heating manual contamination of ready-to-eat foods, these organisms must have a low enough thermotolerance that cells contaminating the food prior to heating will be destroyed during heat processing. In the case of most types of cheese, this requirement means that the staphylococci in cheese-making milk must be killed during pasteurization. Otherwise, it would not be possible to differentiate pre-pasteurization and post-pasteurization contami-

nants. Limited earlier work based on results of a modified thermotolerant plate count (4) suggested that staphylococci from hard Italian-type cheese were primarily post-pasteurization contaminants.

This study investigated the use of staphylococci as an indicator of direct or indirect manual contamination of hard Italian-type cheeses during post-pasteurization manufacture and ripening. Specific objectives were:

1. to survey the surface and interior of hard Italian-type cheeses, cheese plant environmental surfaces, and cheese plant employee hands for the presence of staphylococci,
2. to determine the thermotolerance of the isolated presumptive staphylococci strains in order to determine whether contamination occurred before or after milk pasteurization; and
3. to evaluate the ability of staphylococci to survive on the surface and in the interior of a hard Italian-type cheese during ripening.

MATERIALS AND METHODS

Staphylococci isolates from cheese and environmental samples

Fourteen finished, packaged cheese samples were purchased from a local grocery store, and samples of freshly made cheeses were obtained from two cooperating cheese manufacturers (54 samples from "X" and 5 samples from "Y"). The collection of the cheese was almost weekly over a 12-week period, alternating between the grocery store and the manufacturing facilities. Samples of partially aged (4 and 8 month) cheese were also obtained from one of the manufacturers (Company X) during this 12-week period. Samples from the same lots as the freshly made cheeses were obtained from the manufacturer after 4 (16 lots) and 10 months

(8 lots) ripening, to obtain information throughout the ripening process. In addition, Company X provided surface and core samples from 32 samples of their competitors' hard Italian-type cheeses. Equipment surface samples from within Company X and Company Y cheese facilities and swabbings from employee hands, with and without gloves, were also taken (27 and 19 total samples from companies X and Y, respectively).

All samples received were shipped in insulated containers with cooling packs and were analyzed upon arrival at the laboratory. Swabbing was done to each cheese surface, environmental, or hand sample by use of a sterile sponge that had been previously wetted with 10 ml of sterile Butterfield's phosphate diluent (BPD; USDA beef/pork carcass sponge-sampling kit, International BioProducts, Redmond, WA). Following swabbing, the sponge was returned to a sterile plastic bag along with the remaining 15 ml BPD, which was then absorbed by the sponge. Each sponge was then manually squeezed and the expressed liquid was spread-plated in triplicate (0.3, 0.3, and 0.4 ml) onto the selective/differential medium. Each core sample (11g) was obtained by use of a sterile spatula. In the laboratory, each core sample was homogenized for two minutes in 99 ml of a 45°C 2% (w/v) sodium citrate buffer solution, using a stomacher on high speed. Like the sponge samples, the homogenized core samples were also spread-plated in triplicate (0.3, 0.3, and 0.4 ml) onto the selective/differential medium. The same techniques were used to evaluate samples obtained from the cooperating manufacturer (Company X).

The selective/differential medium used in the study was Baird-Parker agar base (Difco, Becton-Dickinson, Mansfield, MA) with mannitol (10g/l; Sigma Chemical Co., St. Louis, MO), Phenol Red [2.5 ml of 1% (w/v) solution/l; Sigma], and potassium tellurite (10 ml of a 0.1g/l solution/l; Sigma). This selec-

TABLE 1. Prevalance of confirmed staphylococci isolates as determined from API biochemical identification methods

Sample Age and Type	Number of Samples Tested	Number of samples with		
		Presumptive <i>Staphylococcus</i>	Confirmed <i>Staphylococcus</i>	Number of Confirmed Isolates
Fresh Cheese (0 Months)				
Core	10	4	0	0
Surface	15	6	4	5 ^a
Mid Cheese (4 Months)				
Core	18	3	1	1
Surface	18	0	0	0
Full Cheese (10 Months)				
Core	72	53	6	7 ^b
Surface	72	32	13	22 ^b
Subtotal	205	98	24	35
Equipment	34	15	9	12 ^a
Personnel	12	10	9	23 ^b
Total	251	123	42	70

^aIncludes one pair of isolates from a single sample with the same API biochemical profile.

^bIncludes three pairs of isolates, both members of a pair from 1 sample having the same API biochemical profile.

tive medium (BP + MPRT) was developed to improve the differential enumeration of staphylococci on Baird-Parker agar plus egg yolk-tellurite (BP + EYT) and had been shown in previous studies to allow for the growth and easy recognition of several *Staphylococcus* spp. based on colony size, morphology, and the black color resulting from tellurite reduction. We have previously reported that several *Staphylococcus* spp. (11) and organisms other than identifiable *Staphylococcus* spp. (4) produce colonies on BP + EYT that resemble atypical *S. aureus*. The plates were incubated for 48 h at 35°C. After incubation, possible *Staphylococcus* colonies (small-to-medium size, round, smooth edged, and black) were transferred to Brain Heart Infusion (BHI) agar (Difco) and incubated for 24 h at 35°C. From plates containing five or fewer possible *Staphylococcus* colonies, all colonies

were transferred. If more than 5 possible *Staphylococcus* colonies were present, the area of the plate containing these colonies was divided into five equivalent sectors and one representative colony from each sector was transferred. These isolates then underwent tests for Gram reaction, cell morphology, catalase production, and anaerobic utilization of glucose and mannitol. Isolates that were Gram (+) catalase (+) cocci in clusters and capable of anaerobically fermenting glucose were termed presumptive staphylococci and then tested for coagulase production and identified using biochemical characteristics (API Staph kit, bioMerieux, Hazelwood, MO). Isolates identified as staphylococci by biochemical profiling were then tested for staphylococcal enterotoxin production by use of a Reverse Passive Latex Agglutination kit for enterotoxins a, b, c, and d (Oxoid, Ogdensburg, NY).

Thermotolerance of isolates

A variation of the thermotolerant plate count (8) was used to test Gram(+) catalase (+) glucose-fermenting cocci isolates for thermotolerance. Each isolate was transferred from a stock culture frozen in double-strength BHI broth + 20% (v/v) glycerol (Sigma) to BHI agar, incubated for 24 hours at 35°C, and then transferred to 5 ml of Brain Heart Infusion (BHI) broth (Difco), which was also incubated for 24 h at 35°C. Following incubation, the culture was serially diluted in BPD and spread-plated onto BHI agar. After 24 h incubation at 35°C, colonies were counted to determine the initial log CFU/ml of inoculum. Also, 0.1 ml of the culture was transferred to 9.9 ml of sterile 3°C skim milk. The initial log CFU/ml in the milk was calculated by reducing the culture log CFU/ml by two logs. This inoculated skim milk was immediately placed into a 62.8°C wa-

TABLE 2. Identification (API biochemical profiling) of 110 Gram (+) catalase (+), glucose-fermenting cocci isolated from cheese and environmental samples

	No. of isolates
<i>Staphylococcus aureus</i>	3
<i>Staphylococcus capitis</i>	2
<i>Staphylococcus coproae</i>	2
<i>Staphylococcus cornosus</i>	9
<i>Staphylococcus epidermidis</i>	30
<i>Staphylococcus equorum</i>	0
<i>Staphylococcus hominis</i>	2
<i>Staphylococcus pasteurii</i>	0
<i>Staphylococcus piscifermentons</i>	0
<i>Staphylococcus saprophyticus</i>	5
<i>Staphylococcus sciuri</i>	5
<i>Staphylococcus succinus</i>	0
<i>Staphylococcus warneri</i>	9
<i>Staphylococcus xylosus</i>	3
Unknown	40
TOTAL	110

ter bath and held there for 30 min as per the standard thermotolerant plate count method (8). Inoculated skim milk samples took 160 s to reach the water bath temperature (determined in a separate experiment). Following the 30 min, the samples were cooled immediately in ice, and subsequently diluted and spread-plated in duplicate onto BHI agar. The BHI agar plates were incubated for 24 h at 35°C; colonies were then enumerated to determine the final log CFU/ml. Subtraction of the final log CFU/ml from the initial log CFU/ml in milk provided the decrease in log CFU/ml for each isolate, which was a measure of each isolate's thermotolerance. Three separate determinations of thermotolerance were made, and the mean decrease in log CFU/ml was calculated for each isolate. As a control, *Staphylococcus aureus* strains FRI 100 and 1007 (Food Re-

search Institute, University of Wisconsin - Madison) and ATCC 12600 (American Type Culture Collection, Manassas, VA) were tested in this manner and used as a reference point. Because standard High Temperature Short Time (HTST) pasteurization normally eliminates *S. aureus* from raw milk, it is believed that strains more thermotolerant than *S. aureus* may have been present in the raw milk and may have survived HTST pasteurization.

Inoculation study

A study was done to evaluate the survival of three *S. epidermidis* strains during ripening of Parmesan cheese after surface and internal inoculation. Three 18.2-kg blocks of Parmesan cheese were received from a cooperating manufacturer, from three different points in the ripening process: freshly produced

and dried, and ripened at 10°C for 4 or 8 months. After inoculation, the surface and core of blocks were analyzed monthly for 6, 6, and 2 months, respectively. The thermotolerance of the isolates, having been previously determined, three *S. epidermidis* isolates were chosen for use in the inoculation study: one with a decrease of > 4.0 log CFU/ml in the thermotolerance test, one with a decrease of about 3.5 log CFU/ml, and one with a decrease of about 3.0 log CFU/ml. Each isolate was transferred from its frozen stock culture to BHI agar and grown for 24 h at 35°C. Following incubation, a colony was transferred to 5 ml of BHI broth and incubated for 24 h at 35°C. These cultures were then combined, forming a staphylococcal cocktail. The cocktail was serially diluted with BPD and enumerated by duplicate spread-plating onto BHI agar; colonies were counted after incubation at 35°C for 24 h.

A 1.0 ml aliquot of this cocktail was directly applied, using an automatic pipettor, to the top surface of the fresh block of cheese on each of six separate 7.5 cm × 8.3 cm portions and spread using a sterile glass "hockey stick." Nine remaining uninoculated sections served as controls. The same inoculation was done to the other two cheese blocks, except that seven sections were inoculated for the 4-month-ripened sample and three for the 8-month-ripened sample.

For internal inoculation, core sections were removed from the side of each cheese block with a sterile spatula, 1.0 ml of the cocktail inoculum was applied to each resulting opening, and the core was reinserted. Petroleum jelly was lightly spread over the resulting cracks and was covered with aluminum foil. This core inoculation was done the same number of times as for the surface inoculation. The blocks were then vacuum-sealed and held at 10°C, a temperature similar to that used for ripening. Every month, the cheese packages were opened, and one swab and one core sample were taken as previously described, plated onto BP + MPRT in triplicate, and incubated

TABLE 3. Thermotolerance of confirmed staphylococci isolates (identified by API method). Column headings are ranges of mean (n = 3) decrease in log CFU/ml in skim milk heated in a water bath at 62.8°C for 30 minutes

Organism	Number of isolates with mean decrease in log CFU/ml within the given range					TOTAL
	< 1.0	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	≥ 4.0	
<i>S. aureus</i> (controls)	0	0	0	3	0	3
<i>S. aureus</i>	0	0	1	2	0	3
<i>S. capitis</i>	0	0	1	1	0	2
<i>S. caprae</i>	0	1	0	0	1	2
<i>S. carnosus</i>	0	0	5	4	0	9
<i>S. epidermidis</i>	0	0	6	21	3	30
<i>S. hominis</i>	0	0	0	1	1	2
<i>S. saprophyticus</i>	0	0	1	4	0	5
<i>S. sciuri</i>	1	2	0	2	0	5
<i>S. warneri</i>	0	0	4	5	0	9
<i>S. xyloso</i>	0	0	1	1	1	3
Unknown	1	1	14	23	1	40
TOTAL	2	4	33	67	7	113

at 35°C for 48 h. Following the incubation, the plates were counted and then replica-plated onto nutrient agar (Difco) base with added mannose (10g/l; Sigma) and bromocresol purple [4.0 ml of 1% (w/v) solution/l; Sigma]. This selective medium contained mannose as a carbon source that two of the isolates in the staphylococcal cocktail could ferment. Thus, surviving staphylococci could be partially differentiated on this medium, based on yellow zones (indicating acid production) surrounding colonies. After this preliminary detection, up to 10 isolates from each plate with ≤ 300 colonies were biochemically characterized using the API Staph kit to estimate the proportions of the strains present.

RESULTS AND DISCUSSION

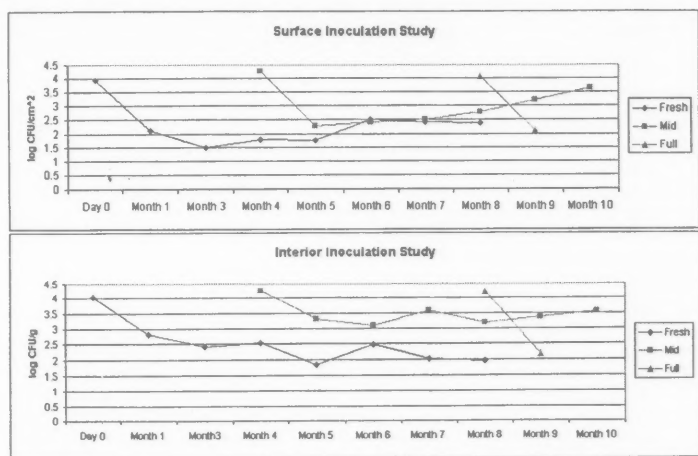
Confirmed staphylococci isolates were most often obtained from personnel (75% of samples) and equipment (26%), rather than from

cheese samples (12%; Table 1). Among cheese samples, confirmed staphylococci were found more than twice as frequently on surface samples, as on core samples. These differences in prevalence strongly suggested that staphylococcal contamination of hard Italian-type cheeses was caused by post-pasteurization contamination via employee hands or colonized equipment. Cheese surfaces that were found to be contaminated were either early (fresh cheese) or late (fully aged = 10 months) in ripening. The fact that these times correspond to more frequent handling supports our hypothesis of post-pasteurization contamination.

A total of 70 confirmed staphylococci isolates were obtained from 42 of 251 cheese, equipment, and personnel samples (Table 1), with 40 presumptive isolates not identifiable using the API Staph database. All other presumptive isolates differed from staphylococci in at least cell morphology, Gram reaction,

catalase reaction, or the ability to ferment glucose. The confirmation rate obtained (70 of 293 presumptive isolates, 24%) is evidence that BP + MPRT selectivity could be improved and is lower than that reported for presumptive staphylococci isolated from hot-smoked fish (9). Slightly over one-quarter of the unconfirmed isolates were Gram (-) rods (52 isolates), for which no further identification tests were done. Most frequently, the non-staphylococcal isolates were Gram (+) catalase (-) cocci, suggesting that *Enterococcus* spp. were important false-positive organisms. A total of 56 isolates were Gram (+) catalase (+) cocci that were incapable of fermenting glucose. These isolates may have been *Micrococcus* spp. (10) or catalase (+) *Enterococcus* spp. (2). Future research is needed to develop a staphylococci growth medium that is more selective against these organisms. In addition, the ability of BP + MPRT to recover stressed and/or injured staphylococci should be examined.

Figure 1. Survival of *S. epidermidis* (3-strain cocktail) on the surface and inside of Parmesan cheese (freshly made/dried (fresh), ripened 4 months (mid), ripened 8 months (full) that was vacuum-packaged and ripened at 10°C. Values are log CFU per 62.25 cm² surface area or per g of interior sample



Initial inoculation times: fresh = day 0, mid = month 4, full = month 8.

Among the confirmed staphylococcal isolates, the common skin-borne organism *S. epidermidis* was the most prevalent (30 of 70 isolates, 42.9%; Table 2), with *S. carnosus* (9 of 70 isolates, 12.9%), *S. warneri* (9 of 70 isolates, 12.9%), *S. saprophyticus* (5 of 70 isolates, 7.1%), *S. sciuri* (5 of 70 isolates, 7.1%), *S. aureus* (3 of 70 isolates, 4.2%), *S. xyloso* (3 of 70 isolates, 4.2%), *S. capitis* (2 of 70 isolates, 2.9%), *S. caprae* (2 of 70 isolates, 2.9%), and *S. hominis* (2 of 70 isolates, 2.9%) much less frequently isolated. *S. hominis* and *S. capitis* have been described as major species inhabiting the human skin. All of the other species can be considered minor human skin inhabitants, with *S. sciuri* also being commonly isolated from goat and sheep udders (6). Because of the occasional production of enterotoxin in non-*S. aureus* staphylococcal species (1), latex agglutination testing was done. None of the coagulase-negative staphylococci tested produced enterotoxin a, b, c, or d, and one *S. aureus* isolate tested positive for enterotoxin production. As a whole, the staphylococci isolates found are commonly associated with human skin.

A standard lab assay was used to evaluate the thermotolerance of 110 presumptive isolates. Of these, all but six decreased by more than 2 log CFU/ml. It is possible that these six isolates were thermotolerant strains present in the raw milk prior to pasteurization (Table 3). Three *S. aureus* control isolates subjected to the same treatment had a log CFU/ml decrease between 3.0 and 3.9. Slightly less than two-thirds of the isolates (71 of 110) had thermotolerance comparable to that of the *S. aureus* control strains. High-temperature short-time pasteurization conditions are chosen to eliminate foreseeable levels of *S. aureus*, so organisms with a thermotolerance comparable to *S. aureus* probably would be eliminated by standard milk pasteurization. This evidence further suggests that most staphylococcal contamination of hard Italian-type cheeses occurs after pasteurization. These results resemble those of an earlier study (4) in which four of five confirmed staphylococcal isolates decreased by ≥ 2.0 log CFU/ml in thermotolerance testing.

To determine the survival of staphylococci on cheese over time, an inoculation study was done. Figure 1 represents the survival of sta-

phylococci over time on Parmesan cheese of three different ripeness levels. There is no clear evidence of staphylococcal growth above initial levels during the ripening of the cheese. In months 4 through 10, levels of *S. epidermidis* on the cheese surface were between 0.8 and 2.0 log units lower than immediately after inoculation of 4-month-old cheese, although counts slowly increased from the lowest level at month 5. Corresponding monthly values for the cheese interior were between 0.7 and 1.2 log units lower than initial values. In freshly made cheese, *S. epidermidis* levels on the surface during storage were between 1.4 and 2.4 log units lower and interior levels were between 1.2 and 2.1 log units lower than initial levels. After reaching the lowest level at month 3, surface counts slowly rose in months 4 through 8. After inoculation of 8-month-ripened cheese, *S. epidermidis* levels dropped by 2.0 log units. There was no detectable difference in survival among the three *S. epidermidis* inoculum strains. It appears that *S. epidermidis* will initially decrease in numbers after inoculation, but will then survive several months both on the surface and in the interior of Parmesan cheese. It is possible that slow growth may even occur on the cheese surface. These findings contrast with those of Thompson et al. (12), who described Parmesan cheese as an unfavorable environment that could cause death of vegetative bacteria, including staphylococci. The ability of *S. epidermidis* to survive on hard Italian-type cheeses over time suggests that this bacterium could serve as an indicator for inappropriate direct or indirect manual contact with these cheeses during post-pasteurization manufacture and ripening.

The results of this study show that the presence of presumptive staphylococci in hard Italian cheeses most likely results from post-pasteurization contamination via either equipment or personnel. The results support the use of staphylococci as an indicator of post-pasteurization hygienic conditions.

The BP + MPRT agar medium can be used to detect staphylococci in cheese or environmental samples, but its selectivity is less than optimal. Nevertheless, the use of this medium for detecting staphylococci would allow the manufacturer to verify that appropriate hygienic measures are being followed to prevent contamination of hard Italian-type cheeses with hand-transmittable pathogens.

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10. Abstract — Type abstract, double-spaced, in the space provided or on a separate sheet of paper, using a 12-point font size. Use no more than 250 words.

Abstract Submission

Abstracts submitted for IAFP 2003 will be evaluated for acceptance by the Program Committee. Be sure to include all ten (10) items requested in the "Instructions for Preparing Abstracts" above; failure to do so may result in rejection. Information in the abstract data must not have been previously published in a copyrighted journal.

Abstracts must be received no later than January 6, 2003. Submit abstracts through one of the following methods:

1. Online: Use the online abstract submission form located at www.foodprotection.org. You will receive an E-mail confirming receipt of your submission.
2. E-mail: Submit via E-mail as an attached text or MS Word document to abstracts@foodprotection.org.

Selection Criteria

1. Abstracts must accurately and briefly describe:
 - (a) the problem studied and/or objectives;
 - (b) methodology;
 - (c) essential results; and
 - (d) conclusions and/or significant implications.
2. Abstracts must report the results of original research pertinent to the subject matter. Papers should report the results of applied research on: food, dairy and environmental sanitation; foodborne pathogens; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives and residues; food and dairy technology; food service and food administration; quality assurance/control; mastitis; environmental health; waste management and water quality. Papers may also report subject matter of an educational and/or nontechnical nature.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting. Papers should not appear in print prior to the Annual Meeting.
5. Results should be summarized. Do not use tables or graphs.

Rejection Reasons

1. Abstract was not prepared according to the "Instructions for Preparing Abstracts."
2. Abstract does not contain essential elements as described in "Selection Criteria."
3. Abstract reports inappropriate or unacceptable subject matter or is not based on accepted scientific practices, or the quality of the research or scientific approach is inadequate.
4. Work reported appears to be incomplete and/or data are not presented. Indication that data will be presented is not acceptable.
5. Abstract was poorly written or prepared. This includes spelling and grammatical errors.
6. Results have been presented/published previously.
7. Abstract was received after the deadline for submission.
8. Abstract contains information that is in violation of the International Association for Food Protection Policy on Commercialism for Annual Meeting Presentations.

Projected Deadlines/Notification

Abstract Submission Deadline: January 6, 2003.
Submission Confirmations: On or before January 7, 2003. Acceptance/Rejection Notification: February 14, 2003.

Contact Information

Questions regarding abstract submission may be directed to Bev Corron, 515.276.3344 or 800.369.6337; E-mail: bcorron@foodprotection.org.

Program Chairperson

Lynn McMullen
University of Alberta
Agricultural, Food and Nutritional Science
4-10 Agriculture/Forestry Center
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Fax: 780.492.8914
E-mail: lynn.mcmullen@ualberta.ca

Abstract Form

DEADLINE: Must be Received by January 6, 2003

(1) Title of Paper _____

(2) Authors _____

(3) Full Name and Title of Presenter _____

(4) Institution and Address of Presenter _____

(5) Phone Number _____

(6) Fax Number _____

(7) E-mail _____

(8) Format preferred: Oral Poster No Preference

The Program Committee will make the final decision on presentation format.

(9) Developing Scientist Awards Competition Yes Graduation date _____

Major Professor/Department Head approval (signature and date) _____

(10) TYPE abstract, DOUBLE-SPACED, in the space provided or on a separate sheet of paper, using a 12-point font size. Use no more than 250 words.

Call for Entrants in the Developing Scientist Awards Competitions

Supported by the International Association for Food Protection Foundation

The International Association for Food Protection is pleased to announce the continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the oral or poster competition.

Purpose

1. To encourage students and recent graduates to present their original research at the Annual Meeting.
2. To foster professionalism in students and recent graduates through contact with peers and professional Members of the Association.
3. To encourage participation by students and recent graduates in the Association and the Annual Meeting.

Presentation Format

Oral Competition – The Developing Scientist Oral Awards Competition is open to graduate students (enrolled or recent graduates) from M.S. or Ph.D. programs or undergraduate students at accredited universities or colleges. Presentations are limited to 15 minutes, which includes two to four minutes for discussion.

Poster Competition – The Developing Scientist Poster Awards Competition is open to students (enrolled or recent graduates) from undergraduate or graduate programs at accredited universities or colleges. The presenter must be present to answer questions for a specified time (approximately two hours) during the assigned session. Specific requirements for presentations will be provided at a later date.

General Information

1. Competition entrants cannot have graduated more than a year prior to the deadline for submitting abstracts.
2. Accredited universities or colleges must deal with environmental, food or dairy sanitation, protection or safety research.
3. The work must represent original research completed and presented by the entrant.
4. Entrants may enter only one paper in either the oral or poster competition.
5. All entrants must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
6. Acceptance of your abstract for presentation is independent of acceptance as a competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the chairperson by May 30, 2003.
7. All entrants with accepted abstracts will receive complimentary, one-year Association Membership, which includes their choice of *Dairy, Food and Environmental Sanitation* or *Journal of Food Protection*.
8. In addition to adhering to the instruction in the "Call for Abstracts," competition entrants must check the box to indicate if the paper is to be presented by a student in this competition. A signature and date is required from the major professor or department head.

Judging Criteria

A panel of judges will evaluate abstracts and presentations. Selection of up to five finalists for each competition will be based on evaluations of the abstracts and the scientific quality of the work. All entrants will be advised of the results by May 30, 2003. Only competition finalists will be judged at the Annual Meeting and will be eligible for the awards.

All other entrants with accepted abstracts will be expected to be present as part of the regular Annual Meeting. Their presentations will not be judged and they will not be eligible for the awards.

Judging criteria will be based on the following:

1. Abstract – clarity, comprehensiveness and conciseness.
2. Scientific Quality – Adequacy of experimental design (methodology, replication, controls), extent to which objectives were met, difficulty and thoroughness of research, validity of conclusions based upon data, technical merit and contribution to science.
3. Presentation – Organization (clarity of introduction, objectives, methods, results and conclusions), quality of visuals, quality and poise of presentation, answering questions, and knowledge of subject.

Finalists

Awards will be presented at the International Association for Food Protection Annual Meeting Awards Banquet to the top three presenters (first, second and third places) in both the oral and poster competitions. All finalists must be present at the banquet where the awards winners will be announced and recognized.

Awards

- First Place – \$500 and an engraved plaque
- Second Place – \$300 and a framed certificate
- Third Place – \$100 and a framed certificate

Award winners will also receive a complimentary, one-year Membership including *Dairy, Food and Environmental Sanitation* and *Journal of Food Protection*.

Policy on Commercialism

for Annual Meeting Presentations

1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or other related types of forums and discussions offered under the auspices of the International Association for Food Protection (hereafter referred to as to Association forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the express permission of the staff or Executive Board. The Association enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for the Association forums.

2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff on the basis of originality before inclusion in the program.

2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.)

and, if it will become available, when. The explanation for unavailable data will be considered by the Program Committee chairperson and/or technical reviewers selected by the Program Committee chairperson to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available, as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this would make the submission or presentation significantly more difficult to understand, the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff, will judge whether the use of trade names, etc., is necessary and acceptable.

2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services; however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

2.6 Proprietary Information (See also 2.2.)

Some information about products or services may not be publishable because it is proprietary to the author's agency or company or to the user. However, the scientific principles and validation of performance parameters must be described for such products or services. Conclusions and/or comparisons may be made only on the basis of reported data.

2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.

3. GRAPHICS

3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

3.2 Source

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

3.3 Company Identification

Names or logos of agencies or companies supplying goods or services must not be the focal point of the slide. Names or logos may be shown on each slide so long as they are not distracting from the overall presentation.

3.4 Copies

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the Program Committee chairperson, session convener, and/or staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convener to verify that all graphics to be shown have been cleared by Program Committee chairperson, session convener, staff, or other reviewers designated by the Program Committee chairperson.

4. INTERPRETATION AND ENFORCEMENT

4.1 Distribution

This policy will be sent to all authors of submissions and presentations in the Association forums.

4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both staff and technical reviewers selected by the Program Committee chairperson. All reviewer comments shall be sent to and coordinated by either the Program Committee chairperson or the designated staff. If any submissions are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

4.3 Author Awareness

In addition to receiving a printed copy of this policy, all authors presenting in a forum will be reminded of this policy by the Program Committee chairperson, their session convener, or the staff, whichever is appropriate.

4.4 Monitoring

Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convener that a violation or violations have occurred or are occurring, he or she will publicly request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.) and will notify the Program Committee chairperson and staff of the action taken.

4.5 Enforcement

While technical reviewers, session convenors, and/or staff may all check submissions and presentations for commercialism, ultimately it is the responsibility of the Program Committee chairperson to enforce this policy through the session convenors and staff.

4.6 Penalties

If the author of a submission or presentation violates this policy, the Program Committee chairperson will notify the author and the author's agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, the Association reserves the right to ban the author and the author's agency or company from making presentations in the Association forums for a period of up to two (2) years following the violation or violations.

New Members

AUSTRALIA

Paul Diggles
Food Spectrum
Salisbury, Queensland

CANADA

Sabah P. Bidawid
Health Canada
Ottawa, Ontario

Doug J. McPhee
JohnsonDiversey
Guelph, Ontario

GREECE

Christofaras A. Christofarou
GoldMate Ltd.
Palao Faliro, Athens

MAURITIUS

Vikash Lutchmiah
Hotel School of Mauritius
Coromandel

PUERTO RICO

Marlene Diaz-Santiago
University of Puerto Rico
San Juan

UNITED STATES

California

Tamir A. Halaban
Amgen
Studio City

Marc A. Hughston
IQ Scientific Instruments, Inc.
San Diego

Florida

Sara Reyes
Reyes Associates
Davie

Georgia

Dawn M. Norton
Centers for Disease Control
Atlanta

Idaho

Mark J. Gabiola
SSI Food Services Inc.
Wilder

Jeang Y. Park
J.R. Simplot Co.
Caldwell

Indiana

Travis L. Selby
Purdue University
West Lafayette

Louisiana

Richelle L. Beverly
Louisiana State University
Baton Rouge

Maryland

Michael L. Perdue
USDA-ARS, Animal Waste
Pathogen Lab, Beltsville

Massachusetts

Sandra C. Smole
Boston VA Medical Center
Boston

Michigan

Kevin Ricker
Jack's Fruit Market Inc.
Bay City

New Jersey

Maria Mantaya
North Plainfield

New York

James Cayea
Clinton Co. Health Dept.
Plattsburgh

Gregory J. Newman
Simply Litre Foods Inc.
Commack

Kendra K. Nightingale
Cornell University
Ithaca

North Carolina

Saphia Kathariou
North Carolina State University
Raleigh

Pennsylvania

Ernest Fogle
J & J Snack Foods
Scranton

South Dakota

Clark R. Hepper
So. Dakota Dept. of Health
Pierre

Texas

Sherry A. Harper
City of Lewisville
Lewisville

Virginia

Michael C. Bazaca
Virginia Tech
Blacksburg

Washington

Richard H. Daugherty
Washington State University
Pullman

Wisconsin

David P. Gebhart
Pro Chemicals LLC
Green Bay

Updates

American Dairy Science Association Names Officers

At its annual meeting recently, the American Dairy Science Association (ADSA) elected its officers for the 2002-2003 term.

Elected officials include: president, David Beede; vice president, Joseph O'Donnell; past president, John Bruhn; treasurer, Ronald Richter; and editor-in-chief, Steve Nickerson.

International Fresh-cut Produce Association Announces Marketing and Communications Directors

The International Fresh-cut Produce Association (IFPA) has announced the recent appointment of Ken Hodge as its new communications director and Loren Queen as its new marketing director. Both Hodge and Queen most recently worked for Columbia Publishing in Yakima, WA.

Ken has served as editor of *Fresh Cut* magazine for the past

nine years. He is also the author of many articles for other agricultural publications in Columbia's roster.

As advertising manager for Columbia Publishing, Loren has developed many relationships in the produce industry over the last seven years and comes to IFPA with a thorough knowledge of the marketing needs for the fresh-cut industry.

Guelph Food Technology Centre Announces New Positions

The Guelph Food Technology Centre (GFTC) has announced the promotion of Kathryn Cooper to the position of vice president client services and market development. This position, and our newly-formed marketing unit, emphasize the value we place on reaching out to our members and clients in the agri-food sector. Kathryn has been with GFTC since its inception and has been a key factor in the growth of our business says Terry Maurice, president and CEO.

Dr. Ruby Lee has been appointed as senior quality systems specialist, training and quality systems group. Dr. Lee has a Ph.D. from Iowa State University in food science and technology, where much of her research focused on the extension of shelf life of fresh meat, poultry and processed meats. She has worked with US Army Natick Labs on the FDA approval of the irradiation of seafood. As a member of the quality control leadership management team at Tyson, Ruby developed and implemented HACCP programs, developed the implemented microbiological environmental sampling systems, and conducted line personnel training.

SIG Combibloc Names Ben Hamer President and CEO

SIG Combibloc Inc., has announced that Ben Hamer has taken the helm as the company's new president and CEO. He comes to this position from Stork Mexico, where he was managing director of the firm.

Automated Chicken Inspection Ready to Commercialize

Moving automated chicken inspection into the nation's 300-plus poultry-processing plants is the goal of cooperative research between the Agricultural Research Service and Stork Gamco, Inc., of Gainesville, GA, one of the largest chicken-processing plant equipment manufacturers in the world. Stork Gamco will soon test a system, developed by ARS agricultural engineer Yud-Ren Chen in Beltsville, MD, that moves 140 birds a minute.

In a processing plant, the test equipment will be mounted alongside a processing line at the point right after the chickens are killed and defeathered. The equipment takes two complementary readings of the carcasses' condition. For one, a probe bounces light off the carcasses. The reflected light goes to a spectrophotometer and then a computer—which is in a room away from the moist conditions of the processing line—for analysis.

Differences between light shining on the chicken and light reflected back are due to variations in external skin color and meat tissue composition that are clues to problems.

For the second reading, a camera takes three spectral images of each chicken through different color filters. Then the computer reads the spectral images and decides if the carcass is wholesome or not, as well as identifying local tears, bruises or tumors and carcass size. Together, the equipment pieces quickly diagnose physical or biological conditions causing inspectors to reject chickens. They spot both definitely unwholesome carcasses for rejection and suspect ones requiring closer human inspection.

The equipment does not detect bacterial contamination. But the



ARS Poultry Processing and Meat Quality Research Unit in Athens, GA, has signed a companion cooperative research and development agreement with Stork Gamco to find a way to spot contamination from the ruptured crops of chicken carcasses and from fecal matter, both of which contain bacteria.

California Dairies Join NMPF; Federation Contracts for Services of Alliance's Tillison

California Dairies Incorporated (CDI), headquartered in Artesia, CA, has joined the National Milk Producers Federation (NMPF), effective Oct. 1, NMPF announced.

As the second, largest dairy cooperative in the US, CDI represents approximately 700 dairy farmers in California and is ranked second in the nation in the volume of milk produced by those farmers. Dairy Farmers of America (DFA), of Kansas City, MO, is the largest dairy cooperative in the US.

CDI is also a major processor of butter and nonfat dry milk. "This will be a terrific win-win relationship for both National Milk and CDI," said Jerry Kozak, president and CEO of NMPF. "Our organization will benefit greatly from the perspective and resources of the producer, members of California

Dairies, and CDI will benefit from being part of the national membership organization representing dairy producer concerns across the country," Kozak said. "CDI's membership in NMPF provides us with the unique viewpoint of California's dairy industry. CDI's membership will also help ensure that their viewpoint is shared with policy makers in Washington," Kozak said.

California Dairies is also a member of the Alliance of Western Milk Producers, Sacramento, CA, which is headed by Jim Tillison. As part of an arrangement with the Alliance, NMPF will contract for Tillison's services on certain national issues. Tillison will report directly to Kozak as NMPF vice president, special projects, while maintaining his status as CEO of the Alliance.

This arrangement "not only provides us with a new member cooperative, but also secures for us the services of someone as talented and effective as Jim Tillison," Kozak said. With CDI's new membership, the National Milk Producers Federation now represents more than two thirds of the nation's 75,000 dairy farmers, as well as a similar proportion of the overall volume of milk produced in the US.

The Alliance of Western Milk Producers was formed in 1991, and Tillison was hired that year as the group's executive vice president. From 1981 to 1990, Tillison had served as executive director of the Wisconsin Cheese Makers Association.

Giant Associates Sign Food Safety Pledge

Giant Food has launched an internal program focused on re-emphasizing the importance of food safety by having all of its store associates sign a food safety pledge. The program incorporates the four Fight BAC!® messages: clean;

separate; cook, and chill. These practices protect perishable foods and prevent foodborne illness. The pledge emphasizes that it is the responsibility of each Giant associate to use the best food safety practices at all times.

In late August all Giant stores received Fight BAC![®] signage from the Food Marketing Institute (FMI), a trade organization that represents the supermarket industry. These informative signs have been placed in strategic locations in food preparation areas to remind Giant associates about specific safe food handling practices. A new handwashing video has also been made available to associates in all Giant stores. "Food safety has always been a part of our commitment at Giant, and with National Food Safety Education MonthSM in September, we want to re-emphasize how important safe food handling is to all of our associates. The signs are a very effective tool for communicating this message," said Odonna Mathews, vice president of consumer affairs for Giant Food. She added, "Our commitment extends from our stores to our customers as well."

Consumers can find safe food handling information on all types of products, information for high risk populations and answers to frequently asked questions at Giant's Web site, <http://www.giantfood.com> and <http://www.superfood.com>. Giant is also providing information to consumers by posting signs in all of its stores through September. The signs will promote the message, "Don't Put It on the Bun Until It's Done."

Brochures with the same message are also available advising consumers to use a thermometer

or disposable T-stick to assure that hamburgers are cooked to the safe internal temperature of 160°F.

Take a Look at Real Magic: Disney and Food Safety

"Food safety is magical, but it doesn't magically happen," Frank Yiannas, manager of food safety and health at Walt Disney World, likes to say. Responsible for the safe food served to the thousands of guests who come to Walt Disney World, Yiannas knows the truth behind this statement. Foodservice at Walt Disney World is a dizzying array of complexity; utilizing foods from hundreds of suppliers, relying on 5,000 food and beverage "cast members," and serving food from hundreds of sites ranging from quick service to full-service kitchens serving convention dinners. "We refer to our employees as 'cast members,' because we're all part of the show," Yiannas explains. And what a show it is!

While guests wander through a place of wonder, behind the scenes science, planning, and teamwork combine to ensure food safety. "When I think of food safety, there is no silver bullet," says Yiannas. Instead, Yiannas addresses issues at each step of the food safety chain. In order to purchase the safest food possible, Walt Disney World developed and uses a Vendor Food Safety Program to screen new vendors and monitor existing vendors. Vendors must meet a variety of requirements, including providing a Hazard Analysis Critical Control Points (HACCP) plan and a sanitation plan. They also undergo food safety audits and microbiological testing.

When it comes to training 15,000 "cast members," Yiannas believes "you need to go beyond just relaying information. You need to look at how to influence behavior, and we use a variety of tools, including social marketing principles," Yiannas notes.

Social marketing works to change behavior by utilizing audience research to construct messages specifically for targeted audiences. "One of the things we do," Yiannas explains, "is to provide 'wake-up messages'." Some of these messages are delivered through videos designed to reinforce the real-world relationship between foodborne illness outbreaks and people – real illness, real consequences. "We don't want people to get so comfortable that they don't hear the food safety message," he explained. Their training program is also science-and risk-based.

"When you look at training that's available off-the-shelf, frequently there is no real relationship between the training principles and the causes of foodborne illness indicated by science-based data. We try to gear our training to areas of risk," Yiannas says.

One of those key areas is hygiene. Yiannas notes that the Centers for Disease Control and Prevention estimates that a large percentage of foodborne illness outbreaks may be attributed to poor personal hygiene. Another key to food safety – no bare hand contact. According to Yiannas, "we use enough single-service gloves in 1 year to fit the entire population of Florida – and still have gloves left over. We have long recognized the need to keep hands away from direct contact with ready-to-eat foods."

Training messages are reinforced on a daily basis through

electronic communications, including an Intranet food safety site, traditional vehicles like signs and newsletters, and personal interaction and evaluations from foodservice and health inspectors. Walt Disney World relies on HACCP to assure that foods and beverages are handled safely by checking time and temperature requirements throughout the day. "These plans aren't required by law, but we do it for the right reason, to produce the safest food possible," Yiannas says.

Indeed, HACCP is everywhere at Walt Disney World. They have HACCP cards, a HACCP manual, daily and weekly HACCP checklists, and they are testing a paperless HACCP project. Technology and information sharing is key to the future of food safety, according to Yiannas. One way they are using technology today is by equipping their inspectors with hand-held devices that allow them to conduct an inspection, print out a report on the spot, and then enter the data into shared communication networks. The hand-held device even comes equipped with its own temperature probe – and records the food's temperature for HACCP monitoring. A longtime participant in food safety endeavors beyond the boundaries of Walt Disney World, Yiannas believes in the importance of working with every partner in the food safety chain. "At Walt Disney World we know that the only way to get things done is through partnerships," he says.

Tin Levels in Canned Foods Down

Tin levels in canned foods are lower than five years ago and are well within regulatory limits, according to a Food Standards Agency survey.

Of the canned fruit and vegetables and tomato-based products tested, 99.5 percent contained tin concentrations below 200 milligrams per kilogram (mg/kg). This is the maximum legal amount of tin that can be present in canned foods. A total of 400 different samples were tested between December 2000 and August 2001. Relatively high levels of tin were found in some samples when canned fruit and vegetable products were last surveyed in 1997, and tomato products in 1999.

In the latest survey, only two products were found to contain levels of tin above the legal limit: one sample of gooseberries and one of spaghetti in tomato sauce. Manufacturers and suppliers voluntarily withdrew these affected batches from store shelves after the Agency notified them. They also issued notices in stores and the national press asking consumers to return the products. Most foods contain very low concentrations of tin. Canned foods may contain higher levels because the tin coating used to protect the steel body of the can from corrosion can slowly transfer into food. No long-term health effects are associated with consuming tin. But it can cause stomach upsets such as nausea, vomiting, diarrhea, abdominal cramps and bloating in some sensitive people at levels above 200 milligrams per kilogram. Most of our dietary intake of tin (94 percent) comes from canned fruit and vegetables.

The Agency has worked with the food industry and enforcement officials to find out the causes of tin contamination in canned foods and to minimize the likelihood of high levels. It commissioned the survey to get up-to-date information on tin levels in canned food and to see if moves to reduce tin levels were having any effect. The survey

confirms that introducing cans that are fully lacquered on the inside to contain acidic foods has helped to control and reduce tin levels. The 200 milligram per kilogram limit is supported by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT). This committee gives the FSA and other Government departments independent expert advice on chemical safety in food.

Publix to Offer Ground Beef and Chicken Irradiated by Food Technology Service, Inc.

Publix, one of the 10 largest volume supermarket chains in the United States will offer New Generation irradiated frozen ground beef and chicken early next year. New Generation products are irradiated by Food Technology Service, Inc. Ground beef patties, boneless chicken breasts and chicken tenders will be offered at all 711 Publix stores. In addition to these frozen items, Publix will also consider offering fresh products in the future.

"Publix is known for the quality of its stores and the products it offers," said FTSI President Richard Hunter. "Publix's decision to provide customers the option of purchasing irradiated products as another line of defense against foodborne illness is further evidence of their commitment to food safety."

Food irradiation is a safe and effective technology that destroys *E. coli*, *Salmonella* and other harmful bacteria using radiant energy. It is supported by the American Medical Association, the American Dietetic Association, the World Health Organization, the U.S. Centers for Disease Control and Prevention and numerous other public health organizations. Food Technology

Service, Inc. began operating in 1992 and is the nation's most experienced food irradiation company. The firm's process allows irradiation of a large variety of fresh and frozen meat including chicken, ground beef, pork and turkeys.

"I am pleased that Publix has chosen our firm and for the positive impact it will have on our company," said FTSI board member Dr. John Sinnott. "However, as a practicing physician, I am even more pleased by the public health benefit of their decision and the choice it provides my patients, friends and family."

On-Farm Testing for Pathogens on the Horizon

Researchers are creating a new system for rapid on-farm detection of pathogens. Such an achievement could usher in a new age of agricultural diagnostics, allowing the detection of tiny, potentially harmful organisms before they leave the farm and get into the food chain. Agricultural Research Service scientist Michael Perdue and his Animal Waste Pathogen Laboratory team are collaborating with researchers at Idaho Technology, a company based in Salt Lake City, UT, to design fluorescent probes and primers to identify specific genetic sequences in 30 to 45 minutes – far faster than is currently possible. Current culture techniques require 18 hours to several days to unequivocally identify pathogens in the laboratory. The relatively new genetic analysis technique, called fluorescent real-time polymerase chain reaction (PCR), is used with investigator-designed probes and primers to rapidly pinpoint short stretches of each pathogenic organism's genetic code.

In addition to quick results, the detection system would be

portable and could be brought to the farm or any other location. Regulatory agencies, farmers, consumer groups and industry groups could all benefit from the nearly immediate assessment of the presence of pathogens in a number of settings, whereas previously, days could pass prior to identification.

Before this new age of detection can proceed, researchers have to evaluate a host of different primers, using real-life organic substances as test samples, to determine the usefulness of real-time fluorescence-based PCR machines. Researchers will analyze substances such as milk, soil, water and manure for the presence of pathogenic organisms like *Salmonella*, *Listeria monocytogenes*, *E. coli* O157:H7, hepatitis viruses (A and E), and bovine enteric viruses.

Guidance for Industry: Juice HACCP Hazards and Controls Guidance First Edition Draft Guidance

This guidance document is being distributed for comment purposes only.

Draft released for comment on: September 12, 2002. Comments and suggestions regarding this draft document should be submitted by November 12, 2002, to Dockets Management Branch (HFA-305), Food and Drug Administration, 5630 Fishers Lane, Rm. 1061, Rockville, MD 20852. For questions regarding this draft document, contact Michael Kashtock at 301.436.2022.

This draft guidance represents FDA's current views on potential hazards in juice products and how to control them, and it is designed to assist juice processors in the development of HACCP plans to satisfy the

requirements of the Hazard Analysis Critical Control Points (HACCP) regulation for juice in 21 CFR Part 120. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public. An alternative approach may be used if such an approach satisfies the requirements of applicable statutes and regulations.

Highlights of the Juice HACCP Regulation: Both interstate and intrastate juice processors must evaluate their processing operations using HACCP principles. Effective dates for the regulation are January 20, 2002, January 21, 2003, or January 22, 2004, depending upon the size of your business. The regulation does not pre-empt the existing requirements to follow the current Good Manufacturing Practice (CGMP) regulations for your juice processing operations.

The HACCP Plan and other records of your sanitation standard operating procedures (SSOPs) and HACCP operations must be available for official inspection and copying. Employees involved in developing, or in certain aspects of implementing, a HACCP plan, must be trained in HACCP principles.

The 5-log pathogen reduction must be accomplished for the microbe you identify as the "pertinent microorganism," which is the most resistant microorganism of public health significance that is likely to occur in the juice, e.g., *E. coli* O157:H7, take place in one facility just prior to or after packaging, and be applied directly to the juice, except for citrus juices.

Fruit surface treatments may be used to accomplish the 5-log reduction for citrus fruits, but cleaned and undamaged tree-picked fruit must be used and the effectiveness of the treatment

must be verified by regularly testing your product for generic *E. coli*.

Shelf stable juices made using a single thermal processing step and juice concentrates made using a thermal concentration process that includes all of the ingredients, are exempt from the requirement to include control measures in your HACCP plan to achieve the 5-log pathogen reduction, but a copy of the thermal process must be included in your hazard analysis.

Low-acid canned juice is exempt from the requirement to include control measures in your HACCP plan to achieve the 5-log pathogen reduction, but the juice is still subject to the low-acid canned food regulation and all of the other requirements of the juice HACCP regulation.

Retail establishments or businesses that make and sell juice directly to consumers and do not sell or distribute juice to other businesses are exempt from the juice HACCP regulation, but must comply with any applicable state regulations.

Research Shows Improvements in Safe Food Handling by Consumers

Consumers continue to improve their food safety practices, according to research findings released by the Food and Drug Administration of the Department of Health and

Human Services and the Food Safety and Inspection Service of the U.S. Department of Agriculture at the National Conference for Food Safety Educators. The results of the 2001 Food Safety Survey, a nationwide telephone survey of 4,500 adult consumers, reveal that the dramatic improvement in consumer food safety practices that occurred between 1993 and 1998 continued between 1998 and 2001.

In 2001, most consumers reported food handling practices that were consistent with the four basic food safety messages FSIS and FDA have been stressing since 1997: clean, separate, cook and chill. In particular, consumers reported using improved food handling practices that reduce cross-contamination after contact with raw fish, meat, or chicken. The number of consumers eating pink hamburger, steak tartar, and raw eggs stayed relatively level. However, more people reported eating raw clams, oysters, or fish in 2001 than in 1998.

"The Food Safety Survey provides evidence to support continued public health efforts to educate consumers about safe food handling practices to reduce the incidence of foodborne illness," said Dr. Lester Crawford, FDA Deputy Commissioner.

Also released are the findings from a USDA study reviewing a variety of research that measured changes in consumer knowledge and safe food handling practices since the implementation of the Pathogen Reduction/Hazard

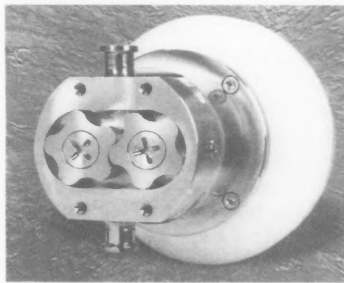
Analysis Critical Control Point (PR/HACCP) Systems final rule in 1996. "Although consumers report that they are more knowledgeable about food safety and have improved their safe food handling practices, in reality, some consumers are still using unsafe practices," said Dr. Elsa Murano, under secretary for food safety at USDA.

The research reviewed by USDA included not only the Food Safety Survey data, but observational studies of consumers preparing food and informal discussions with small groups of consumers. The research shows that while food thermometer ownership has increased since 1998 and usage has doubled, the percentage of consumers who use food thermometers remains low.

"Consumers continue to mistakenly believe they can tell when food is fully cooked by color alone when color is not an indicator of safety," Murano added. "A food thermometer is the only way to determine when meat has reached a high enough temperature to kill harmful bacteria."

The 2001 Food Safety Survey and related documents can be found at www.cfsan.fda.gov; choose National Food Safety Programs, then Food Safety Survey. The USDA report, "Changes in Consumer Knowledge, Behavior, and Confidence Since the 1996 PR/HACCP Final Rule," can be found at www.fs.is.usda.gov/oa/research/HACCP_impacts.htm.

Industry Products



Viking Pump Inc.

New AccuLobe™ from Viking Pump Provides Accurate, Repeatable Flow for Sanitary and Industrial Applications

Viking Pump has released the AccuLobe™ Pump, a compact positive displacement pump that delivers accurate, repeatable flow in sanitary and industrial applications. Unlike other small rotary pumps, the AccuLobe features a five lobe rotor design with a unique one-piece rotorcase/gearcase. The five lobe rotors minimize pulsation, while the precise alignment of the one-piece rotorcase/gearcase helps maximize repeatability. The AccuLobe is ideal for pumping shear-sensitive or viscous fluids, and for applications where producible flow is necessary, such as metering creams and lotions, vaccines and hormones, dairy and food ingredients, water treatment polymers, and inks and paints.

The AccuLobe also provides easy cleaning for critical-hygiene or frequent-fluid change applications. Its front-loading seals allow for simple maintenance, and its one-piece rotorcase/gearcase

contributes to longer bearing and seal life. The pump is self-draining, yet maintains volumetric efficiency through chamfered cusps around the ports. The pump is also 3-A-conforming, and certified according to EDEDG method for in-place cleanability of food processing equipment. Construction is 316L Stainless Steel for minimized carbon pull-out.

Designed for metering, filling and transfer, the pump can handle liquids up to 75,000 SSU (6,500 cSt) viscosity, in capacities to 9.2 gpm (32 lpm) and pressures to 175 psi (12 bar). The standard AccuLobe is foot-mounted, or it can be bulkhead-mounted for OEM applications. Other mounting options include a NEMA 143/145TC motor mount or IEC Frame 80 motor mount, both offering integral 3:1 gear reduction.

Viking Pump Inc., Cedar Falls, IA

Reader Service No. 287

3M Introduces Fast, Accurate, Streamlined Staph Test

3M Petrifilm Staph Express Count Plate, the latest addition to the 3M Petrifilm line, delivers confirmed *Staphylococcus aureus* test results in as few as 22 hours in three easy steps.

Petrifilm Staph Express Count plates provide food processors with an early, accurate indication and risk assessment of food quality and sanitation effectiveness. The speed of the *S. aureus* test allows faster decisions on when to reject or release product.

Petrifilm Staph Express Count plates are cost-effective, space-saving, and sample-ready.

"Petrifilm Staph Express Count plates deliver fast, confirmed results for easy *S. aureus* testing. This capability will help every lab meet the growing need for increased efficiency and productivity," says Jennifer Eide Boucher of 3M Microbiology Market Development.

The streamlined process produces fast, accurate results. The Petrifilm Staph Express Count plate method requires only one incubation temperature and is equivalent to the BAM three-plate Baird-Parker agar and tube coagulase method. Distinctive red-violet colonies and the plate's built-in grid allow easy, precise interpretation.

Petrifilm Staph Express Count plates join the industry-leading Petrifilm family of dependable products. Petrifilm plates facilitate frequent process monitoring and increased profitability through better inventory management and process control. The end result is higher quality products and improved facility cost savings.

All Petrifilm plates are manufactured at an ISO 9002-certified site, where strict quality-control procedures help reduce media variations. Petrifilm plates are backed by the 3M commitment to quality products, customer service, and technical support.

3M Microbiology, St. Paul, MN

Reader Service No. 288

The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.

New Tamper-Evident Reveal Estate™ TE Label Protects Packagers and Informs Consumers from Label Express

Label Express, Inc., has developed the tamper-evident version of its popular Reveal Estate™ extended text label specifically for the upscale nutraceutical and biomedical markets. Reveal Estate TE combines expanded space for informational text with a self-destructing feature designed to thwart label-switching counterfeiters and thieves.

The Reveal Estate TE label incorporates hidden crescent-shaped face slits that tear cleanly when there is an attempt to remove the label. The design is bi-directional, so no matter what the direction of the attempted removal, the label destructs. This feature makes it almost impossible to move the label to another product's package.

Reveal Estate is a simple, one-piece pressure-sensitive label that incorporates both permanent and removable adhesives to create a liftable back panel.

A tab is added to the die-cut with a patterned adhesive, creating a convenient lift tab that can then be repositioned. The patent pending construction also creates a memory feature allowing the label to "spring back" into place avoiding unsightly flagging on the retail shelf.

Necessary information is printed on the back of the label before the adhesive is patterned, leaving the outer label face free for full graphics, brand identification, bar codes and initial product and performance information.

Reveal Estate converts formerly unusable space into a new informational panel that can be used for regulatory language, government warnings, multi-language content, and supplement

panels. The one-piece design is essentially the same size and structure as users' current labels, and no special application equipment is required.

Label Express, Inc.,
Naperville, IL

Reader Service No. 289



KES Science & Technology, Inc.

KES Science & Technology AVA Series is Groundbreaking Development in Produce Misting and Reverse Osmosis Technology

The most important development in produce misting since the 360° rotating sprayhead has just hit the market. The new AVA Series Produce Misting and Reverse Osmosis systems not only have a state-of-the-art look, but their advanced function might just start a revolution.

For starters, both pieces of equipment feature LED lights on their control panels. These lights alert store personnel to the machines' functions at any given time. The "smart technology" can save hundreds of dollars in unnecessary troubleshooting service calls.

Beyond that, these products get even smarter. The AVA Series Produce Misting has just one mist control unit that will operate virtually any spray delivery style on the market. The advanced control unit gives the user no limitations when it comes to the look they want in the front of their case.

Perhaps the most effective development is the AVA Series

RO's revolutionary "Push/Pull" technology. By using only about 20% of the water of standard RO units, the AVA Series RO can save thousands of dollars a year in water utility costs. One unit can save up to 50,000 gallons of waste water per year in a single store. The technology also lessens wear and tear on membranes and pre-filters. One can expect about half the amount of maintenance than with standard RO's.

KES Science & Technology,
Inc., Kennesaw, GA

Reader Service No. 290

BioControl Develops a Multi-variable Testing Platform for ATP Bioluminescence and More

BioControl Systems, Inc., is pleased to announce the development of the first testing platform to integrate multiple quality parameters in one instrument. The LIGHTNING MVP® System is a portable instrument suitable for use in both plant and laboratory environments for the measurement of ATP bioluminescence, pH and temperature. One instrument captures all test results into one integrated database. This allows record keeping and analysis previously unavailable to optimize quality and HACCP programs.

"We have created a next generation instrument that will revolutionize the way HACCP monitoring is conducted in the food industry," said Phil Feldsine, president and CEO of BioControl. "The new LIGHTNING MVP instrument will allow QA Managers to validate their cleaning procedures and monitor their critical process control points with one instrument. Test results from each testing parameter are stored in the same MVP database, so cause/effect interrelationships can easily be identified and corrective actions can quickly be taken."

ATP users will find the LIGHTNING MVP system more user-friendly and versatile than any ATP luminometer previously available. The MVP features a unique one-step, one-hand swab insertion mechanism that allows ATP swabs to be read quickly and easily while protecting the device from exposure to light, moisture and debris. Temperature and pH are measured with rugged, non-glass probes that are safe to use in all environments.

Results from all parameters are stored in the LIGHTNING MVP and can be downloaded to a personal computer for analysis with MVP TRAX[®]. Since the results from all parameters are captured within the same device, they can be analyzed as an inter-related set of data points. This unique capability of overlaying several types of data allows for the identification of potential cause/effect relationships of quality measurements that would otherwise be difficult to determine. As a result corrective action can be implemented much faster.

BioControl Systems, Inc.,
Bellevue, WA

Reader Service No. 291

Ultra-Strong, Corrosion-Resistant Thermoplastic Bearing Housing Family Now Offered by Jilson

A wide selection of ultra-strong, dimensionally stable thermoplastic bearing housings is now available from The Jilson Group, Inc. They are offered as pillow block, 2-bolt and 4-bolt styles in the popular 204, 205, 206, and 207 sizes, and can be equipped with either metal or plastic insert bearings.

Standard size insert bearings with bore sizes ranging from 1/2 in. to 1-1/2 in., or 12 mm to 50 mm, are available from stock for use in Jilson thermoplastic housings.



The Jilson Group, Inc.

The Jilson housings are made of high-grade, solid PBT thermoplastic polyester, and are excellent replacements for conventional cast iron housings in many applications. With a tensile strength of 17,300 psi, they provide a strength and durability not found in other plastic housings. Additionally, they can be cleaned or hosed down with hot water and will operate at temperatures up to 280°F.

Unlike cast iron housings, the Jilson housings never need plating or coating and will not peel or chip; the PBT thermoplastic material is corrosion proof.

Jilson can supply the thermoplastic housings with or without insert bearings. The housings accept standard size metal and plastic insert bearings, as well as plastic insert bushings. Jilson plastic insert bearings are available with either plastic, glass or stainless steel balls.

Industries which use corrosion-resistant, non-magnetic bearing housings and insert bearings are: food processing, canning, bottling, pharmaceutical, packaging, paint, dye, textiles, exercise equipment, marine, automotive, photo processing, appliance and chemical processing.

For maximum corrosion resistance, or where non-magnetic qualities are important, Jilson thermoplastic housings with Jilson plastic insert bearings are recommended.

The Jilson Group, Inc., Lodi, NJ

Reader Service No. 292

Alfa Laval Releases New Comprehensive Line of Sanitary Heat Exchangers

Alfa Laval, a supplier of heat exchangers, separators and fluid handling equipment, announces the release of a new comprehensive heat exchanger product line. This product line includes sanitary plate heat exchangers, semi-welded plate heat exchangers, scraped-surface heat exchangers and brazed heat exchangers. This new product range is the most comprehensive product offering from any supplier in the sanitary heat exchanger industry. These heat exchangers are used for applications in the food, beverage, brewery, dairy and bio-pharm industries.

The gasketed sanitary plate heat exchanger is specially designed for pasteurizing and general heating or cooling of beverages, dairy products, brewery products and other viscous products. All gasketed heat exchangers have glue-free clip-on gaskets that can be removed and replaced while the plates are still in the frame.

The FrontLine Series of plate heat exchanger, designed solely for food applications, is suitable for a dairy pasteurization, yogurt cooling, treatment of heat-sensitive products, and UHT heat treatment. It offers longer production periods as a result of fouling-resistant plate design and low-cost operation as a result of a glue-free gasket design.

The BaseLine Series, a low-cost modular design for fast delivery, is suitable for duties such as simple pasteurization, raw milk cooling, media heating/cooling, small batch wort cooling and CIP heating. The BaseLine is available in a wide range of plates and gasket materials.

The M-Line Series is manufactured in two models, one with a painted frame for liquid-to-liquid and product-to-liquid duties, particularly for service media, and one with a stainless steel frame for sanitary duties such as raw milk chilling and simple pasteurization. Both M-Line variants offer a versatile low-cost heat transfer alternative.

In the sanitary industries, the Semi-Welded Series is ideal for utility applications such as liquid-to-refrigerant and as replacements for shell-and-tube heat exchangers. With alternating welded and gasketed channels, the Semi-Welded combines ease of service with protection from leakage. This makes it possible to use aggressive media for the direct cooling of food products with the media in the welded channel and the product in the gasketed channels. This provides highly efficient cooling with a fraction of the refrigerant charge.

The Brazed Heat Exchanger is a compact, low-cost plate heat exchanger consisting of a series of stainless steel plates brazed together using copper or nickel as the brazing material. This compact heat exchanger is easy to fit and install. In sanitary applications, it is suited for use in utilities for liquid-to-liquid, refrigerant-to-liquid and steam-to-liquid duties.

The Contherm® Scraped-Surface Heat Exchanger is a vertically mounted scraped-surface heat exchanger designed for the heating and cooling of particulate, sticky, viscous and crystallizing/phase-change processes. It is available in three sizes and can serve in a wide range of process stages including heating, cooling, slush freezing, pasteurization, sterilization and

crystallization. The Contherm can operate with either steam, water, brine, ammonia, glycol, R22, R12 or liquid gases.

Alfa Laval Inc., Pleasant Prairie, WI

Reader Service No. 293

Parker Hannifin Corp. Extends Food Product Shelf Life with Sterile Air System

Balston® sterile air filtration system now available from Parker Hannifin Corp. provides clean, dry sterile air for the most demanding applications in the food and dairy industry.

Balston sterile air filters are in full compliance with FDA requirements, are USDA accepted for use in federally inspected meat and poultry plants, and comply with 3-A accepted practices. The filter cartridges are rated at 99.9999+% efficient for 0.1µm particles, are at least 30 times more efficient than the currently accepted standard for sterile air filters developed by independent research organizations in the US and UK.

Balston Sterile Air Filters are available for 1/4" to 10" line sizes at a maximum operating pressure of 250 psig and temperature of 250°F.

Parker Hannifin Corporation, Tewksbury, MA

Reader Service No. 294

Protein Solutions Introduces Aviv Plasmon Waveguide Resonance Technology

Protein Solutions has announced that it will introduce its new Aviv Plasmon Waveguide Resonance (PWR) technology

at the Protein Society Symposium and Exhibit, August 18-20, in San Diego, California. This new PWR technology was licensed and developed under a cooperative agreement with the University of Arizona and allows researchers to study molecular interactions, protein structure changes and molecular orientation in membrane environments.

Based on the principles of both surface plasmon resonance (SPR) and waveguide phenomena, the Aviv PWR technology is a novel spectroscopic technique that provides critical information about biological samples in real time, faster, more directly, and with higher sensitivity than other techniques. Rather than making relative measurements of the resonance angle, the Aviv PWR measures the absolute reflectance as a function of the absolute angle, resulting in reflectance spectra that can be analyzed in terms of the sample's optical properties. This allows structure measurements that are not possible by SPR.

Applications of the technology currently available include studying membrane-bound proteins and peptides, studying interactions and structures, and characterizing lipid bilayers. The PWR technology has been applied to the study of G-protein-coupled receptors (GPCRs), a class of membrane proteins involved in cell signaling and regulations. GPCRs play a significant role in many physiological activities, including pain regulation, cardiovascular and neurological behavior making them important potential therapeutic drug candidates.

Protein Solutions, Lakewood, NJ

Reader Service No. 295

How the Audiovisual Library Serves IAFP Members

Purpose ...

The Audiovisual Library offers International Association for Food Protection Members an educational service through a wide variety of quality training videos dealing with various food safety issues. This benefit allows Members free use of these videos.

How It Works ...

- 1) Members simply fill out an order form (see page 914) and fax or mail it to the IAFP office. Members may also find a Library listing and an order form online at the IAFP Web site at www.foodprotection.org.
- 2) Material from the Audiovisual Library is checked out for a maximum of two weeks (three weeks outside of North America) so that all Members can benefit from its use.
- 3) Requests are limited to five videos at a time.

How to Contribute to the Audiovisual Library ...

- 1) As the IAFP Membership continues to grow, so does the need for additional committee members and materials for the Library. The Audiovisual Committee meets at the IAFP Annual Meeting to discuss the status of the Audiovisual Library and ways to improve the service. New Members are sought to add fresh insight and ideas.
- 2) Donations of audiovisual materials are always needed and appreciated. Tapes in foreign languages (including, but not limited to Spanish, French, Chinese [Mandarin/Cantonese]), are especially desired for International Members who wish to view tapes in their native language.
- 3) Members may also make a financial contribution to the Foundation Fund. The Foundation Fund sponsors worthy causes that enrich the Association. Revenue from the Foundation Fund supports the IAFP Audiovisual Library. Call Lisa Hovey, Assistant Director or Lucia Collison McPhedran, Association Services at 800.369.6337 or 515.276.3344 if you wish to make a donation.

Audiovisual Library

as of October 1, 2002

A Member Benefit of IAFFP

DAIRY

- D1180 10 Points to Dairy Quality**—(10 minute videotape). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk-receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance-1992) (Reviewed 1998)
- D1010 The Bulk Milk Hauler: Protocol & Procedures**—(8 minute videotape). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension-1990). (Reviewed 1998)
- D1030 Cold Hard Facts**—This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association-1993) (Reviewed 1998)
- D1040 Ether Extraction Method for Determination of Raw Milk**—(26 minute videotape). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA-1988) (Reviewed 1998)
- D1060 Frozen Dairy Products**—(27 minute videotape). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients; emphasis is on what to look for in a plant inspection. Everything from receiving, through processing and cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA-1987) (Reviewed 1997)
- D1070 The Gerber Butterfat Test**—(7 minute videotape). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA-1990) (Reviewed 1998)
- D1080 High-Temperature, Short-Time Pasteurizer**—(59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.-1986) (Reviewed 1997)
- D1090 Managing Milking Quality**—(33 minute videotape). This training video is designed to help dairy farmers develop a quality management process and is consistent with ISO 9000 certification and HACCP processes. The first step is to evaluate the strengths and weaknesses of a dairy operation. The video will help you find ways to improve the weaknesses that are identified on your farm.
- D1100 Mastitis Prevention and Control**—(2:45 minute videotapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Postmilking Teat Dip Protocols, Milk Quality, Milking Systems. (Nasco-1993)
- D1110 Milk Plant Sanitation: Chemical Solution**—(13 minute videotape). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed... alkaline wash, presence of chlorine and iodophor, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)
- D1120 Milk Processing Plant Inspection Procedures**—(15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre- and post-inspection meeting with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)
- D1130 Pasteurizer - Design and Regulation**—(16 minute videotape). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods-1990) (Reviewed 1998)

- D1140 Pasteurizer - Operation**-(11 minute videotape). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods-1990) (Reviewed 1998)
- D1150 Processing Fluid Milk**-(30 minute-140 slides-script-tape). This slide set was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Reviewed 1998)

ENVIRONMENTAL

- E3010 The ABCs of Clean-A Handwashing & Cleanliness Program for Early Childhood Programs**-For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association-1991)
- E3020 Acceptable Risks?**-(16 minute videotape). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.-1993) (Reviewed 1998)
- E3030 Air Pollution: Indoor**-(26 minute videotape). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Reviewed 1998)
- E3040 Asbestos Awareness**-(20 minute videotape). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.-1988) (Reviewed 1998)
- E3055 Effective Handwashing-Preventing Cross-Contamination in the Food Service Industry**-(3 1/2 minute videotape). It is critical that all food service workers wash their hands often and correctly. This video discusses the double wash method and the single wash method and when to use each method. (Zep Manufacturing Company-1993)
- E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)**-(22 minute videotape). Demonstrates the Ceriodaphnia 7-Day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Reviewed 1998)
- E3070 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)**-(15 minute videotape). A training tape that teaches environmental professionals about the Fathead Minnow Larval Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Reviewed 1998)
- E3075 EPA: This is Super Fund**-(12 minute videotape). Produced by the United States Environmental Protection Agency (EPA) in Washington, D.C., this videotape focuses on reporting and handling hazardous waste sites in our environment. The agency emphasizes community involvement in identifying chemical waste sites and reporting contaminated areas to the authorities. The primary goal of the "Super Fund Site Process" is to protect human health and to prevent and eliminate hazardous chemicals in communities. The film outlines how to identify and report abandoned waste sites and how communities can participate in the process of cleaning up hazardous sites. The program also explains how federal, state and local governments, industry and residents can work together to develop and implement local emergency preparedness/response plans in case chemical waste is discovered in a community.

- E3080 Fit to Drink**—(20 minute videotape). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and flocculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.-1987)
- E3110 Garbage: The Movie**—(25 minute videotape). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Reviewed 1998)
- E3120 Global Warming: Hot Times Ahead**—(23 minute videotape). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films-1995)
- E3130 Kentucky Public Swimming Pool & Bathing Facilities**—(38 minute videotape). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987). (Reviewed 1998)
- E3135 Plastics Recycling Today: A Growing Resource**—(11:35 minute videotape). Recycling is a growing segment of our nation's solid waste management program. This video shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc.-1988)
- E3140 Putting Aside Pesticides**—(26 minute videotape). This program probes the long-term effects of pesticides and explores alternative pest-control efforts; biological pesticides, genetically-engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.) (Reviewed 1999)
- E3150 Radon**—(26 minute videotape). This program looks at the possible health implications of radon pollution, methods home-owners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.
- E3160 RCRA-Hazardous Waste**—(19 minute videotape). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)
- The New Superfund. What It is & How It Works**—A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:
- E3170 Tape 1—Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements**—(62 minute videotape). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process — long-term and permanent clean-up is illustrated step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.
- E3180 Tape 2—Changes in the Removal Process: Removal and Additional Program Requirements**—(48 minute videotape). The removal process is a short-term action and usually an immediate response to accidents, fires and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

- E3190** **Tap 3-Enforcement & Federal Facilities**-(52 minute videotape). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARS) are explained.
- E3210** **Tap 4-Emergency Preparedness & Community Right-to-Know**-(48 minute videotape). A major part of SARA is a free-standing act known as Title III: The Emergency Planning and Community Right-to-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency & hazardous chemical inventory and the toxic chemical release inventory.
- E3220** **Tap 5-Underground Storage Tank Trust Fund & Response Program**-(21 minute videotape). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking-and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.
- E3230** **Tap 6-Research & Development/Closing Remarks**-(33 minute videotape). An important new mandate of the new Superfund is the technical provisions for research and development to create more permanent methods in handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.
- E3240** **Sink A Germ**-(10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.-1986). (Reviewed 1998)
- E3245** **Wash Your Hands**-(5 minute videotape). Handwashing is the single most important means of preventing the spread of infection. This video presents why handwashing is important and the correct way to wash your hands. (LWB Company-1995)
- E3250** **Waste Not: Reducing Hazardous Waste**-(35 minute videotape). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. Waste Not also looks at the obstacles to waste reduction, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella films)

FOOD

- F2260** **100 Degrees of Doom... The Time & Temperature Caper**-(14 minute videotape). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.-1987) (Reviewed 1998)
- F2450** **A Guide to Making Safe Smoked Fish**-(21 minute videotape). Smoked fish can be a profitable product for aquaculturalists, but it can be lethal if not done correctly. This video guides you through the steps necessary to make safe smoked fish. It provides directions for brining, smoking, cooling, packaging and labeling, and cold storage to ensure safety. The video features footage of fish smoking being done using both traditional and modern equipment. (University of Wisconsin-Madison-Spring, 1999)
- F2005** **A Lot on the Line**-(25 minute videotape). Through a riveting dramatization, "A Lot on the Line" is a powerful training tool for food manufacturing and food service employees. In the video, a food plant supervisor and his pregnant wife are eagerly awaiting the birth of their first child. Across town, a deli manager is taking his wife and young daughter away for a relaxing weekend. Both families, in a devastating twist of fate, will experience the pain, fear, and disruption caused by foodborne illness. This emotionally charged video will enthrall new and old employees alike and strongly reinforce the im-

portance of incorporating GMPs into everyday work routines. Without question, "A Lot on the Line" will become an indispensable part of your company's training efforts. (Silliker Laboratories-2000)

- F2007 The Amazing World of Microorganisms**-(12 minute videotape). This training video provides your employees with an overview of how microorganisms affect their everyday lives and the foods they produce. The video explores how microscopic creatures are crucial in producing foods, fighting disease, and protecting the environment. In addition, certain microorganisms-when given the proper time and conditions to grow-are responsible for food spoilage, illness, and even death. Equipped with this knowledge, your employees will be better able to protect your brand. (Silliker Laboratories Group, Inc., Homewood, IL- 2001)
- F2440 Cleaning & Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!**-(16 minute videotape) This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for processing plant as it is for washing dishes at home. (University of Wisconsin Extension-1996) (Available in Spanish)
- F2010 Close Encounters of the Bird Kind**-(18 minute videotape). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Reviewed 1998)
- F2015 Controlling Listeria: A Team Approach**-(16 minute videotape). In this video, a small food company voluntarily shuts down following the implication of one of its products in devastating outbreak of *Listeria monocytogenes*. This recall dramatization is followed by actual in-plant footage highlighted key practices in controlling *Listeria*. This video provides workers with an overview of the organism, as well as practical steps that can be taken to control its growth in plant environments. Finally, the video leaves plant personnel with a powerful, resounding message: Teamwork and commitment are crucial in the production of safe, quality foods. (Silliker Laboratories-2000)
- F2037 Cooking and Cooling of Meat and Poultry Products**-(2 videotapes - 176 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2036). This is session 3 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon completion of viewing these videotapes, the viewer will be able to (1) recognize inadequate processes associated with the cooking and cooling of meat and poultry at the retail level; (2) Discuss the hazards associated with foods and the cooking and cooling processes with management at the retail level; (3) Determine the adequacy of control methods to prevent microbiological hazards in cooking and cooling at the retail level, and (4) Understand the principle for determining temperature with various temperature measuring devices. (AFDO/USDA-1999)
- F2030 "Egg Games" Foodservice Egg Handling and Safety**-(18 minute videotape). Develop an effective egg handling and safety program that is right for your operation. Ideal for manager training and foodservice educational programs, this video provides step-by-step information in an entertaining, visually-exciting format. (American Egg Board-1999)
- F2020 Egg Handling & Safety**-(11 minute videotape). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board-1997)
- F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef**-(2 videotapes - 165 minutes.) (See Part 1 Tape F2035 and Part 3 Tape F2037.) This is session 2 of a 3-part Meat and Poultry Teleconference co-sponsored by AFDO and the USDA Food Safety Inspection Service. These videotapes present an action plan for federal, state, local authorities, industry, and trade associations in a foodborne outbreak. (AFDO/USDA-1998)
- F2035 Fabrication and Curing of Meat and Poultry Products**-(2 videotapes - 145 minutes). (See Part 2 Tape F2036 and Part 3 Tape F2037). This is session 1 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon viewing, the sanitarian will be able to (1) Identify typical equipment used for meat and poultry fabrication at retail and understand their uses; (2) Define specific terms used in fabrication of meat and poultry products in retail establishments, and (3) Identify specific food safety hazards associated with fabrication and their controls. (AFDO/USDA-1997)
- FastTrack Restaurant Video Kit**-These five short, direct videos can help make your employees more aware of various food hazards and how they can promote food safety. (DiverseyLever/American Hotel & Lodging Educational Institute - 1994)
- F2500 Tape 1-Food Safety Essentials**-(23 minute videotape). This video provides an overview of food safety. All food service employees learn six crucial guidelines for combating foodborne illness. Prepares employees for further position-specific training to apply the six food safety principles to specific jobs.
- F2501 Tape 2-Receiving and Storage**-(22 minute videotape). Make sure only safe food enters your doors! Receiving and

storage staff learn what to look for and how to prevent spoilage with proper storage with this video.

- F2502** **Tape 3-Service**-(22 minute videotape). Servers are your last safety checkpoint before guests receive food. This video helps you make sure they know the danger signs.
- F2503** **Tape 4-Food Production**-(24 minute videotape). Food production tasks cause most food safety problems. Attack dangerous practices at this critical stage with this video training tool.
- F2504** **Tape 5-Warewashing**-(21 minute videotape). Proper sanitation starts with clean dishes! With this video, warewashers will learn how to ensure safe tableware for guests and safe kitchenware for co-workers.
- F2039** **Food for Thought-The GMP Quiz Show**-(16 minute videotape). In the grand tradition of television quiz shows, three food industry workers test their knowledge of GMP principles. As the contestants jockey to answer questions, the video provides a thorough and timely review of GMP principles. This video is a cost-effective tool to train new hires or sharpen the knowledge of veteran employees. Topics covered include employee practices, including proper attire, contamination, stock rotation, pest control, conditions for microbial growth and employee traffic patterns. Food safety terms such as HACCP, microbial growth niche, temperature danger zone, FIFO and cross-contamination, are also defined. (Silliker Laboratories-2000)
- F2040** **Food Irradiation**-(30 minute videotape). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, overripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Reviewed 1998)
- F2045** **Food Microbiological Control**-(6-videotapes - approximate time 12 hours). Designed to provide information and demonstrate the application of basic microbiology, the Good Manufacturing Practices (GMPs), retail Food Code, and sanitation practices when conducting food inspections at the processing and retail levels. Viewers will enhance their ability to identify potential food hazards and evaluate the adequacy of proper control methods for these hazards. (FDA-1998)
- F2050** **Food Safe-Food Smart-HACCP & Its Application to the Food Industry**-(2-16 minute videotapes). (1)-Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2)-Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Reviewed 1998)
- F2060** **Food Safe-Series I**-(4-10 minute videotapes). (1) "Receiving & Storing Food Safely," details for food-service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food-service Facilities and Equipment," outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Foodservice Workers," provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Food-service Housekeeping and Pest Control," emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education-1991) (Reviewed 1998)
- F2070** **Food Safe-Series II**-(4-10 minute videotapes). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus*, (sauces) (2) *Salmonella*, (eggs) (3) *Campylobacter*, and (4) *Clostridium botulinum*. Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education-1991) (Reviewed 1998)
- F2080** **Food Safe-Series III**-(4-10 minute videotapes). More case histories of foodborne disease. This set includes (1) Hepatitis "A", (2) *Staphylococcus aureus* (meats), (3) *Bacillus cereus*, and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education-1991) (Reviewed 1998)
- F2133** **Food Safety First**-(50 minute videotape). This food safety training video presents causes of foodborne illness in foodservice and ways to prevent foodborne illness. Individual segments include personal hygiene and handwashing, cleaning and sanitizing, preventing cross contamination and avoiding time and temperature abuse. Foodhandling principles are presented through scenarios in a restaurant kitchen. (Glo-Germ 1998). Available in Spanish.

- F2090 Food Safety: An Educational Video for Institutional Food-Service Workers**-(10 minute videotape). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (US Department of Health & Human Services-1997)
- Food Safety for Foodservice Series I**-An employee video series containing quick, 10-minute videos that teach food service employees how to prevent foodborne illness. This four video series examines sources of foodborne illness, plus explores prevention through awareness and recommendations for best practices for food safety. It also looks at how food safety affects the food service employee's job. (J.J. Keller & Associates-2000)
- F2100 Tape 1-Food Safety for Food Service: Cross Contamination** - (10 minute videotape). Provides the basic information needed to ensure integrity and safety in foodservice operations. Explains proper practices and procedures to prevent, detect and eliminate cross contamination.
- F2101 Tape 2-Food Safety for Food Service: HACCP** - (10 minute videotape). This video takes the mystery out of HACCP for your employees, and explains the importance of HACCP procedures in their work. Employees will come away feeling confident, knowing how to make HACCP work. The seven steps of HACCP and how HACCP is used in foodservice are some of the topics discussed.
- F2102 Tape 3-Food Safety for Food Service: Personal Hygiene**-(10 minute videotape). This video establishes clear, understandable ground rules for good personal hygiene in the foodservice workplace and explains why personal hygiene is so important. Topics include: personal cleanliness; proper protective equipment; correct hand washing procedures; when to wash hands, hygiene with respect to cross contamination and prohibited practices and habits.
- F2103 Tape 4-Food Safety for Food Service: Time and Temperature Controls**-(10 minute videotape). This video examines storage and handling of raw and cooked ingredients, and explains how to ensure their safety. Employees learn how to spot potential problems and what to do when they find them. Topics include: correct thermometer use, cooling, thawing and heating procedures, food storage procedures, holding temperature requirements, and handling leftovers.
- Food Safety for Foodservice Series II**-An employee video series containing quick, 10-minute videos that boost safety awareness for food service employees and teach them how to avoid foodborne illness. (J. J. Keller & Associates, Neenah, WI-2002)
- F2104 Tape 1-Basic Microbiology and Foodborne Illness**-(10 minute videotape). Covers four common microorganisms in food, how they get into food, and simple ways to prevent contamination. Stresses the importance of keeping food at the right temperature, having proper personal hygiene, and cleaning and sanitizing work surfaces.
- F2105 Tape 2-Handling Knives, Cuts and Burns**-(10 minute videotape). Explains why sharp knives are safer than dull ones, provides tips for selecting a good knife, and gives techniques for cutting food safely. Also explains first aid for cuts and burns and the most common causes of burns.
- F2106 Tape 3-Working Safely to Prevent Injury**-(10 minute videotape). Discusses common lifting hazards and how back injuries can happen. Gives proper lifting and carrying techniques to prevent soreness and injury. Also covers how to prevent slips, trips, and falls.
- F2107 Tape 4-Sanitation**-(10 minute videotape). Provides tips for good personal hygiene habits, including the proper way to wash your hands, dress, and prepare for work. Also covers cleaning and sanitizing equipment; storing chemicals and cleaning supplies; and controlling pests that can contaminate work areas and food.
- F2120 Food Safety: For Goodness Sake, Keep Food Safe**-(15 minute videotape). Teaches food-handlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extension-1990) (Reviewed 1998)
- F2110 Food Safety is No Mystery**-(34 minute videotape). This is an excellent training visual for food-service workers. It shows the proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a food-service worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross-contamination, and storage of foods are included. (USDA-1987). Also available in Spanish. - (Reviewed 1998)

- F2130 Food Safety: You Make the Difference**-(28 minute videotape). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: handwashing, preventing cross-contamination, moving foods quickly through the danger zone, and hot/cold holding (Seattle-King County Health Department-1995)
- Food Safety Zone Video Series**-A one-of-a-kind series that helps get your employees to take food safety issues seriously! These short, to-the-point videos can help make your employees aware of various food hazards, and how they can help promote food safety. The 4 topics are: Basic Microbiology, Cross Contamination, Personal Hygiene, and Sanitation. (J.J. Keller & Associates - 1999). (Also available in Spanish.)
- F2125 Tape 1-Food Safety Zone: Basic Microbiology**-(10 minute videotape). In this video, food service personnel will gain a deeper understanding of food safety issues and what they can do to prevent recalls and contamination. It describes the different types of bacteria that can be harmful to food, and tells how to minimize bacterial growth through time and temperature controls, personal hygiene practices, and sanitation.
- F2126 Tape 2-Food Safety Zone: Cross Contamination**-(10 minute videotape). Quickly teach your employees how they can help prevent cross contamination. Employees are educated on why contaminants can be extremely dangerous, cause serious injury, and even death, to consumers of their food products. This fast-paced video will give your employees a deeper understanding of the different types of cross contamination, how to prevent it, and how to detect it through visual inspections and equipment. The emphasis is that prevention is the key to eliminating cross contamination.
- F2127 Tape 3-Food Safety Zone: Personal Hygiene**-(10 minute videotape). After watching this video, your employees will understand why their personal hygiene is critical to the success of your business. This video teaches employees about four basic good personal hygiene practices: keeping themselves clean, wearing clean clothes, following specific hand washing procedures, and complying with all related work practices. Personnel are also taught that personal hygiene practices are designed to prevent them from accidentally introducing bacteria to food products, and are so important that there are federal laws that all food handlers must obey.
- F2128 Tape 4-Food Safety Zone: Sanitation**-(10 minute videotape). Don't just tell your employees why sanitation is important, show them! This training video teaches employees about the sanitation procedures that cover all practices to keep workplaces clean, and food produced free of contaminants and harmful bacteria. Four areas covered include personal hygiene, equipment and work areas, use and storage of cleaning chemicals and equipment, and pest control.
- F2135 Get with a Safe Food Attitude**-(40 minute videotape). Consisting of nine short segments which can be viewed individually or as a group, this video presents safe food handling for moms-to-be. Any illness a pregnant woman contracts can affect her unborn child whose immune system is too immature to fight back. The video follows four pregnant women as they learn about food safety and preventing foodborne illness. (US Department of Agriculture-1999)
- F2136 GLP Basics: Safety in the Food Micro Lab**-(16 minute videotape). This video is designed to teach laboratory technicians basic safety fundamentals and how to protect themselves from inherent workplace dangers. Special sections on general laboratory rules, personal protective equipment, microbiological, chemical, and physical hazards, autoclave safety, and spill containment are featured. (Silliker Laboratories Group, Inc., Homewood, IL-2001)
- F2137 GMP Basics: Avoiding Microbial Cross-Contamination**-(15 minute videotape). This video takes a closer look at how harmful microorganisms, such as *Listeria*, can be transferred to finished products. Employees see numerous examples of how microbial cross-contamination can occur from improper traffic patterns, poor personal hygiene, soiled clothing, unsanitized tools and equipment. Employees need specific knowledge and practical training to avoid microbial cross-contamination in plants. This video aids in that training. (Silliker Laboratories-2000)
- F2140 GMP Basics - Employee Hygiene Practices**-(20 minute videotape). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particularly hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories-1997)
- F2143 GMP Basics: Guidelines for Maintenance Personnel**-(21 minute videotape). Developed specifically for maintenance personnel working in a food processing environment, this video depicts a plant-wide training initiative following a product recall announcement. Maintenance personnel will learn how GMPs relate to their daily activities and how important their roles are in the production of safe food products. (Silliker Laboratories-1999)

- F2148 GMP-GSP Employee**-(38 minute videotape). This video was developed to teach food plant employees the importance of "Good Manufacturing Practices" and "Good Sanitation Practices." Law dictates that food must be clean and safe to eat. This video emphasizes the significance of each employee's role in protecting food against contamination. Tips on personal cleanliness and hygiene are also presented. (L.J. Bianco & Associates)
- F2150 GMP: Personal Hygiene & Practices in Food Manufacturing**-(14 minute videotape). This video focuses on the personal hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State-1993)-(Available in Spanish and Vietnamese)
- F2147 GMP Basics: Process Control Practices**-(16 minute videotape). In actual food processing environments, an on-camera host takes employees through a typical food plant as they learn the importance of monitoring and controlling key points in the manufacturing process. Beginning with receiving and storing, through production, and ending with packaging and distribution, control measures are introduced, demonstrated, and reviewed. Employees will see how their everyday activities in the plant have an impact on product safety. (Silliker Laboratories-1999)
- F2160 GMP: Sources & Control of Contamination during Processing**-(20 minute videotape). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross-contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State-1995)
- F2180 HACCP: Safe Food Handling Techniques**-(22 minute videotape). The video highlights the primary causes of food poisoning and emphasizes the importance of self-inspection. An explanation of potentially hazardous foods, cross-contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a food-service operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Foodservices Association-1990) (Reviewed 1998)
- F2169 HACCP: Training for Employees - USDA Awareness**-(15 minute videotape). This video is a detailed training outline provided for the employee program. Included in the video is a synopsis of general federal regulations; HACCP plan development; incorporation of HACCP's seven principles; HACCP plan checklist, and an HACCP employee training program. (J.J. Keller & Associates-1999)
- F2172 HACCP: Training for Managers**-(17 minute videotape). Through industry-specific examples and case studies, this video addresses the seven HACCP steps, identifying critical control points, recordkeeping and documentation, auditing, and monitoring. It also explains how HACCP relates to other programs such as Good Manufacturing Practices and plant sanitation. (J.J. Keller & Associates, Inc.-2000)
- F2170 The Heart of HACCP**-(22 minute videotape). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work environment. This video emphasizes the principles of primary concern to plant personnel such as critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratories Group-1994)
- F2171 HACCP: The Way to Food Safety**-(53 minute videotape). The video highlights the primary causes of food poisoning and stresses the importance of self-inspection. Potentially hazardous foods, cross-contamination and temperature control are explained. The video is designed to give a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to a work environment. Critical limits, monitoring systems and corrective action plans are emphasized. The video also provides an overview of foodborne pathogens, covering terminology, the impact of pathogens, and what employees must do to avoid problems. Also described are the sources, causes and dangers of contamination in the food industry. (Southern Illinois University-1997)
- F2173 Inside HACCP: Principles, Practices & Results**-(15 minute videotape). This video is designed to help you build a more knowledgeable workforce and meet safety standards through a comprehensive overview of HACCP principles. Employees are provided with details of prerequisite programs and a clear overview of the seven HACCP principles. "Inside HACCP" provides short succinct explanations of how HACCP works and places special emphasis on the four principles - monitoring, verification, corrective action, and recordkeeping - in which employees actively participate. (Silliker Laboratories Group, Inc., Homewood, IL-2001)
- F2175 Inspecting For Food Safety-Kentucky's Food Code**-(100 minute videotape). Kentucky's Food Code is patterned after the Federal Food Code. The concepts, definitions, procedures, and regulatory standards included in the code are based on the most current information about how to prevent foodborne diseases. This video is designed to prepare food safety inspectors to effectively use the new food code in the performance of their duties. (Department of Public Health Commonwealth of Kentucky-1997) (Reviewed 1999)

- F2190 Is What You Order What You Get? Seafood Integrity**-(18 minute videotape). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Reviewed 1998)
- F2210 Northern Delight-From Canada to the World**-(13 minute videotape). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Reviewed 1998)
- F2240 On the Front Line**-(18 minute videotape). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association-1993) (Reviewed 1998)
- F2250 On the Line**-(30 minute videotape). This was developed by the Food Processors Institute for training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (Available in Spanish) The Food Processors Institute. 1993. (Reviewed 1998)
- F2270 Pest Control in Seafood Processing Plants**-(26 minute videotape). Videotape which covers procedures to control flies, roaches, mice, rats and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations. (Reviewed 1998)
- F2280 Principles of Warehouse Sanitation**-(33 minute videotape). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking-1993)
- F2290 Product Safety & Shelf Life**-(40 minute videotape). Developed by Borden Inc., this videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problems caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden-1987) - (Reviewed 1997)
- F2220 Proper Handling of Peracetic Acid**-(15 minute videotape). Introduces peracetic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.
- F2230 Purely Coincidental**-(20 minute videotape). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats Company-1993.) (Reviewed 1998)
- F2310 Safe Food: You Can Make a Difference**-(25 minute videotape). A training video for food-service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning and sanitizing, and handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional foodhandlers. (Tacoma-Pierce County Health Department-1990). (Reviewed 1998)
- F2320 Safe Handwashing**-(15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology and Management-1991) (Reviewed 1998)
- F2325 Safe Practices for Sausage Production**-(3 hour videotape). This videotape is based on a series of educational broadcasts on meat and poultry inspections at retail food establishments produced by the Association of Food and Drug Officials (AFDO) and USDA's Food Safety and Inspection Service (FSIS), along with FDA's Center for Food Safety and Applied Nutrition. The purpose of the broadcast was to provide training to state, local, and tribal sanitarians on processes and procedures that are being utilized by retail stores and restaurants, especially those that were usually seen in USDA-inspected facilities. The program will cover the main production steps of sausage products, such as the processes of grinding, stuffing, and smoking, and typical equipment used will be depicted. Characteristics of different types of sausage (fresh, cooked and smoked, and dry/semi-dry) will be explained. Pathogens of concern and outbreaks associated with sausage will be discussed. The written manual for the program is available at www.fsis.usda.gov/fof/hrds/STATE/RETAIL/manual.htm. (1999)

- F2460 Safer Processing of Sprouts**—(1 hour and 22 minute videotape). Sprouts are enjoyed by many consumers for their taste and nutritional value. However, recent outbreaks of illnesses associated with sprouts have demonstrated a potentially serious human health risk posed by this food. FDA and other public health officials are working with industry to identify and implement production practices that will assure that seed and sprouted seed are produced under safe conditions. This training video covers safe processing practices of sprouts including growing, harvesting, milling, transportation, storage, seed treatment, cleaning and sanitizing, sampling and microbiological testing. (CA Dept. of Health Services, Food and Drug Branch; U.S. Food and Drug Administration, and the Centers for Disease Control and Prevention - 2000)
- F2330 Sanitation for Seafood Processing Personnel**—(20 minute videotape). A training video suited for professional foodhandlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional foodhandler is introduced to a variety of sanitation topics including: (1) foodhandlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross-contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Reviewed 1998)
- F2340 Sanitizing for Safety**—(17 minute videotape). Provides an introduction to basic food safety for professional foodhandlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox-1990) (Reviewed 1998)
- F2350 ServSafe® Steps to Food Safety**—The ServSafe food safety series consists of six videos that illustrate and reinforce important food safety practices in an informative and entertaining manner. The videos provide realistic scenarios in multiple industry segments. English and Spanish are provided on each tape. (National Restaurant Association Education Foundation -2000)
- Step One: Starting Out with Food Safety**—(12 minute videotape). Defines what foodborne illness is and how it occurs; how foods become unsafe; and what safety practices to follow during the flow of food.
- Step Two: Ensuring Proper Personal Hygiene**—(10 minute videotape). Introduces employees to ways they might contaminate food; personal cleanliness practices that help protect food; and the procedure for thorough handwashing.
- Step Three: Purchasing, Receiving and Storage**—(12 minute videotape). Explains how to choose a supplier; calibrate and use a thermometer properly; accept or reject a delivery; and store food safely.
- Step Four: Preparing, Cooking, and Serving**—(11 minute videotape). Identifies proper practices for thawing, cooking, holding, serving, cooling and reheating food.
- Step Five: Cleaning and Sanitizing**—(11 minute videotape). Describes the difference between cleaning and sanitizing; manual and machine warewashing; how sanitizers work; how to store clean items and cleaning supplies; and how to setup a cleaning program.
- Step Six: Take the Food Safety Challenge: Good Practices, Bad Practices — You Make the Call!**—(35 minute videotape). Challenges viewers to identify good and bad practices presented in five short scenarios from different industry segments.
- F2400 The Amazing World of Microorganisms** — (12 minute videotape). This video will provide your employees with an overview of how microorganisms affect their everyday lives and the foods they produce. The video explores how microscopic creatures are crucial in producing foods, fighting disease, and protecting the environment. In addition, certain microorganisms are responsible for food spoilage, illness, and even death. Equipped with this knowledge, your employees will be better able to protect your brand. (Silliker Laboratories Group, Inc., Homewood, IL-2001)
- F2430 Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant**—(20 minute videotape). A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laboratories Group-1996)
- F2370 Supermarket Sanitation Program—"Cleaning & Sanitizing"**—(13 minute videotape). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees. (1989) (Reviewed 1998)
- F2380 Supermarket Sanitation Program—"Food Safety"**—(11 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees. (1989) (Reviewed 1998)
- F2390 Take Aim at Sanitation**—(8 minute videotape). This video features tips on food safety and proper disposal of single service items. Also presented is an emphasis on food contact surfaces as well as the manufacture, storage and proper handling of these items. (Foodservice and Packaging Institute, Inc.-1995). (Available in Spanish)

- F2410 Wide World of Food-Service Brushes**-(18 minute videotape). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989) (Reviewed 1998)
- F2420 Your Health in Our Hands-Our Health in Yours**-(8 minute videotape). For professional foodhandlers, the tape covers the do's and don'ts of foodhandling as they relate to personal hygiene, temperature control, safe storage and proper sanitation. (Jupiter Video Production-1993). (Reviewed 1998)
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- OTHER**
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- M4010 Diet, Nutrition & Cancer**-(20 minute videotape). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.
- M4020 Eating Defensively: Food Safety Advice for Persons with AIDS**-(15 minute videotape). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC-1989)
- M4030 Ice: The Forgotten Food**-(14 minute videotape). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.); it documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association-1993)
- M4050 Personal Hygiene & Sanitation for Food Processing Employees**-(15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State-1993)
- M4060 Psychiatric Aspects of Product Tampering**-(25 minute videotape). This was presented by Emanuel Tanay, M.D. from Detroit, at the fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead to up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper proof containers are not the ultimate answer. (1987)
- M4070 Tampering: The Issue Examined**-(37 minute videotape). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro-1987)

Educators, did you know?

Studies confirm that one-third of all foodborne illnesses in this country occur in children under 10 years old. In fact, children under 1 are the age group most likely to get sick from *Salmonella*. (See "Children and Microbial Foodborne Illness," *Food Review*, May 2001: <http://www.ers.usda.gov/publications/FoodReview/may2001>). Parents, despite their best intentions, may not be handling food safely, according to consumer research. You can help change that picture. Encourage parents to check their food handling habits.



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- D1180 10 Points to Dairy Quality
 - D1010 The Bulk Milk Hauler: Protocol & Procedures
 - D1040 Cold Hard Facts
 - D1040 Ether Extraction Method for Determination of Raw Milk
 - D1060 Frozen Dairy Products
 - D1070 The Gerber Butterfat Test
 - D1080 High-Temperature, Short-Time Pasteurizer
 - D1090 Managing Milking Quality
 - D1100 Mastitis Prevention and Control
 - D1110 Milk Plant Sanitation - Chemical Solution
 - D1120 Milk Processing Plant Inspection Procedures
 - D1150 Pasteurizer - Design and Regulation
 - D1140 Pasteurizer - Operation
 - D1150 Processing Fluid Milk (slides)

- ENVIRONMENTAL**
- E3010 The ABCs of Clean - A Handwashing & Cleanliness Program for Early Childhood Programs
 - E3020 Acceptable Risks?
 - E3040 Air Pollution, Indoor
 - E3040 Asbestos Awareness
 - E3055 Effective Handwashing-Preventing Cross-Contamination in the Food Service Industry
 - E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)
 - E3070 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)
 - E3075 EPA. This is Super Fund
 - E3080 Fit to Drink
 - E3110 Garbage: The Movie
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 - E3130 Kentucky Public Swimming Pool & Bathing Facilities
 - E3135 Plastic Recycling Today: A Growing Resource
 - E3140 Putting Aside Pesticides
 - E3150 Radon
 - E3160 RCRA - Hazardous Waste
 - E3170 The New Superfund. What It is & How It Works-(1) Changes in the Remedial Process. Clean-up Standards & State Involvement Requirements
 - E3180 The New Superfund. What It is & How It Works-(2) Changes in the Remedial Process. Removal & Additional Program Requirements
 - E3190 The New Superfund. What It is & How It Works - (3) Enforcement and Federal Facilities
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 - E3220 The New Superfund. What It is & How It Works - (5) Underground Storage Tank Trust Fund & Response Program

- E3230 The New Superfund. What It is & How It Works - (6) Research & Development. Closing Remarks
 - E3240 Sink a Germ
 - E3245 Wash Your Hands
 - E3250 Waste Not: Reducing Hazardous Waste
- FOOD**
- F2260 100 Degrees of Doom...The Time & Temperature Caper
 - F2450 A Guide to Making Safe Smoked Fish
 - F2005 A Lot on the Line
 - F2007 The Amazing World of Microorganisms
 - F2440 Cleaning & Sanitizing in Vegetable Processing Plants. Do It Well. Do It Safely!
 - F2010 Close Encounters of the Bird Kind
 - F2015 Controlling Listeria: A Team Approach
 - F2047 Cooking and Cooling of Meat and Poultry Products (2 Videos)
 - F2040 "Egg Games" Foodservice Egg Handling and Safety
 - F2020 Egg Handling & Safety
 - F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef (2 Videos)
 - F2035 Fabrication and Curing of Meat and Poultry Products (2 Videos)
 - FastTrack Restaurant Video Kit*
 - F2500 Tape 1-Food Safety Essentials
 - F2501 Tape 2-Receiving and Storage
 - F2502 Tape 3-Serv. ...
 - F2503 Tape 4-Food Production
 - F2504 Tape 5-Warewashing
 - F2059 Food for Thought - The GMP Quiz Show
 - F2040 Food Irradiation
 - F2045 Food Microbiological Control (6 Videos)
 - F2050 Food Safe - Food Smart - HACCP & Its Application to the Food Industry (Part 1&2)
 - F2060 Food Safe - Series I (4 Videos)
 - F2070 Food Safe - Series II (4 Videos)
 - F2080 Food Safe - Series III (4 Videos)
 - F2143 Food Safety First
 - F2090 Food Safety: An Educational Video for Institutional Food Service Workers
 - F2100 Tape 1-Cross Contamination
 - F2101 Tape 2-HACCP
 - F2102 Tape 3-Personal Hygiene
 - F2103 Tape 4-Time and Temperature Controls
 - F2104 Tape 1-Basic Microbiology and Foodborne illness
 - F2105 Tape 2-Handling Knives, Cuts and Burns
 - F2106 Tape 3-Working Safely to Prevent Injury
 - F2107 Tape 4-Sanitization
 - F2120 Food Safety: For Goodness Sake. Keep Food Safe
 - F2110 Food Safety is No Mystery
 - F2150 Food Safety: You Make the Difference
 - F2125 Food Safety Zone: Basic Microbiology
 - F2126 Food Safety Zone: Cross Contamination
 - F2127 Food Safety Zone: Personal Hygiene
 - F2128 Food Safety Zone: Sanitation

- F2155 Get with a Safe Food Attitude
- F2146 GLP Basics: Safety in the Food Micro Lab
- F2147 GMP Basics: Avoiding Microbial Cross-Contamination
- F2140 GMP Basics: Employee Hygiene Practices
- F2145 GMP Basics: Guidelines for Maintenance Personnel
- F2148 GMP - GSP Employee
- F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
- F2147 GMP Basics: Process Control Practices
- F2160 GMP: Sources & Control of Contamination during Processing
- F2180 HACCP: Safe Food Handling Techniques
- F2169 HACCP: Training for Employees-1'SDA Awareness
- F2172 HACCP: Training for Managers
- F2170 The Heart of HACCP
- F2171 HACCP: The Way to Food Safety
- F2175 Inside HACCP: Principles, Practices & Results
- F2175 Inspecting For Food Safety - Kentucky's Food Code
- F2190 Is What You Order What You Get? Seafood Integrity
- F2210 Northern Delight - From Canada to the World
- F2240 On the Front Line
- F2250 On the Line
- F2270 Pest Control in Seafood Processing Plants
- F2280 Principles of Warehouse Sanitation
- F2290 Product Safety & Shell Life
- F2220 Proper Handling of Peroxide Acid
- F2240 Purely Coincidental
- F2310 Safe Food: You Can Make a Difference
- F2320 Safe Handwashing
- F2325 Safe Practices for Sausage Production
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- F2390 Take Aim at Sanitation
- F2410 Wide World of Food-Service Brushes
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OTHER

- M4010 Diet, Nutrition & Cancer
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- M4060 Psychiatric Aspects of Product Tampering
- M4070 Tampering: The Issue Examined

3-A[®] Sanitary Standards for Formers, Fillers, and Sealers of Containers for Fluid Milk and Fluid Milk Products, Number 17-10

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)
United States Department of Agriculture - Dairy Programs (USDA)

It is the purpose of the IAFIS, IAFP, USPHS, DIC, and USDA in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new development. Specifications for formers, fillers, and sealers of containers for fluid milk and fluid milk products heretofore and hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform to the following standards, but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, DIC, and USDA at any time. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

- A1 These standards cover the sanitary aspects of unitized equipment for forming, filling, and sealing containers for fluid milk and fluid milk products. The equipment shall perform one or more of the following functions: 1) forming the container, 2) applying and sealing a supplementary fitment or device, 3) filling the container and 4) sealing, including capping if part of the unitized equipment, the container. The equipment shall start at the points where the product, utilities (air, water, steam, cleaning chemicals, etc.), container, container blank, or container material first enters the unitized equipment. The equipment shall end where the formed, filled, and/or sealed container exits the equipment.
- A2 These standards do not pertain to the container, to free-standing container forming equipment or to other equipment such as labelers, printers, daters, cappers, applicators of supplementary fitments or devices or wrappers not furnished as part of the unitized equipment, nor shall it apply to fillers of viscous prod-

ucts, such as frozen desserts, cottage cheese, cultured yogurt, sour cream, whipped butter, cream cheese, and other similar viscous dairy products.

- A3 In order to conform to these 3-A Sanitary Standards, formers, fillers, and sealers of containers shall comply with the following design, material, and fabrication criteria.¹

B DEFINITIONS

- B1 *Product:* Shall mean fluid milk or fluid milk products, such as whole milk, low-fat milk, skim milk, half and half, creams, cultured buttermilk, frozen dessert mixes, and similar fluid milk products.
- B2 *Container:* Shall mean a package or material being formed into the package, or a packaging construction including one or more of a package body, cap, closure, cover, supplementary device (such as a dispensing fitment), or other structure capable of holding the product.

¹Use current revisions or editions of all referenced documents cited herein.

- B3 *Mechanical Forming Equipment*: Shall mean the equipment for performing all or part of the following integral functions without manual contact with any product contact surface of the container: feeding, opening, seaming, forming, or sealing, and all parts which are essential to those functions that are furnished as a unit by the manufacturer.
- B4 *Mechanical Filling Equipment*: Shall mean the equipment for filling the container with the product without manual contact with any product contact surface of the container.
- B5 *Mechanical Opening Equipment*: Shall mean the equipment for opening a container without manual contact with any product contact surface of the container.
- B6 *Mechanical Sealing Equipment*: Shall mean the equipment for closing and/or sealing the filled container without manual contact with any product contact surface of the container.
- B7 **Surfaces**
- B7.1 *Product Contact Surfaces*: Shall mean all surfaces which are exposed to the product during normal equipment operation, surfaces from which liquids may drain, drop, diffuse, or be drawn into the product or into the container, and surfaces that touch product contact surfaces of the container.
- B7.2 *Solution Contact Surfaces*: Shall mean the interior surfaces of the equipment or system which are used exclusively for supply and recirculation of cleaning and/or sanitizing solutions, except those used to supply concentrated cleaning and/or sanitizing materials to the point of use.
- B7.3 *Nonproduct Contact Surfaces*: Shall mean all other exposed surfaces except Sterilant Contact Surfaces and splash contact surfaces.
- B7.3.1 *Splash Contact Surfaces*: Shall mean other nonproduct contact surfaces that during normal use are subject to accumulation of soil and which require routine cleaning.
- B7.4 *Sterilant Contact Surfaces*: Shall mean the interior surfaces of the equipment or system which are used exclusively for the supply and recirculation of sterilizing solutions.
- B8 **Cleaning**
- B8.1 *Mechanical Cleaning or Mechanically Cleaned*: Shall mean soil removal by impingement, circulation, flowing chemical detergent solutions, and water rinses onto and over the surfaces to be cleaned, by mechanical means in equipment specifically designed for this purpose.
- B8.2 *Manual (COP) Cleaning*: Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses, and tank(s) which may be fitted with recirculating pump(s), and with all cleaning aids manipulated by hand.
- B9 *Sanitizing or Sanitization*: Shall mean a process applied to a cleaned surface which is capable of reducing the numbers of the most resistant human pathogens by at least 5 log cycles (99.999%) to 7 log cycles (99.99999%) by applying accumulated hot water or steam or by applying an EPA registered sanitizer according to label directions. Sanitizing may be effected by mechanical or manual methods.
- B10 *Sterilization*: Shall mean a process effected by heat, chemicals, or other mechanical means that destroys all vegetative bacteria and inactivates relevant bacterial spores.
- B11 **Surface Modification²**
- B11.1 *Surface Treatments*: Shall mean a process whereby chemical compositions or mechanical properties of the existing surface are altered. There is no appreciable, typically less than 1 mm, build-up of new material or removal of existing material.
- B11.1.1 Surface treatments may include:

- 1) Mechanical (shot peening³, glass beading, polishing)

²Additional information on surface modification is contained in *Advanced Materials and Processes*, Vol. 137 (1), January 1990; p. 59 - "Coating and Coating Practices" by H. Herman and p. 61 - "Surface Modification" by F.A. Schmidt. ASM International, Materials Park, OH 44073 (216-338-5151).

³MIL-S-13165C (1), November 27, 1991. *Military Specification: Shot Peening of Metal Parts*. Available from Standardization, Document Order Desk (Department of Navy), 700 Robbins Avenue, Building 4, Section D, Philadelphia, PA 19111-5094 (215-697-2179).

- 2) Thermal (surface hardening by laser, electron beam)
- 3) Diffusion (carburizing, nitriding)
- 4) Chemical (etching, oxidation)
- 5) Ion Implantation
- 6) Electropolishing

B11.2 *Coatings*: Shall mean the results of a process where a different material is deposited to create a new surface. There is appreciable, typically more than 1 mm, build-up of new material.

B11.2.1 Coating processes may include:

- 1) Chemical (conversion coatings)
- 2) Electrodeposition⁴
- 3) Spraying (pneumatic, flame, plasma, arc spray)
- 4) Physical Vapor Deposition
- 5) Chemical Vapor Deposition
- 6) Centrifugal Casting

B12 *Arithmetical Mean (R_a)*: Shall be the arithmetical mean of the absolute values of the profile departure within a sampling length.⁵

B13 *Supplementary Fitment or Device*: Shall mean any component or assembly which is attached to the container. Examples include but are not limited to pour spouts, closures, handles, and tamper evident seals.

B14 *Readily or Easily Removable*: Shall mean quickly separated from the equipment with the use of simple hand tools if necessary.

B15 *Easily or Readily Accessible*: Shall mean a location which can be safely reached by an employee from the floor, platform, or other permanent work area.

B16 *Simple Hand Tools*: Shall mean implements normally used by operating and cleaning personnel such as a screwdriver, wrench, or hammer.

⁴QQ-C-320B - *Federal Specification for Chromium Plating (Electrodeposited)*, June 1954 with Amendment 4 on April 10, 1987. QQ-N-290A - *Federal Specification for Nickel Plating (Electrodeposited)*, November 12, 1971. Available from the General Services Administration, Federal Supply Services Bureau, Specification Section, 470 East L'Enfant Plaza, Suite 8100, Washington, DC 20407 (202-755-0325).

⁵Additional information on arithmetical mean (R_a) is contained in ANSI B46.1-1978, available from the American National Standards Institute, 1430 Broadway, New York, NY 10018 (212-354-3300).

C MATERIAL

CI Metals

CI.1 All product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series⁶ (except 301 and 302) or corresponding Alloy Cast Institute (ACI)⁷ types (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types and is nontoxic and non-absorbent, except that:

CI.1.1 Those surfaces of container forming, closing, and sealing devices which are product contact surfaces may be made of a nontoxic, nonabsorbent metal which can be adequately manually cleaned and that is corrosion resistant under conditions of intended use; or may be made of metal made corrosion resistant and wear resistant by a covering of an electrodeposited coating of chromium and/or nickel, electroless nickel⁸, or coatings of a corrosion- and wear-resistant nontoxic material. (See Appendix, Section F.)

C2 Nonmetals

C2.1 Where materials having certain inherent functional purposes are required for specific applications, such as rotary seals, carbon and/or ceramic materials may be used. Carbon and/or ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, and resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C2.2 Rubber or rubber-like materials may be used for filling nozzles, plungers, gaskets, diaphragms, sealing rings, O-rings, rollers, belts, or conveyors, drip shields, protective caps for sanitary connections, container forming and closing parts, filling valve parts, seals, flexible tubing, hoses, and parts having the same functional purpose.

⁶The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, November 1990, Table 2-1, pp. 17-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-1535).

⁷Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708-299-9160).

⁸MIL-C-26074E NOT 2, August 22, 1995. *Military Specifications: Coatings, Electroless Nickel, Requirements For*. Available from Standardization, Document Order Desk (Department of Navy), 700 Robbins Avenue, Building 4, Section D, Philadelphia, PA 19111-5094 (215-697-2179).

- C2.2.1 Rubber and rubber-like materials, when used for specific applications, shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18.
- C2.3 Plastic materials may be used for filling nozzles, plungers, gaskets, diaphragms, sealing rings, O-rings, rollers, belts, or conveyors, drip shields, protective caps for sanitary connections, container forming and closing parts, filling valve parts, seals, flexible tubing, hoses, and parts having the same functional purpose. These parts may be made of, coated, or covered with plastic material.
- C2.3.1 Plastic materials, when used for specified applications, shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used on Product Contact Surfaces for Dairy Equipment, Number 20.
- C2.4 Plastic may be used in sight and/or light openings and as direct reading gauge tubes, and when used shall be of a clear, heat resistant type.
- C2.5 Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.
- C2.6 The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic shall be nontoxic.⁹
- C2.7 Single service gaskets of a sanitary type may be used on parts which must be disassembled for daily cleaning.
- C3 In a processing system to be sterilized by heat and operated at a temperature of 250°F (121°C) or higher, all materials having product contact surface(s) used in the construction of packaging equipment and nonmetallic component parts shall be such that they can be (1) sterilized by saturated steam or water under pres-

sure (at least 15.3 psig or 106 kPa) at a temperature of at least 250°F (121°C) and (2) operated at the temperature required for processing.

C4 Nonproduct Contact Surfaces

- C4.1 All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D FABRICATION

D1 General Fabrication Requirements

D1.1 Surface Texture

- D1.1.1 All product contact and solution contact surfaces shall have a finish at least as smooth as an R_a of 32 μm . (0.80 μm) (No. 4 Finish) and be free of imperfections such as pits, folds, and crevices in the final fabricated form (See Appendix, Section G), except that:

- D1.1.1.1 Rollers used to apply sterilizing chemicals by contact to the product contact surfaces of the package material may have a surface finish at least as smooth as an R_a finish of 125 μm . (3.18 μm).

D1.2 Permanent Joints

- D1.2.1 All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as an R_a of 32 μm . (0.80 μm) (No. 4 finish) and be free of imperfections such as pits, folds, and crevices.

D1.3 Bonded Materials

- D1.3.1 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded. Excess bonding adhesive shall be removed.

⁹Adhesives shall comply with 21 CFR Part 175 - "Indirect Food Additives: Adhesives and Components of Coatings." Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (202) 512-1800.

D1.4 Hoses and Flexible Tubing

D1.4.1 Hoses and flexible tubing, with attached sanitary fittings used for flexible connections shall meet the requirements of 3-A Sanitary Standards for Hose Assemblies for Milk and Milk Products, Number 62.

D1.5 Coatings

D1.5.1 The thickness of electrodeposited coatings on product contact surfaces shall not be less than 0.0002 in. (0.005 mm), except that when these surfaces are other than stainless steel, the thickness of electrodeposited coatings shall not be less than 0.002 in. (0.05 mm).

D1.5.2 Coatings of electroless nickel alloy, as specified in C1.1.1, shall conform to the applicable provisions of MIL-C-26074E NOT 2, as amended.

D1.5.3 The minimum thickness of coating of electroless nickel alloy, as specified in C1.1.1, shall be 0.002 in. (0.05 mm).

D1.5.4 Plastic or rubber and rubber-like materials, when used as a coating, shall be at least 0.001 in. (0.025 mm) thick.

D1.6 Cleaning and Inspectibility

D1.6.1 Equipment that is to be mechanically cleaned shall be designed so that the product contact surfaces of the equipment and all nonremovable components of the equipment can be mechanically cleaned and are easily accessible and readily removable for inspection employing simple hand tools.

D1.6.2 Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an installed position or when removed. Demountable parts shall be readily removable.

D1.7 Draining

D1.7.1 All product contact surfaces shall be self-draining or self-purging except for normal clingage.

D1.7.2 If filler bowl product contact surfaces are not self-draining, the filler bowl shall have sufficient pitch to suitable drain points so the filler bowl can be drained.

D1.8 Filler Bowls

D1.8.1 All filler bowls shall be effectively enclosed or covered and covers shall be self-draining.

D1.8.1.1 Filler bowls or tanks not designed for mechanical cleaning or sterilization with pressurized steam shall be equipped with covers which (1) shall be sufficiently rigid to prevent buckling, (2) if provided with handles, the handles shall be adequate, durable, conveniently located and of sanitary design, welded in place or formed into the cover materials, and, (3) unless gasketed and clamped, shall have downward flanges not less than 3/8 in. (10 mm) along all edges. The edges of all cover openings shall extend upward at least 3/8 in. (10 mm) or be fitted with a permanently attached sanitary pipeline connection conforming to D1.17 or D1.18.

D1.8.1.2 Openings in the bowl cover, except those fitted with a permanently installed sanitary instrument connection, shall be provided with covers having a downward flange of not less than 1/4 in. (6 mm) so designed as to prevent liquid from entering the filler tank.

D1.8.1.3 Systems in which the filler bowls are subjected to vacuum shall be designed to prevent the movement of gasketing materials or the ingress of contamination while under expected levels of negative pressure.

D1.8.1.4 The bottom of the filler tank(s) shall have a minimum pitch of 1/8 in. per ft (10 mm per m) toward the outlet(s).

D1.8.2 The filling equipment shall be so designed that adjustments necessary during the operation may be made without raising or removing the filler bowl cover(s).

D1.9 Gaskets

D1.9.1 Gaskets having a product contact surface shall be removable or bonded.

D1.9.2 Grooves in gaskets shall be no deeper than their width, unless the gasket is readily removable and reversible for cleaning.

D1.9.3 Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard O-rings smaller than 1/4 in. (6 mm) and those provided for in Section D1.17.

D1.10 Radii

D1.10.1 All internal angles of less than 135° on product contact surfaces shall have radii of not less than 1/4 in. (6 mm), except that:

- D1.10.1.1 Radii of 1/32 in. (1 mm) may be used when they are required for essential functional reasons, such as those in filler nozzles.
- D1.10.1.2 The radii in grooves in gaskets or gasket retaining grooves shall not be less than 3/32 in. (2 mm), except for those for standard 1/4 in. (6 mm) and smaller O-rings and those provided for in Sections D1.17 and D1.18.
- D1.10.1.3 Radii in standard O-ring grooves for standard 1/4 in. (6 mm) O-rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-rings shall be not less than 1/32 in. (1 mm).
- D1.10.1.4 The minimum radii for fillets of welds in product contact surfaces shall be not less than 1/4 in. (6 mm) except that the minimum radii for such welds may be 1/8 in. (3 mm) when the thickness of one or both parts joined is less than 3/16 in. (5 mm).
- D1.11 Shields and Guards**
- D1.11.1 Shields or guards shall be provided as necessary and shall be so designed to be self-draining and located to prevent liquid or other contaminants from draining or dropping into the container or product, or onto the product contact surfaces, except that:
- D1.11.1.1 Shields and guards may not be required in equipment designed to provide a controlled environment such as an enclosure pressurized with sterile air or inert gas, or an environment controlled by flowing air rendered sterile by incineration, filtration, irradiation, or other means to adequately prevent contamination.
- D1.11.2 Shields shall be easily cleaned.
- D1.11.3 When packaging material rolls are used, the packaging material product contact surface shall be protected from contamination when installed on the machine.
- D1.11.4 Each fill valve or valve block shall have a deflector shield installed at the lowest practical location in such a manner that it will collect the maximum amount of condensate draining from the exterior of the valve or valve block and discharge it to waste away from the open container, except that:
- D1.11.4.1 Deflector shields may not be required in a system designed to prevent the formation of condensate in critical areas. The formation of condensate may be prevented by:
1. Maintaining a valve block temperature higher than the dew point of its operating environment. Methods include but are not limited to: preventing heat transfer from the product to the exterior of the valve block, warming the ambient air, or chilling the ambient air.
 2. Dehumidifying the ambient air.
 3. Maintaining a flow of unsaturated air, across the valve block, of sufficient volume and velocity to prevent the formation of condensate.
- D1.11.4.2 Deflector shields may be required if the exterior of the fill valve is subject to chemical sprays.
- D1.11.5 When an enclosure is provided around the filling system, shields which are outside of such an enclosure shall not drain into the filling enclosure.
- D1.11.6 Shields which are made up of several independent parts shall overlap in such a manner as to prevent condensate from draining between the individual parts.
- D1.11.7 Any guard(s) required by a safety standard shall permit accessibility for cleaning and inspection.
- D1.12 Fill Valves Entering the Package (Bottom-Up Fill)**
- D1.12.1 The following shall be employed for fill valves that enter the package and that accumulate product splash:
- D1.12.1.1 Provisions shall be made to sanitize nozzles as needed, or:
- D1.12.1.2 A controlled environment, as described in D1.11.1.1 of these standards, shall be provided.
- D1.12.1.3 Any fill valves on packages over 2 liters in volume shall be periodically sanitized as needed and be located in a controlled environment as provided for in D1.11.1.1 of these standards.
- D1.13 Threads**
- D1.13.1 There shall be no exposed threads on product contact surfaces except as provided in D1.16.
- D1.14 Threads on Splash Contact Surfaces**
- D1.14.1 There shall be no exposed threads on splash contact surfaces, except that:

D1.14.1.1 Exposed threads are permitted on removable clamps or other components which can be easily removed for cleaning.

D1.14.1.2 Exposed threads are permitted when required for essential functional reasons. Such exposed threads shall be easily accessible for cleaning.

D1.15 **Metal Tubing**

D1.15.1 All metal tubing shall comply with the applicable provisions of the 3-A Sanitary Standards for Polished Metal Tubing, Number 33.

D1.16 **Flow Meters**

D1.16.1 Product flow meters, if used, shall conform to the applicable provisions of 3-A Sanitary Standards for Flow Meters for Milk and Liquid Milk Products, Number 28.

D1.17 **Product Pumps**

D1.17.1 Product pumps, if used, shall conform to the applicable provisions of 3-A Sanitary Standards for Centrifugal and Positive Rotary Pumps for Milk and Milk Products, Number 02, 3-A Sanitary Standards for Homogenizers and Pumps of the Plunger Type, Number 04, or 3-A Sanitary Standards for Air Driven Diaphragm Pumps for Milk and Milk Products, Number 44.

D1.18 **Fittings and Connections**

D1.18.1 All sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Fittings, including Numbers 59- (Automatic Positive Samplers), 60- (Rupture Discs), 62- (Hose Assemblies), 63- (Sanitary Fittings), and 65- (Sight and/or Light Windows and Sight Indicators) for Milk and Milk Products.

D1.19 **Instrument Connections**

D1.19.1 All instrument connections having product contact surfaces shall conform to the 3-A Sanitary Standards for Sensor and Sensor Fittings and Connections Used on Milk and Milk Products Equipment, Number 74.

D1.20 **Sanitary Valves**

D1.20.1 All sanitary valves shall conform to those applicable provisions of 3-A Sanitary Standards for Valves, including Numbers 51- (Plug-Type Valves), 52- (Thermoplastic Plug-Type Valves), 53- (Compression-Type Valves), 54- (Diaphragm-Type Valves), 55-

(Vacuum Breakers and Check Valves), and 64- (Pressure Reducing and Back Pressure Regulating Valves) for Milk and Milk Products.

D1.21 **Springs**

D1.21.1 Coil springs having product contact surfaces shall have at least 3/32 in. (2 mm) openings between coils including the ends when the spring is in a free position. Coil springs shall be readily accessible for cleaning and inspection.

D1.22 **Sight and Light Openings**

D1.22.1 Sight and light openings into product contact surfaces, when provided, shall be of such design and construction that the inner surfaces drain inwardly; if the equipment is designed for mechanical cleaning, the inner surface of the glass shall be relatively flush with the inner surface of the product contact surface. The exterior flare shall be pitched so that liquids cannot accumulate. The glass shall be readily removable. The inside diameter or smallest dimension of the opening shall be at least 3 3/4 in. (95.25 mm).

D1.23 **Supports**

D1.23.1 The equipment shall be mounted on legs or casters that will provide a clearance between the lowest fixed point on the equipment and the floor of at least 4 in. (100 mm) when the base outlines an area in which no point is more than 12 1/2 in. (320 mm) from the nearest edge, or a clearance of at least 6 in. (150 mm) when any point is more than 12 1/2 in. (320 mm) from the nearest edge.

D1.23.1.1 Legs, if provided, shall be smooth with rounded ends or with a flat, load-bearing foot suitable for sealing to the floor, and have no exposed threads. Legs made of hollow stock shall be sealed.

D1.23.1.2 Casters, if provided, shall be durable and of a size that will permit easy movement of the equipment.

D1.24 **Guards and Other Safety Devices**

D1.24.1 Guards required by a safety standard that will not permit accessibility for cleaning and inspection shall be designed so that they can be removed with the use of simple hand tools.

D1.25 Recirculated Cooling Media

D1.25.1 Recirculated cooling media shall be non-toxic and properly protected. Mandrels, piping, and other equipment cooled by recirculated cooling media shall be designed to preclude leakage of cooling media or condensate into product or onto product contact surfaces.

D1.26 Nonproduct Contact Surfaces

D1.26.1 Nonproduct contact surfaces shall have a smooth finish, be free of pockets and crevices, and shall be readily cleanable. Surfaces to be coated shall be effectively prepared for coating.

D1.27 Information Plates

D1.27.1 Where manufacturers provide an information plate, this plate shall be affixed to a surface in such a manner as to be effectively sealed.

D1.27.2 The information plate shall also provide the following information: "This packaging equipment **(Insert one of the following)** designed for steam sterilization.
(a) is
(b) is not

D1.27.3 This packaging equipment is designed with these fittings and design criteria to be part of an aseptic processing system where applicable.

D2 Special Fabrication Requirements

Formers, fillers and sealers shall also comply with the following fabrication criteria when applicable to the specific filler type.

D2.1 Defoamer Systems

D2.1.1 Milk and milk products from continuous defoamers shall not be returned directly to the filler bowl. (See Appendix, Section H.)

D2.1.2 If a defoamer system is provided, all surfaces from which foam may drain, drop, or be drawn into the product shall be constructed in conformance to D1.6.1 and D1.6.2. All surfaces of blower or vacuum lines subject to contact with foam shall be constructed in such a manner as to be readily accessible for cleaning and sanitizing.

D2.2 Supplementary Fitments

D2.2.1 If supplementary fitments or devices are attached to the container within the unitized equipment, the fitment or device applicator shall be designed, installed and operated such that the attachment of the fitment or device is performed in such a manner that open and unsealed containers are not subject to contamination. If shielding is provided, it shall be properly designed and installed to preclude contamination of open containers.

D2.3 Automatic Sanitizer Fogging/Spraying Systems for Equipment Surfaces

D2.3.1 When supplied by the manufacturer, equipment for the intermittent fogging or spraying of sanitizing solutions on equipment surfaces shall be installed in such a manner that it does not interfere with access to product contact surfaces for cleaning and inspection, and shall be accessible and easily cleanable if it is located such that it constitutes a splash contact surface or a product contact surface.

D2.3.2 Automatically timed intermittent systems shall operate only after the filling operation has been stopped and all containers which have entered the product or splash contact area of the machine have been removed. Sufficient time shall be allowed for solutions to drain from the equipment before filling is resumed.

D2.4 Single Use Fill Nozzle Screen Assemblies

D2.4.1 Woven wire screen assemblies or assemblies of perforated plates which are installed and removed as unitary assemblies may be used in fill nozzles to minimize the generation of foam in the containers.

D2.4.2 When used, single use fill nozzle screen assemblies shall be readily accessible for removal and replacement.

D2.4.3 Single use fill nozzle screen assemblies shall be constructed such that the edges of the screens are pressed, bonded, or otherwise treated to prevent unraveling or the shedding of material into the product.

D2.4.4 Single use fill nozzle screen assemblies shall be removed and replaced according to Appendix, Section I.

D2.5 Multiple Use Fill Nozzle Screens

- D2.5.1 Woven wire screens or perforated plates may be used in fill nozzles to minimize the generation of foam in the containers.
- D2.5.1.1 Woven wire screens or perforated plates shall be designed so they are readily accessible for cleaning, sanitizing, and inspection. (See Appendix, Section J.)
- D2.5.1.2 In woven wire screens, screen wires shall be circular in cross section and shall be no less than 0.010 in. (0.25 mm) in diameter.
- D2.5.1.3 Woven wire screens shall have no more than 40 wires per in. (25 mm).
- D2.5.1.4 In woven wire screens, the edges of the screens shall be pressed, bonded, or otherwise treated to prevent unraveling.
- D2.5.1.5 Holes in perforated plates used in filler nozzles to minimize the generation of foam in the containers may be round, square, or rectangular. If round, the holes shall be a minimum of 1/32 in. (1 mm) in diameter. If square or rectangular, the least dimension shall be no less than 0.020 in. (0.51 mm) with corner radii of no less than 0.0050 in. (0.13 mm).
- D2.5.1.6 Spacers between screens and/or perforated plates, if used, shall be accessible for cleaning and inspection.

D2.6 Culinary Steam

- D2.6.1 Steam used as the sterilizing medium of product contact surfaces, when produced or transported within the unitized equipment, shall meet the criteria for culinary steam as specified in 3-A Accepted Practices for a Method of Producing Steam of Culinary Quality, Number 609.

D2.7 Coding and Dating Equipment

- D2.7.1 If coding and/or dating is to be performed within the unitized equipment, coding and/or dating devices shall be designed, installed, and operated such that these operations are performed in such a manner that open or unsealed containers are not subject to contamination. If shielding is provided, it shall be properly designed and installed to preclude contamination of open containers.

D2.8 Aseptic Equipment

- D2.8.1 Filling equipment intended for aseptic operation shall be designed so that adjustments necessary during operation may be made without jeopardizing the sterility of the unit.
- D2.8.2 Filling equipment intended to be part of an aseptic processing system shall be equipped with appropriate fittings for required instruments and recording devices.
- D2.8.3 Packaging machines used in a processing system to be sterilized by heat and operated at a temperature of 250°F (121°C) or higher shall comply with the following additional criteria:
- D2.8.4 The construction shall be such that all product contact surfaces can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250°F (121°C) and (2) operated at the temperature required for processing.
- D2.8.5 Packaging machines that have a product contact surface(s) to be used in such a processing system, not designed so that the system is automatically shut down if the product pressure in the system becomes less than that of the atmosphere and cannot be restarted until the system is re-sterilized, shall have a steam or other sterilizing medium chamber surrounding the valve stems in the sterile areas, if required, to maintain sterility. The packaging machine shall be constructed so that the steam chamber or other sterilizing medium chamber may be exposed for inspection.
- D2.8.6 Where steam or other sterilizing medium is used, the connection(s) on the packaging machines shall be such that the steam lines or other sterilizing medium lines can be securely fastened to the packaging machines. The packaging machines shall be constructed so that the steam or other sterilizing medium chamber may be exposed for inspection.
- D2.8.7 The seal(s) in a packaging machine designed to be used in a processing system to be sterilized by heat and operated at a temperature of 250°F (121°C) or higher shall be between the product contact surface and the steam or other sterilizing chamber.

- D2.9 Cappers and Capping Equipment**
- D2.9.1 When supplied as part of the unitized equipment by the manufacturer, all components of the capping equipment that touch product contact surfaces of the cap or closure including but not limited to sorters, hoppers, magazines, chutes, and applicators shall comply with the applicable sections of D1.
- D2.10 Container Disinfection or Sterilization Systems**
- D2.10.1 Filling equipment which introduces disinfecting or sterilizing chemicals into packages or onto product contact surfaces shall have a means to control the amount of chemical remaining on product contact surfaces.
- D2.10.1.1 Residual chemicals in the package shall not exceed FDA allowable limits for that chemical.
- D2.11 Air Under Pressure**
- D2.11.1 When supplied by the manufacturer, or transported within the unitized equipment, all air under pressure used in contact with product or product contact surfaces shall conform to 3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products, and Product Contact Surfaces, Number 604.
- D2.12 Modified Atmosphere Injection Systems**
- D2.12.1 Modified atmosphere injection systems, when fitted as part of the unitized equipment, shall conform to D2.11 above.
- D2.12.1.1 The gas (e.g. nitrogen, carbon dioxide, etc.)⁹ used in a modified atmosphere injection system shall be of a purity suitable for its intended use. The gas quality shall meet the appropriate FDA Food Quality Specification.
- D2.13 Self-Contained Mechanical Cleaning Systems**
- D2.13.1 When furnished as a part of the unitized equipment, self-contained mechanical cleaning systems shall meet the Materials and Fabrication criteria described above for product contact surfaces.
- D2.14 Filling Nozzle Gangs**
- D2.14.1 The area between the filling nozzles shall be defined as a product contact surface, unless shielding per paragraph D1.11 is installed.
- D2.15 Paper Forming or Scoring Equipment**
- D2.15.1 Radii of less than 1/32 in. (1 mm) may be used in equipment when required for essential functional reasons such as mandrel relief patterns and for paper scoring.
- D2.16 Hollow Rollers**
- D2.16.1 Hollow rollers shall not be used where they form product contact surfaces or splash contact surfaces, unless the inside of the roller meets the cleanability criteria of this standard or is sealed to prevent ingress of soil or product.

APPENDIX

E STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACl for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical composition of these cast grades are covered by ASTM¹⁰ specifications A351/A351M, A743/A743M and A744/A744M.

⁹Nitrogen shall comply with 21 CFR Part 184.1540 and carbon dioxide shall comply with 21 CFR Part 184.1240 - "Direct Food Substances Affirmed as GRAS." Document for sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (202-783-3238).

- F ELECTROLESS NICKEL ALLOY**
- An electroless nickel alloy coating having the following composition is deemed to be in compliance with C1.1 herein:
 Nickel - 90% minimum.
 Phosphorus - 6% minimum and 10% maximum as a supersaturated solution of nickel phosphide in nickel.
- Trace amounts of carbon, oxygen, hydrogen and nitrogen.
- No other elements.
- G PRODUCT CONTACT SURFACE FINISH**
- Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D1 herein. A maximum R_a of 32 $\mu\text{in.}$ (0.80 μm), when measured according to the recommendations in American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME) B.46.1 - Surfaces Texture, is considered equivalent to a No. 4 finish.¹¹
- H HANDLING OF COLLECTED MILK**
- If the milk or milk product collected in the defoamer system is intended to be used for human consumption, the following procedures are recommended:
- H1** It should be protected from contamination during collection and in subsequent handling.
- H2** It should be maintained at or below 45°F (7°C).
- H3** It should be re-pasteurized.
- I RECOMMENDED REPLACEMENT OF SINGLE USE NOZZLE SCREENS**
- Single use nozzle screen assemblies should be removed from the filling machine at the end of a production period and should be discarded.
- New single use nozzle screen assemblies or packs should be installed in the filling machine immediately prior to sanitizing of the filler prior to production.
- J RECOMMENDED CLEANING AND SANITIZING OF MULTIPLE USE NOZZLE SCREENS**
- The screens should be removed, inspected, cleaned, and autoclaved at 250°F (121°C) for 30 min. After cooling the screens should be reassembled in the filler nozzle immediately prior to sanitizing the filler.
- K INFORMATION PLATE**
- In the case of bottom-up fill type machines which are not provided with a controlled environment, an information plate should be provided which will specify the frequency that the exterior surfaces of the filler valves must be sanitized.

These amended standards are effective November 24, 2002.

¹⁰Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Phone: (610) 832-9500.

¹¹Available from the American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017-2392 (212-705-7722).

3-A Sanitary Standards for Centrifugal Separators and Clarifiers, Number 21-00

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
International Dairy Foods Association (IDFA)
American Dairy Products Institute (ADPI)
United States Public Health Service (USPHS)
European Hygienic Engineering Design Group (EHEDG)
United States Department of Agriculture — Dairy Programs (USDA)

It is the purpose of the IAFIS, IAFP, IDFA, ADPI, USPHS, EHEDG, and USDA in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Centrifugal separators and clarifiers specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, IDFA, ADPI, USPHS, EHEDG, and USDA at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products, and other perishable foods or comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

A1 These Standards cover the sanitary aspects of centrifugal separators or clarifiers used to separate fractions of milk or milk products or other liquid food products or to centrifugally remove dense phase material from products. This machine starts at the product inlet(s) and terminates at the product outlet(s) and the nonproduct discharge(s), if included.

These Standards do not cover cyclonic types of separators, decanters, basket centrifuges and other types of devices and the spacers (caulks) for separator or clarifier discs and their attachment to the discs. (See Appendix M.)

A2 In order to conform to these 3-A Sanitary Standards, centrifugal separators or clarifiers shall comply with the following design, material, and fabrication criteria and the applicable documents referenced herein.¹

B DEFINITIONS

B1 *Product*: Shall mean milk and milk products or other liquid comestibles.

B2 *Solutions*: Shall mean water and/or those homogeneous mixtures of cleaning agents and/or sanitizers and water used for flushing, cleaning, rinsing, and sanitizing.

B3 *Centrifugal Separators (Separators) and Centrifugal Clarifiers (Clarifiers)*: Shall mean machines in which products are separated into their components or fractions using centrifugal force generated by a rotating chamber.

B4 Surfaces

B4.1 *Product Contact Surfaces*: Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, diffuse, or be drawn into the product.

B4.2 *Nonproduct Contact Surfaces*: Shall mean all other exposed surfaces.

¹Use current revisions or editions of all referenced documents cited herein.

B5 Cleaning

B5.1 *Mechanical Cleaning or Mechanically Cleaned*: Shall mean soil removal by impingement, circulation, or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned by mechanical means in equipment or systems specifically designed for this purpose.

B5.1.1 *Cleaned In Place (CIP)*: Shall mean mechanical cleaning of equipment, the cleanability of which has been sufficiently established such that all product or solution contact surfaces do not have to be readily accessible for inspection and is limited to centripetal pumps.

B5.2 *Manual (COP) Cleaning*: Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses and tank(s) which may be fitted with recirculating pump(s), and with all cleaning aids manipulated by hand.

B6 Surface Modification²

B6.1 *Surface Treatments*: Shall mean a process whereby chemical compositions or mechanical properties of the existing surface are altered. There is no appreciable, typically less than 1 mm, build-up of new material; or removal of existing material.

B6.1.1 Surface treatments include:

1. Mechanical (shot peening³, polishing)
2. Thermal (surface hardening laser, electron beam)
3. Electropolishing

B6.2 *Coatings*: Shall mean the results of a process where a different material is deposited to create a new surface. There is appreciable, typically more than 1 mm, build-up of new material. The coating material does not alter the physical properties of the substrate.

B6.2.1 Coating processes include:

1. Chemical (conversion coatings)
2. Engineering Plating
(e.g., Electrodeposition⁴, gold)

B7 *Safe Water*: Shall mean water from a supply properly located, protected, and operated, and shall be of a safe, sanitary quality. The water shall meet the standards prescribed in the National Primary Drinking Water Regulation of the Environmental Protection Agency (EPA) as referenced in The Code of Federal Regulations⁵ (CFR), Title 40, Parts 141, 142, and 143. (Information also available from the environmental protection agency [EPA] Drinking Water Hot Line: 800-426-4791.)

B8 *Soil*: Shall mean the presence of unwanted organic residue or inorganic matter, with or without microorganisms, including food residue, in or on the equipment.

B9 *Sanitizing or Sanitization*: Shall mean a process applied to a cleaned surface which is capable of reducing the numbers of the most resistant human pathogens by at least 5 log₁₀ reductions (99.999%) to 7 log₁₀ reductions (99.99999%) by applying accumulated hot water, hot air, or steam, or by applying an EPA-registered sanitizer according to label directions. Sanitizing may be effected by mechanical or manual methods.

B10 *Easily or Readily Removable*: Shall mean quickly separated from the equipment with the use of simple hand tools, and, if necessary, with the use of lifting equipment.

²Additional information on surface modification is contained in *Advanced Materials and Processes*, Volume 137(1), January 1990; "Coatings and Coating Practices" by H. Herman, p. 59; "Surface Modification" by F. A. Smidt, p. 61. ASM International, Materials Park, OH 44073 (216) 338-5151.

³MIL-S-13165C (1), November 1991, *Military Specification: Shot Peening of Metal Parts*. Available from Standardization, Document Order Desk (Department of Navy), 700 Robbins Avenue, Building 4, Section D, Philadelphia, PA 19111-5094 (215) 697-2179.

⁴Federal Specification #QQ-C-320B for Chromium Plating (Electrodeposited), June 1954 with Amendment 4 on April 10, 1987. Federal Specification #QQ-N-290A for Nickel Plating (Electrodeposited), November 12, 1971. Available from the General Services Administration, Federal Supply Services Bureau, Specification Section, 470 East L'Enfant Plaza, Suite 8100, Washington, DC 20407 (202) 755-0325.

⁵For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202) 512-1800.

- B11 *Easily or Readily Accessible*: Shall mean a location which can be safely reached by personnel from a floor, platform, or other permanent work area.
- B12 *Inspectable*: Shall mean all product contact surfaces can be made available for close visual observation.
- B13 *Simple Hand Tools*: Shall mean implements normally used by operating and cleaning personnel such as a screwdriver, wrench, mallet or dedicated tools supplied.
- B14 *Nontoxic Materials*: Shall mean those substances which under the conditions of their use are in compliance with applicable requirements of the Food, Drug, and Cosmetic Act of 1938, as amended.
- B15 *Dead End*: Shall mean an area or space wherein a product, ingredient, cleaning, or sanitizing agent, or other extraneous matter may be trapped, retained, or not completely displaced during operational or cleaning procedures.
- B16 *Corrosion Resistant*: Shall mean the surface has the property to maintain its original surface characteristics for its predicted service period when exposed to the conditions encountered in the environment of intended use, including expected contact with product and cleaning, sanitizing, or sterilization compounds or solutions.
- B17 *Bond*: Shall mean the adhesive or cohesive forces holding materials together. This definition excludes press and shrink fits.
- B18 *Substantially Flush*: Shall mean mating surfaces or other juxtaposed surfaces shall be within 1/32 in. (0.794 mm).
- B19 *Snug Interference Fit*: Shall mean a condition of fit between two parts that requires pressure to force parts together without apparent tightness or looseness. The parts must be pounded or forced or driven together. This is also referred to as a "force fit."

⁶The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, November 1990, Table 2-1, pp. 17-20. Available from the American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412) 776-1535.

C MATERIALS

C1 Metals

C1.1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300, (except 301 and 302) Series⁶ or corresponding Alloy Cast Institute (ACI) types⁷ (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

C1.1.1 Optional metal alloy may be used for separator or clarifier bowls, shafts, retaining rings, and nuts. (See Appendix, Section E for composition of acceptable optional metal alloys.)

C1.2 Bowl components and centripetal pump assemblies and wear surfaces on shafts made of the materials provided for in C1.1 may have their product contact surfaces modified by surface treatment or coating(s).

C1.3 Separator and clarifier shafts and bowls may also be made of stainless steel of the AISI 400 Series that is made as corrosion resistant as AISI 300 (except 301 and 302) Series by surface treatment or coating(s), or made of nontoxic, nonabsorbent metal that is as corrosion resistant, under the conditions of intended use, as stainless steel of the AISI 300 Series (except 301 and 302).

C2 Nonmetals

C2.1 Rubber and rubber-like materials may be used for O-rings, seals, gaskets, and parts having the same functional purposes.

C2.1.1 Rubber and rubber-like materials, when used for the above-specified application(s), shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18.

⁷Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.

- C2.2 Plastic materials may be used for O-rings, gaskets, seals, bearings, sight and light lenses and parts having the same functional purposes.
- C2.2.1 Plastic materials, when used for the above-specified application(s), shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.
- C2.2.2 Plastic used for sight and/or light openings shall be of a clear, heat-resistant type.
- C2.3 Rubber and rubber-like and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.
- C2.4 The adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic⁸.
- C2.5 Where materials having certain inherent functional purposes are required for specific applications, such as rotary seals, bowl discharge nozzles, wear surfaces and coatings for wear surfaces, carbon, and/or ceramic materials, including tungsten carbide may be used. Carbon and/or ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.
- C2.6 Glass may be used in sight openings, and when used, shall be of a clear, heat-resistant type.
- C3 Nonproduct Contact Surfaces**
- C3.1 All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

⁸Adhesives shall comply with 21 CFR 175 - Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202) 512-1800.

D FABRICATION

D1 Surface Texture

- D1.1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds, and crevices in the final fabricated form. (See Appendix, Section F.)

D2 Permanent Joints

- D2.1 All permanent joints in metallic product contact surfaces shall be continuously welded, except that:
- D2.1.1 In such cases where welding is impractical, press or shrink-fitting may be employed where necessary for essential functional reasons for sleeves on shafts or locating pins on bowl components. (See Appendix, Section H.)
- D2.1.2 Components of centripetal pumps may be joined by metal-to metal bonding. The resulting joints between the mating parts shall be tight without any cracks, spaces or gaps.
- D2.1.3 Product contact surfaces produced by welding⁹, metal-to-metal bonding, and press-fitting or shrink-fitting shall be at least as smooth as a No. 4 ground finish on stainless steel sheets and which are free of imperfections such as pits, folds, and crevices. Crevices may be eliminated by coating (See Section D4). See Appendix, Section H for press-fitting and shrink-fitting restrictions and limitations.

D3 Bonded Materials

- D3.1 Bonded rubber and rubber-like materials, and bonded plastic materials, having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment,

⁹Criteria for hygienic welds may be found in AWS/ANSI D18.1 - *Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications*. Available from the American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126, phone: (305) 443-9353, fax: (305) 443-7559, e-mail: info@amweld.org; and EHEDG Doc. 9 - *Welding Stainless Steel to Meet Hygienic Requirements*. Available from the European Hygienic Equipment Design Group, Ellen Moens, Avenue Grand Champ 148, 1150 Brussels, Belgium.

the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

- D3.2 Bonded metal-to-metal materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the materials shall not separate.

D4 Coatings

- D4.1 Coatings, if used, shall be free from surface delamination, pitting, flaking, spalling, blistering, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

- D4.2 The minimum thickness of electrodeposited coatings shall not be less than 0.0002 in. (0.005 mm) for all product contact surfaces.

- D4.3 Thermospray materials used as coatings shall be at least 0.003 in. (0.08 mm) thick.

D5 Cleaning and Inspectability

- D5.1 Separators and clarifiers that are to be mechanically cleaned shall be designed so that the product contact surfaces of the separator or clarifier and all nonremoved appurtenances thereto can be mechanically cleaned and are easily accessible, readily removable and inspectable, except that:

- D5.1.1 A centripetal pump need only be easily accessible and readily removable and shall have proof of cleanability by a test such as the EHEDG or equivalent test.¹⁰

- D5.2 Product contact surfaces not designed to be mechanically cleaned shall be accessible for cleaning and inspectable when in an assembled position or when removed. Demountable parts shall be readily removable.

- D5.3 When parts having product contact surfaces are too large or heavy for manual handling, appropriate mechanical means for handling shall be provided by the fabricator or user.

- D5.4 Appurtenances having product contact surfaces shall be readily removable or they shall be cleanable when assembled or installed and shall be easily accessible and inspectable.

- D5.5 Product contact surfaces shall not contain dead ends.

D6 Draining

- D6.1 All product contact surfaces shall be self-draining except for normal clingage except that:

- D6.1.1 If the product contact surfaces are not self-draining, or do not have sufficient slope to suitable drain points, the separator or clarifier shall be drainable by expelling liquids by centrifugal force or by disassembly.

D7 Fittings

- D7.1 All sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-.

D8 Sanitary Tubing

- D8.1 All metal tubing shall conform to the applicable provisions for welded sanitary product pipelines found in the 3-A Accepted Practices for Permanently Installed Product and Solution Pipelines and Cleaning Systems Used in Milk and Milk Product Processing Plants, Number 605- and with the 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-.

D9 Gaskets

- D9.1 Gaskets having a product contact surface shall be removable or bonded. Gasketed junctures shall be mated accurately and constructed so the internal sealing edges shall be substantially flush, except for flat sealing surfaces, except that:

- D9.1.1 Gaskets subjected to high centrifugal forces may be recessed and shall not create dead ends.

- D9.2 Grooves in gaskets shall be no deeper than their width.

¹⁰European Hygienic Engineering Design Group, Ellen Moens, moens@ehedg.org, Avenue Grand Champ 148, 1150 Brussels, Belgium.

- D9.3 Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6.35 mm) in depth or be less than 1/4 in. (6.35 mm) wide except those for standard O-rings smaller than 1/4 in. (6.35 mm), and those provided for in the 3-A Sanitary Standards referenced in Section D7.1 and D10.1, except that:
- D9.3.1 The groove for the main bowl gasket, the piston gasket and the gasket between the frame hood and chute may be no more than 2 times deeper than its width and the width shall be not less than 5/32 in. (4.0mm).
- D9.4 Properly constructed nonpermanent joints not intended for daily disassembly, such as the main bowl gasket, shall be designed so they are a snug interference fit (force fit).
- D10 Sensor Fittings and Connections**
- D10.1 All instruments provided shall conform to the applicable provisions of the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products, Number 74.
- D11 Radii**
- D11.1 All internal angles less than 135° on product contact surfaces shall have radii of not less than 1/8 in. (3.18 mm) except that:
- D11.1.1 Smaller radii may be used when they are required for essential functional reasons, such as those in threads covered in Section D12. In no case shall those radii be less than 1/64 in. (0.396 mm).
- D11.1.2 Due to the nature of design and fabrication, the radii of certain components is zero such as, centripetal pump interior halves, feed tube, centripetal pump interface, separating disc, top disc, bowl top interface and any necessary guide pins to maintain alignment.
- D11.1.3 The radii in grooves in gaskets or gasket retaining grooves shall be not less than 1/16 in. (1.59 mm) except for those for standard 1/4 in. (6.35 mm) and smaller O-rings, and those provided for in Section D7.1.
- D11.1.4 Radii in standard O-ring grooves shall be as specified in Appendix, Section I, Table 1.
- D11.1.5 Radii in nonstandard O-ring grooves shall be those radii closest to a standard O-ring as specified in Appendix, Section I, Table 1.
- D11.1.6 Radii in gasket retaining grooves such as those for piston gaskets and rectangular profile gaskets shall not be less than 1/32 in. (1.00 mm).
- D12 Threads**
- D12.1 Enclosed Threads**
- D12.1.1 These are threads that have been sealed from the product by means of an O-ring gasket or similar type seal.
- D12.1.2 Equipment with enclosed threads shall be designed for mechanical cleaning.
- D12.1.3 Thread specifications are designated by the manufacturer.
- D12.2 Exposed Threads**
- D12.2.1 These threads shall be of an approved type listed in Appendix J and shall be designed for manual cleaning or,
- D12.2.2 Used solely for lifting components and not fitted with a nut during operation, and
- D12.2.3 Have thread grooves no deeper than their width, and
- D12.2.4 Comply with radius requirements in D11.1.1.
- D13 Springs**
- D13.1 Coil springs shall be made from round stock. Any coil spring having product contact surfaces shall have at least 3/32 in. (2.38 mm) openings between coils, including the ends, when the spring is in the free position, and shall not have flattened ends.
- D14 Seals**
- D14.1 Where necessary to isolate product contact surfaces, centrifugal separators and clarifiers shall have a seal that is of a packless type, sanitary in design, and readily accessible, easily removable, and inspectable.
- D15 Shafts and Bearings**
- D15.1 Bearings having a product contact surface shall be of a nonlubricated type.
- D15.2 Lubricated bearings, including the permanently sealed type, shall be located outside the product contact surface with at least 1 in. (25.4 mm) clearance open for inspection between the bearing and any product contact surface, except that:

D15.2.1 The inspection opening is not required if a means of lubricant escape, away from the product zone is provided under static and dynamic conditions.

D16 Openings

D16.1 All openings into product contact areas of the machine shall be protected against the entrance of contaminants.

D16.1.1 Sight and light openings provided shall conform to the applicable provisions of the 3-A Sanitary Standards for Sight and/or Light Windows and Sight Indicators in Contact with Milk and Milk Products, Number 65.

D17 Supports

D17.1 The separator or clarifier shall be mounted using legs with smooth rounded ends or with a flat load bearing bottom suitable for sealing to the floor and shall have no exposed threads. Legs made of hollow stock shall be sealed. If a mounting frame used to locate and support the separator or clarifier is imbedded in the floor, any projections above the floor shall be effectively sealed to the floor. The connection of the separator or clarifier leg to the mounting frame shall be smooth with a tight joint and be cleanable. Legs shall provide a minimum clearance between the separator or clarifier and the floor or not less than 4 in. (101.6 mm.) Where the separator or clarifier has a bottom product inlet, this distance shall be measured from the lowest point, excluding the supply line(s).

D18 Nonproduct Contact Surfaces

D18.1 Nonproduct contact surfaces shall have a smooth finish, relatively free of pockets and crevices, and be readily cleanable and those surfaces to be coated shall be effectively prepared for coating. Exposed threads shall be minimized. Exposed braided coverings of cable or hoses shall not be used. No continuous or piano-type hinges shall be used on the machine or its control cabinets. Control cabinets, electrical and utility connections shall

be as remote as practical from the product areas. Riveted nameplates or appendages shall not be used. Socket head cap screws shall not be used. Knurled surfaces shall not be used. Nameplates shall be welded or effectively sealed to the machine.

D18.2 Guards required by a personnel safety standard shall be removable for cleaning and inspection of the equipment. When guards are removed, OSHA lockout/tagout regulations¹¹ shall be followed. Guards are considered nonproduct surfaces.

APPENDIX

E STAINLESS STEEL MATERIALS

E1 Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM¹² specifications A351/A351M, A743/A743M and A744/A744M.

E2 TABLE 1

WROUGHT PRODUCTS TYPICALLY USED			
UNS #	ASTM ¹²	AISI/SAE ²	Properties
S30300	A-582	303	Free-Machining S.S.; Austenitic
S30400	A-276 A-666	304	Austenitic S.S.
S30403	A-276 A-666	304L	Low Carbon Austenitic S.S.
S31600	A-276 A-666	316	Austenitic S.S. plus Mo*
S31603	A-276 A-666	316L	Low Carbon Austenitic S.S. plus Mo*

*Molybdenum

¹¹29 CFR 1910.147 The Control of Hazardous Energy. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (202) 512-1800.

¹²Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Phone: (610) 832-9500.

E3 **TABLE 2**

CAST PRODUCTS			
UNS #	ASTM ¹²	ACI ⁷	Common Names
J92500	A-351 A-743 A-744	CF-3	Cast 304L
J92800	A-351 A-743 A-744	CF-3M	Cast 316L
J92600	A-351 A-743 A-744	CF-8	Cast 304
J92900	A-351 A-743 A-744	CF-8M	Cast 316
J92180	A-747	CB7 Cu —1	Cast 17-4 PH
J92110	A-747	CB7 Cu —2	Cast 15-5 PH
N26055	A-494	CY5Sn BiM	Alloy 88
J92701	A-743	CF-16F	Free Machining Austenitic S.S.

F **PRODUCT CONTACT SURFACE FINISH**

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D1 herein. A maximum R_a of 32 $\mu\text{in.}$ (0.80 μm), when measured according to the recommendations in American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)¹ B46.1 - Surface Texture, is considered to be equivalent to a No. 4 finish.

G **Reserved**H **PRESS-FITS AND SHRINK-FITS**

Press-fits or shrink-fits may be used to produce crevice-free permanent joints in metallic product contact surfaces when neither welding nor soldering is practical. Joints of these types may only be used to assemble parts having circu-

lar cross sections, free of shoulders or relieved areas. For example: they may be used to assemble round pins or round bushings into round holes. In both types of fits, the outside diameter of the part being inserted is greater than the inside diameter of the hole. In the case of the press-fit, the parts are forced together by applying pressure. The pressure required is dependent upon the diameter of the parts, the amount of interference, and the distance the inner member is forced in.

In shrink-fits, the diameter of the inner member is reduced by chilling it to a low temperature. Dry ice is commonly used to shrink the inner member. Heat may also be applied to the outer member of the press-fit. Less assembly force is required for this type of fit.

The design of these fits depends on a variety of factors. The designer should follow recommended practices to assure that a crevice-free joint is produced. A recognized authoritative reference is Machinery's Handbook, published by Industrial Press Inc., 200 Madison Avenue, New York, NY 10157.

I **O-RING GROOVE RADII****TABLE 4 — Minimum Groove Radii Dimensions for Standard O-Rings**

O-Ring Cross Section, Nominal (AS 568 ¹⁴)	O-Ring Cross Section, Actual (AS 568)	O-Ring Cross Section, Actual (ISO 3601-1 ¹⁵)	Minimum Groove Radius
1/16 in.	0.070 in.	1.80 mm	0.016 in. (0.406 mm)
3/32 in.	0.103 in.	2.65 mm	0.031 in. (0.787 mm)
1/8 in.	0.139 in.	3.55 mm	0.031 in. (0.787 mm)
3/16 in.	0.210 in.	5.30 mm	0.062 in. (1.575 mm)
1/4 in.	0.275 in.	7.00 mm	0.094 in. (2.388 mm)

¹²Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017-2392 (212) 705-7722.

¹⁴The document establishing these standard dimensions is Aerospace Standard (AS) 568, published by SAE, 400 Commonwealth Drive, Warrendale, PA 15086 (412-776-4970).

¹⁵The document establishing these standard dimensions is ISO 3601-1: published by the International Organization for Standardization (ISO), 1 Rue de Varembe, Case Postale, 58, CH 1 1211, Geneva, Switzerland (41-22-734-1240).

E4 **TABLE 3 - OPTIONAL METAL ALLOY**

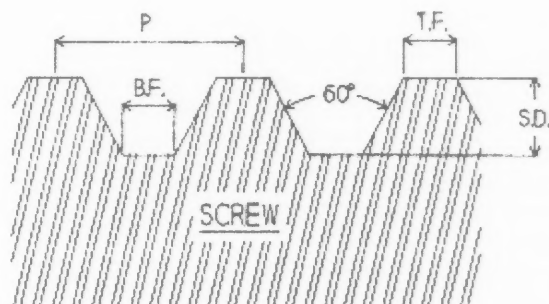
Optional metal alloys having the following compositions are examples considered in compliance with Section C herein. (Percentages are maximum unless range is given.)

	UNS N08367	UNS S21800	UNS S20161	UNS N26055	UNS N26455	UNS S17400	UNS S15500	UNS S32900	UNS R20500	UNS R50400
	ASTM A743 Grade CN-3MN	ASTM A743 Grade CF-10 SMnN		ASTM A494 Grade CY5SnBIM	ASTM Grade CW-2M	ASTM A747 Grade CB7Cu-1	ASTM A747 Grade CB7Cu-2		ASTM A560 Grade 50Cr- 50Ni	ASTM B67 Grade C-2
C	0.03	0.10	0.15	0.05	0.02	0.07	0.07	0.20	0.10	0.10
Mn	2.00	7.00-9.00	4.00-6.00	1.5	1.00	0.70	0.70	1.00	0.30	
Si	1.00	3.50-4.50	3.00-4.00	0.5	0.80	1.00	1.00	0.75	1.00	
P	0.040	0.040	0.040	0.03	0.03	0.035	0.035	0.040	0.02	
S	0.010	0.030	0.040	0.03	0.03	0.03	0.03	0.030	0.02	
Cr	20.0-22.0	16.00- 18.00	15.0-18.0	11.0-14.0	15.0-17.5	15.50- 17.7	14.0- 15.50	23.0-28.0	48.0-52.0	
Ni	23.5-25.5	8.00-9.00	4.00-6.00	Balance	Balance	3.60-4.60	4.50-5.50	2.50-5.00	Balance	
Mo	6.0-7.0			2.0-3.5	15.0-17.5			1.00-2.00		
Cb						0.15-0.35	0.15-0.35			
Cu	0.75					2.50-3.20	2.50-3.20			
N	0.18-0.26	0.08-0.18	0.08-0.20			0.05	0.05		0.30	
Fe	Balance	Balance	Balance	2.00	2.00	Balance	Balance	Balance	1.00	0.30
Su				3.0-5.0						
Bi				3.0-5.0						
W					1.0					
Ti									0.50	Balance
Al									0.25	
Other										H = 0.015 N = 0.03 O = 0.25

E5 Metal alloys or metals other than the above may be as corrosion resistant as 300 Series Stainless steel. This may be shown when metal alloys or metals are tested in accordance with ASTM G31 Laboratory Immersion Corrosion Testing of Metals and have a corrosion rate of less than 10 mil per year. The test parameters such as the type of chemical(s), their concentration(s), and temperature(s) should be representative of cleaning and sanitizing conditions used in dairy equipment. Alloys containing lead, leachable copper, or other toxic metals should not be used.

J These diagrams are intended to demonstrate general principles only, and are not intended to limit individual ingenuity. The design used should conform to the sanitary requirements set forth in these 3-A Sanitary Standards. The following examples are included in this Appendix:

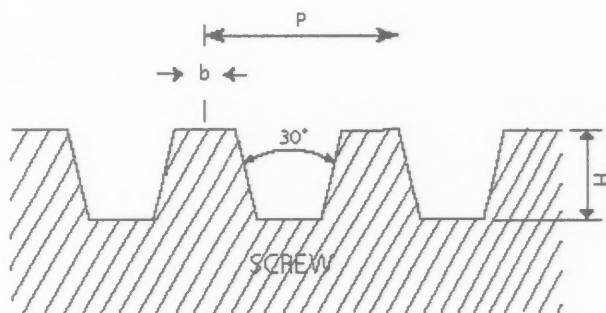
J1 American Standard Stub Acme Thread



P = PITCH	$P = 1/T.P.I.$
S.D. = SINGLE DEPTH	$S.D = 0.433 \times P$
T.F. = TOP FLAT	$T.F. = 0.250 \times P$
B.F. = BOTTOM FLAT	$B.F. = 0.227 \times P$
T.P.I. = THREADS PER INCH	

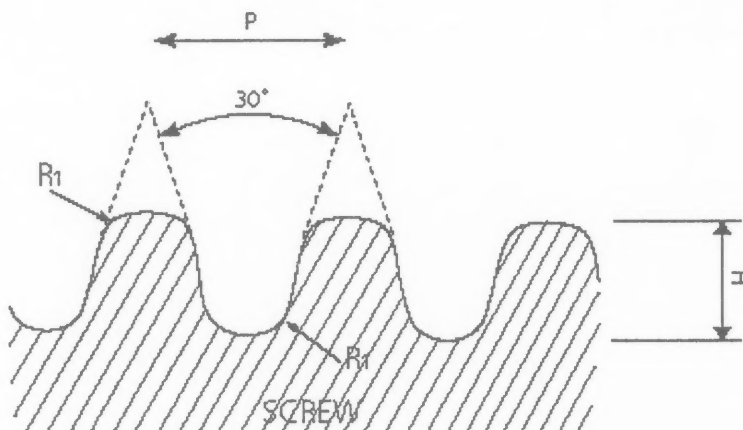
J2

Trapezoid Thread DIN103



P = Pitch	
H = Depth of thread	$H = 0.5 \times P$
b = Top / Bottom flat	$b = 0.37 \times P$

Knuckle Thread DIN405



$P = \text{Pitch}$

$H = \text{Depth of thread}$

$H = 0.5 \times P$

$R_1 = \text{Radius}$

$R_1 = 0.24 \times P$

The DIN standards can be ordered from the
Beuth Verlag GmbH, Burggrafenstrasse 6 D-10787 Berlin, Germany
or under: <http://www2.beuth.de>

K ENGINEERING DESIGN AND TECHNICAL CONSTRUCTION FILE

The following is an example of an engineering design and technical construction file (EDTCF) to be maintained by the fabricator as evidence of complying with 3-A Sanitary Standards or 3-A Accepted Practices. (The file may contain more or less information as applicable to the equipment or system.)

K1 Purpose

K1.1 To establish and document the material, fabrication, and installation (where appropriate) requirements for the engineering design and technical construction files for all products, assemblies, and sub-assemblies supplied by the manufacturer thereof to be in compliance with the sanitary criteria found in 3-A Sanitary Standards or 3-A Accepted Practices. It is recommended that the engineering and construction

file or files be submitted with applications for 3-A Symbol use authorization.

K2 Scope

K2.1 This EDTCF applies to equipment specified by:

K2.1.1 3-A Sanitary Standards for Centrifugal Separators and Clarifiers, Number 21-00.

K2.1.2 List all applicable 3-A Sanitary Standards and 3-A Accepted Practices.

K3 Responsibilities

K3.1 This EDTCF is maintained by: The Engineering Manager (or other company official) {name and title of responsible official} is responsible for maintaining, publishing, and distributing this EDTCF.

- K3.2 Implementation: All divisions, specifically development engineering, standards engineering, sales engineering, and product departments are responsible for implementing this EDTCF.
- K4 Applicability**
- K4.1 The 3-A Sanitary Standards and 3-A Accepted Practices are voluntarily applied as suitable sanitary criteria for dairy and food processing equipment. 3-A Sanitary Standards are referenced in the Grade A Pasteurized Milk Ordinance: "Equipment manufactured in conformity to 3-A Sanitary Standards complies with the sanitary design and construction standards of this Ordinance."
- K5 References**
- K5.1 List any additional regulations that apply to the equipment or system covered by this EDTCF.
- K5.2 Date of conformity or 3-A Symbol Authorization and certificate number, if authorized.
- K6 Design and Technical Construction File**
- K6.1 The Engineering Design and Technical Construction File may consist of the following:
- a. an overall drawing of the subject equipment;
 - b. full detailed drawings, accompanied by any calculations, notes, test results, etc. required to check the conformity of the equipment with the 3-A Standards or 3-A Practices;
 - c. a list of:
 - (1) the essential requirements of the standards or practices;
 - (2) other technical specifications, which were used when the equipment was designed;
 - d. a description of methods adopted;
 - e. if essential, any technical report or certificate obtained from a competent testing body or laboratory;
 - f. any technical report giving the results of tests carried out internally by Engineering or others;
 - g. documentation and test reports on any research or tests on components, assemblies and/or the complete product to determine and demonstrate that by its design and construction the product is capable of being installed, put into service, and operated in a sanitary manner (optional);
 - h. a determination of the foreseeable lifetime of the product (optional);
 - i. a copy of the instructions for the product (Instruction Manuals/ Instruction Books);
 - j. for serial manufacturing, the internal measures that will be implemented to insure that the equipment will continue to be manufactured in conformity to the provisions of the 3-A Sanitary Standards or 3-A Accepted Practices;
 - k. engineering reports;
 - l. laboratory reports;
 - m. bills of material;
 - n. wiring diagrams, if applicable;
 - o. sales order engineering files;
 - p. hazard evaluation committee reports, if executed;
 - q. change records;
 - r. customer specifications;
 - s. any notified body technical reports and certification tests;
 - t. copy of the 3-A Symbol authorization, if applicable;
 - u. independent third party cleanability study test results for centripetal pumps.
- K6.2 The file does not have to include detailed plans or any other specific information regarding the sub-assemblies, tooling, or fixtures used for the manufacture of the product unless a knowledge of them is essential for verification of conformity to the basic sanitary requirements found in 3-A documents.
- K6.3 The documentation referred to in K6.1 above need not permanently exist in a material manner in the EDTCF, but it must be possible to assemble them and make them available within a period of time commensurate with its importance (one week is considered reasonable time). As a minimum, each product EDTCF must physically contain an index of the applicable document of K6.1 above.
- K6.4 The EDTCF may be in hard copy or software form.
- K7 Confidentiality**
- K7.1 The EDTCF is the property of the manufacturer and is shown at their discretion, except that all or part of this file will be available to the 3-A Symbol Council or a regulatory agency for cause and upon request at a location determined by the manufacturer.

K8 File Location

K8.1 The EDTCF shall be maintained at {location}.

K9 File Retention

K9.1 The EDTCF (including all documentation referred to in K6.1) shall be retained and kept available for 12 years following the date of placing the product in use or from the last unit produced in the case of series manufacture.

L Water

Operation water should be from a safe water source.

M

There is no available technology to continuously bond or weld caulks (spacers) to disks without distortion. Manufacturers should develop technology for continuous welding or bonding caulks (spacers) to disks in a timely manner.

These standards are effective November 24, 2002.



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Procedures to
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**PROCEDURES
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ILLNESS**

Second Edition — 1996



Published by the
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Food Protection.

3-A® Sanitary Standards for Non-Coil Type Batch Processors, Number 25-03

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)
United States Department of Agriculture — Dairy Programs (USDA)

It is the purpose of the IAFIS, IAFP, USPHS, DIC and USDA in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Batch processor specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, DIC and USDA at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products, and other perishable foods or other fluid comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

A1 These standards cover sanitary aspects of non-coil type batch processors used to heat, cool, or process milk, fluid milk products, or other fluid comestibles. Batch processors may be either of the atmospheric or closed type. The latter may be operated at pressures from below to above that of the atmosphere.

A2 In order to conform to these 3-A Sanitary Standards, non-coil type batch processors shall conform to the following design, material, and fabrication criteria.¹

B DEFINITIONS

B1 *Batch Processor:* Shall mean a jacketed tank or vat provided with a heating and/or cooling jacket and agitation for the mixing and heat processing of milk, fluid milk products, or other fluid comestibles.

B2 *Product:* Shall mean milk, fluid milk products, or other fluid comestibles where heating and/or cooling are necessary.

B3 Surfaces

B3.1 *Product Contact Surfaces:* Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, diffuse, or be drawn into the product.

B3.2 *Nonproduct Contact Surfaces:* Shall mean all other exposed surfaces.

B3.3 *Lining:* Shall mean all surfaces used to contain the product, including the ends, sides, bottom, and top.

B3.4 *Shell:* Shall mean the material covering the exterior of the insulation and/or heat exchange jacket.

B3.5 *Breast:* Shall mean that portion of the metal used to join the top of the lining to the top of the shell.

B3.6 *Bridge:* Shall mean a cover on an open top type tank which is open on both sides and is permanently attached to the lining on opposite sides of the tank. It may be used to support a removable or nonremovable main cover(s) and accessories.

¹Use current revisions or editions of all referenced documents cited herein.

B4 Cleaning

B4.1 *Mechanical Cleaning or Mechanically Cleaned:* Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned by mechanical means.

B4.2 *Manual (COP) Cleaning:* Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses and tank(s) which may be fitted with recirculating pump(s), and with all cleaning aids manipulated by hand.

B5 *Control Area(s):* Shall mean the area(s) in which all appurtenances for the operation of the processor are located and vent lines terminate, except for top mounted agitators and shall be a part of one or more of the following:

B5.1 A processing area.

B5.2 An area in the plant at least the equivalent of a processing area.

B6 *Alcove(s):* Shall mean an extension of the control area(s) in which appurtenances and vent line openings are located.

B7 *Easily or Readily Removable:* Shall mean quickly separated from the equipment with the use of simple hand tools if necessary.

B8 *Easily or Readily Accessible:* Shall mean a location which can be safely reached by personnel from the floor, platform, or other permanent work area.

B9 *Bond:* Shall mean the adhesive or cohesive forces holding materials together. This definition excludes press and shrink fits.

B10 *Inspectable:* Shall mean all product contact surfaces can be made available for close visual observation.

B11 *Simple Hand Tools:* Shall mean implements such as a screwdriver, wrench, or mallet normally used by operating and cleaning personnel.

B12 *Nontoxic Materials:* Shall mean those substances which under the conditions of their use are in compliance with applicable requirements of the Food, Drug, and Cosmetic Act of 1938, as amended.

B13 *Corrosion Resistant:* Shall mean the surface has the property to maintain its original surface characteristics for its predicted service period when exposed to the conditions encountered in the environment of intended use, including expected contact with product and cleaning, sanitizing, or sterilization compounds or solutions.

C MATERIALS

C1 Metals

C1.1 Product contact surfaces, including the breast, shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series², (excluding 301 and 302), or corresponding Alloy Cast Institute (ACI) types³ (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

C2 Nonmetals

C2.1 Rubber and rubber-like materials may be used for measuring devices, slinger or drip shields, agitator guides, protective caps for openings (other than a personnel access port) and/or sanitary fittings, scraper blades, gaskets, seals, and parts having the same functional purposes.

C2.1.1 Rubber and rubber-like materials when used for the above-specified applications shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C2.2 Plastic materials may be used for bearings, measuring devices, slinger or drip shields, agitator guides, protective caps for openings (other than a personnel access port) and/or sanitary fittings, sight and light ports, scraper blades, gaskets, seals, and parts having the same functional purposes.

C2.2.1 Plastic materials when used for the above-specified applications shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

²The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, Table 2-1. Available from the American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412) 776-1535.

³Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.

C2.3 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C2.4 The adhesive, if used, for bonding rubber and rubber-like materials and bonded plastic materials shall be nontoxic.⁴

C2.5 Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon and/or ceramic materials may be used. Carbon and/or ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, and resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C3 Nonproduct Contact Surfaces

C3.1 Nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D FABRICATION

D1 Surface Texture

D1.1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds, and crevices in the final fabricated form. (See Appendix, Section F.)

D2 Permanent Joints

D2.1 Permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets free of imperfections such as pits, folds, and crevices.

D3 Bonded Materials

D3.1 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, or sterilization the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D4 Cleaning and Inspectability

D4.1 Processors having an inside height of more than 96 in. (244 cm) shall be provided with means for mechanical cleaning.

D4.2 Processors that are to be mechanically cleaned shall be designed so that the product contact surfaces of the processor, including the product contact surfaces of the opening for a vertical mechanical agitator, and all nonremoved appurtenances thereto can be mechanically cleaned and are easily accessible and readily removable and inspectable.

D4.3 Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Demountable parts shall be readily removable.

D4.4 Appurtenances having product contact surfaces shall be readily removable, or they shall be readily cleanable when assembled or installed, and shall be easily accessible for inspection.

D5 Gaskets

D5.1 Gaskets having a product contact surface(s) shall be removable or be bonded.

D5.2 Grooves in gaskets shall be no deeper than their width unless the gasket is readily removable and reversible for cleaning.

D5.3 Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6.35 mm) in depth or be less than 1/4 in. (6.35 mm) wide except those for standard O-rings smaller than 1/4 in. (6.35 mm), and those provided for in the 3-A Standards referenced in Sections D9.1, D10.7, and D11.1.

⁴Adhesives shall comply with 21 CFR 175—Indirect Food Additives, Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (202) 512-1800.

D6 **Radii**

- D6.1 Internal angles of less than 135° on product contact surfaces shall have radii of not less than 1/2 in. (12.70 mm), except that:
- D6.1.1 Minimum radii for fillets of welds in product contact surfaces may be 1/8 in. (3.18 mm) where the thickness of one or both parts joined is less than 3/16 in. (4.76 mm).
- D6.1.2 The radii in agitator shaft bottom support or guide and in gasket grooves or gasket retaining grooves for removable gaskets, except those for standard 1/4 in. (6.35 mm) and smaller O-rings, shall not be less than 1/8 in. (3.18 mm) and those provided in the 3-A Standards referenced in Sections D9.1, D.10.7, D11.1, D13.1 and D14.1.
- D6.1.3 Radii in standard O-ring grooves shall be as specified in Appendix, Section J.
- D6.1.4 Radii in nonstandard O-ring grooves shall be those radii closest to a standard O-ring as specified in Appendix, Section J.
- D6.1.5 The radii of covers shall be not less than 1/4 in. (6.35 mm).

D7 **Draining**

- D7.1 All product contact surfaces shall be self-draining except for normal adherence.
- D7.2 The lining shall remain in a relatively fixed position within the shell or body of the processor and shall be so constructed that it does not sag, buckle, or become distorted in normal use. The bottom of the lining shall have a minimum slope of 3/8 in. per foot (31.2 mm per m) toward the outlet.
- D7.3 The breast shall be integral with or continuously welded to the lining and shall be sloped so that drainage is away from the lining. The junction of the breast and the shell shall be continuously welded.

D8 **Threads**

- D8.1 There shall be no threads on product contact surfaces.

D9 **Fittings and Tubing**

- D9.1 Sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-.
- D9.2 Sanitary tubing shall conform to 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-.
- D9.3 Materials conforming to C2.1.1 or C2.2.1 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings, or vents.

D10 **Openings and Covers**

- D10.1 *Main Covers for Atmospheric-Type Processors:* Main covers (1) shall be of a type which can be opened and maintained in an open position, (2) shall be sufficiently rigid to prevent buckling, (3) shall be self-draining in the closed position, (4) shall be provided with an adequate, conveniently located and durable handle(s) of sanitary design, which are welded in place or formed into the cover materials, (5) shall have flanges extending downward not less than 3/8 in. (9.52 mm) along all edges and (6) shall be close fitting. The design shall be such that when raising the cover(s) any liquid on the top will not enter the processor. When the cover(s) is in its fully opened position, the drops of condensate formed on the underside of the cover(s) shall not drain into the processor.
- D10.2 *Bridges and Fixed Covers for Atmospheric-Type Processors:* Bridges and fixed covers shall pitch to the outside edge(s) of the processor for complete drainage, and shall have a raised flange not less than 3/8 in. (9.52 mm) in height where the edge(s) meets the main cover(s). The bridges and fixed covers shall be integral with or continuously welded to the lining, and shall be installed so the underside is accessible for cleaning and inspection without completely entering the processor.
- D10.3 *Personnel Access Port Covers and Openings:* An access port(s) shall be provided for closed type processors. If there is more than one control area, there shall be an access port accessible from the lowest control area. The inside dimensions of the access port(s) opening shall not be less than 15 by 20 in. (305 x 686 mm) oval, 12 by 27 in. (381 x 508 mm) elliptical, or 18 in. (457.2 mm) in diameter.
- D10.3.1 Covers for personnel access ports in the top of the processor shall be of the outside swing type and shall have downward flanges of not less than 3/8 in. (9.52 mm) along all edges and shall be close fitting.

- D10.3.2 Covers for access ports in sidewalls and/or ends shall be either of the inside or outside swing type. If the cover swings inside, it shall also swing outside, away from the opening. Threads or ball joints employed to attach the personnel access port cover(s) and its appendages shall not be located within the lining and be easily removable. The access port cover and its appendages shall be easily removable.
- D10.3.3 The sleeve or collar of an access port opening for an inside swing type of personnel access port cover shall be sloped so that liquids cannot accumulate. Processors with a capacity of 300 gal (1136 L) or less may have top opening personnel access ports having a diameter of not less than 16 in. (406 mm).
- D10.3.4 A handgrip shall be mounted externally on the processor near the access port in order to afford easy access to the processor interior.
- D10.4 Openings in the lining or in fixed covers or in bridges, or main covers of atmospheric-type processors, except those for agitators, openings with permanently attached sanitary pipeline fittings, and thermometers that remain in place while the product is in the processor shall be provided with removable covers which are designed to make close contact with the upper edges of the opening or cover surface. When the main cover is in an open position, the removable cover(s) shall remain in position.
- D10.5 The edges of openings in the top enclosure, main cover, or bridge shall extend upward at least 3/8 in. (9.52 mm) or be fitted with a permanently installed sanitary pipeline fitting. Openings that extend outward, generally horizontal, shall be fitted with a permanently installed sanitary pipeline fitting.
- D10.6 All openings in the processor lining shall be within a control area except for a top entering agitator. Openings for cleaning, overflow, and/or vent line(s) shall terminate in a control area. When the re-vent line method is used to prevent siphonage, the terminal ends of the cleaning, overflow, and/or vent line(s) in the control area shall be arranged or means provided to prevent liquids or objects being drawn up in the re-vent line. Sanitary vacuum relief valve(s), vent, re-vent, or overflow line(s) terminating in a control area shall be provided with a perforated cover having openings not greater than 1/16 in. (1.59 mm) diameter or slots not more than 1/32 in. (0.794 mm) wide. This cover(s) shall be designed so that parts are readily accessible and easily removable for cleaning. Woven wire mesh shall not be used for this purpose.
- D10.6.1 Sanitary vacuum relief valves shall conform to the applicable provision of the 3-A Sanitary Standards for Vacuum Breakers and Check Valves for Milk and Milk Products, Number 58-.
- D10.7 *Sight and Light Openings:* Sight and light openings shall conform to the applicable provisions of 3-A Sanitary Standards to Sight and/or Light Windows and Sight Indicators in Contact with Milk and Milk Products, Number 65-.
- D11 Instrument Connections**
- D11.1 Connections or openings shall be located in the top enclosure, cover, bridge, bottom, or through a sidewall. Thermometer wells may be used. Connections shall conform to the applicable fitting or connection defined in the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products Equipment, Number 74-.
- D11.2 When thermometers are installed through the sidewall, the location shall be such that the thermometer(s) is easily readable. Thermometer connections and/or openings shall be located so that the thermometer is not influenced by the heating or cooling medium.
- D11.3 A pressure or level sensor, if provided, shall conform to the applicable provisions of the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products Equipment, Number 74-.
- D12 Valves**
- D12.1 The inside diameter of the outlet passage of processors shall not be less than the nominal inside diameter of a 1.5 in. (38.1 mm) (1.402 in. 35.6 mm) 3-A Sanitary Fitting. The outlet shall be in a position that will provide complete drainage of the processor.
- D12.2 Valves if provided, shall conform to the applicable provisions of the 3-A Sanitary Standards for (1) Plug-Type Valves for Milk and Milk Products, Number 51-, (2) Plastic Plug-Type Valves for Milk and Milk Products, Number 52-, (3) Compression-Type Valves for Milk and Milk Products, Number 53-, (4) Diaphragm-Type Valves for Milk and Milk Products, Number 54-, (5) Boot Seal-Type Valves for Milk and Milk Products, Number 55-, (6) Inlet and Outlet Leak-Protector Plug-Type Valves for Milk and Milk Products, Number 56-, and (7) Tank Outlet Valves for Milk and Milk Products, Number 57-.

- D12.3 The outlet valve shall be removable for cleaning. The outlet valve shall be considered removable when secured by not more than four hex nuts.
- D13 Spray Devices**
- D13.1 Spray devices, if supplied, shall conform to the applicable provisions of the 3-A Sanitary Standards for Spray Devices to Remain in Place, Number 78.
- D14 Rupture Disks**
- D14.1 Rupture disks, if supplied, shall conform to the applicable provisions of the 3-A Sanitary Standards for Rupture Disks for Milk and Milk Products, Number 60-.
- D15 Agitators**
- D15.1 Agitators shall conform to the applicable provisions of the 3-A Sanitary Standards for Shear Mixers, Mixers, and Agitators, Number 73-.
- D16 Supports**
- The means of supporting a processor shall be one of the following:
- D16.1 *With legs:* If legs are used, they shall be smooth with rounded ends or with a flat load-bearing foot suitable for sealing to the floor and have no exposed threads. Legs made of hollow stock shall be sealed. Legs shall be of a length that will provide a clearance (1) between the floor and the bottom of the processor or (2) between the floor and the lowest point of the agitator or the agitator drive on processors having bottom entering agitators, of at least 6 in. (152.4 mm) if the processor is 72 in. (183 cm) or less in diameter or width or at least 8 in. (203.2 mm) if the processor is more than 72 in. (183 cm) in diameter or width.
- D16.2 If the base of the processor is mounted on a slab or island and shall be designed for sealing to the slab or island (see Appendix, Section G). Cone bottomed processors and processors with bottom mounted agitators shall not be mounted on a slab or an island.
- D17 Nonproduct Contact Surfaces**
- D17.1 Nonproduct contact surfaces shall be relatively smooth, free of pockets and crevices, and be readily cleanable and those to be coated shall be effectively prepared for coating. All seams and openings shall be effectively sealed against moisture and vermin.
- D17.2 All seams and openings in the shell shall be effectively sealed against the entrance of moisture and extraneous material.
- D17.3 The control area and alcove, or if there is more than one, the lowest shall be at an elevation that will include the lowest vertical portion of the processor. Alcove(s) shall be fabricated of stainless steel with the lower portion pitched for adequate drainage and be of sufficient size for access to all fittings and accessories located within the alcove(s) control areas.
- D17.3.1 If the processor is designed to be installed partially outside the processing area, it shall be provided with a wall flange or other suitable member to allow sealing the opening into the process area.
- D17.4 A guard(s) required by a safety standard that will not permit accessibility for cleaning and inspection shall be designed so it (they) can be removed without tools. The machine shall be designed so that when guards are removed, OSHA lockout/tagout regulations⁵ can be followed.
- D18 Information Plate**
- D18.1 Processors shall have an information plate permanently affixed in juxtaposition to the nameplate giving the following applicable information.
- D18.1.1 If the vessel is a processor at the time of manufacture.
- D18.1.2 The maximum operating pressure and/or vacuum under which a closed type processor may be safely operated.
- D18.2 All information plates and nameplate shall be attached and sealed to an exterior surface.
- D18.3 If designed for sterilization.

APPENDIX

E STAINLESS STEEL MATERIALS

- E1 Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series Cast grades of

⁵29 CFR 1910.147 The Control of Hazardous Energy. Document for sale by the; Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (202) 512-1800.

stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM⁶ specifications A351/A351M, A743/A743M, and A744/A744M.

E2 **TABLE 1**

WROUGHT PRODUCTS TYPICALLY USED			
UNS #	ASTM ⁶	AISI/SAE ²	Properties
S30300	A-582	303	Free-Machining S.S.; Austenitic
S30400	A-276 A-666	304	Austenitic S.S.
S30403	A-276 A-666	304L	Low Carbon Austenitic S.S.
S31600	A-276 A-666	316	Austenitic S.S. plus Mo*
S31603	A-276 A-666	316L	Low Carbon Austenitic S.S. plus Mo*

*Molybdenum

E3 **TABLE 2**

CAST PRODUCTS			
UNS #	ASTM ⁶	ACT ³	Common Names
J92500	A-351 A-743 A-744	CF-3	Cast 304L
J92800	A-351 A-743 A-744	CF-3M	Cast 316L
J92600	A-351 A-743 A-744	CF-8	Cast 304
J92900	A-351 A-743 A-744	CF-8M	Cast 316
J92180	A-747	CB7 Cu — 1	Cast 17-4 PH
J92110	A-747	CB7 Cu — 2	Cast 15-5 PH
N26055	A-494	CY5Sn BiM	Alloy 88
J92701	A-743	CF-16F	Free Machining Austenitic S.S.

⁶Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Phone: (610) 832-9500.

F **PRODUCT CONTACT SURFACE FINISH**

F1 Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D1 herein. A maximum R_a of 32 $\mu\text{in.}$ (0.80 μm), when measured according to the recommendations in American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)⁷ B46.1 - Surface Texture, is considered to be equivalent to a No. 4 finish.

F2 Sheets of 2B (cold rolled) stainless steel, inspected and selected to be free of pits, folds and crevices are generally found to be as smooth as or smoother than stainless steel sheets with a No. 4 ($R_a \leq 32 \mu\text{in.}$ or $\leq 0.80 \mu\text{m}$) finish and are acceptable for the fabrication of equipment if free of imperfections.

G **SLABS OR ISLANDS**

When the processor is designed to be installed on a slab or island, the dimensions of the slab or island should be such that the base of the processor will extend beyond the slab or island at least one in. in all horizontal directions. The slab or island should be of sufficient height so that the bottom of all product connections are not less than 4 in. (101.6 mm) above the floor. The surface of the slab or island should be coated with a thick layer of waterproof mastic material, which will harden without cracking. The junction of the processor base and the slab or island should be sealed.

H **ACCESS**

Means should be provided for access to a personnel access port and a sight and/or light glass when one or both are provided.

I **RESERVED**

E4 **TABLE 3 OPTIONAL METAL ALLOYS**

Optional metal alloys having the following compositions are examples considered in compliance with Section C herein. (Percentages are maximum unless range is given.)

	UNS N0836 7	UNS S21800	UNS S20161	UNS N26055	UNS N26455	UNS S17400	UNS S15500	UNS S32900	UNS R20500	UNS R50400
	ASTM A743 Grade	ASTM A743 Grade		ASTM A494 Grade	ASTM A494 Grade	ASTM A747 Grade	ASTM A747 Grade		ASTM A560 Grade	ASTM B67 Grade
	CN- 3MN	CF-10MnN		CY5SnBIM	CW-2M	CB7Cu-1	CB7Cu-2		50Cr- 50Ni	C-2
C	0.03	0.10	0.15	0.05	0.02	0.07	0.07	0.20	0.10	0.10
Mn	2.00	7.00-9.00	4.00-6.00	1.5	1.00	0.70	0.70	1.00	0.30	
Si	1.00	3.50-4.50	3.00-4.00	0.5	0.80	1.00	1.00	0.75	1.00	
P	0.040	0.040	0.040	0.03	0.03	0.035	0.035	0.040	0.02	
S	0.010	0.030	0.040	0.03	0.03	0.03	0.03	0.030	0.02	
Cr	20.0- 22.0	16.00-18.00	15.0-18.0	11.0-14.0	15.0-17.5	15.50-17.7	14.0-15.50	23.0-28.0	48.0-52.0	
Ni	23.5- 25.5	8.00-9.00	4.00-6.00	Balance	Balance	3.60-4.60	4.50-5.50	2.50-5.00	Balance	
Mo	6.0-7.0			2.0-3.5	15.0-17.5			1.00-2.00		
Cb						0.15-0.35	0.15-0.35			
Cu	0.75					2.50-3.20	2.50-3.20			
N	0.18- 0.26	0.08-0.18	0.08-0.20			0.05	0.05		0.30	
Fe	Balance	Balance	Balance	2.00	2.00	Balance	Balance	Balance	1.00	0.30
Sn				3.0-5.0						
Bi				3.0-5.0						
W					1.0					
Ti									0.50	Balance
Al									0.25	
Other										H = 0.015 N = 0.03 O = 0.25

E5 Metal alloys or metals other than the above may be as corrosion resistant as 300 Series Stainless steel. This may be shown when metal alloys or metals are tested in accordance with ASTM G31 Laboratory Immersion Corrosion Testing of Metals and have a corrosion rate of less than 10 mil per year. The test parameters such as the type of chemical(s), their concentration(s), and temperature(s) should be representative of cleaning and sanitizing conditions used in dairy equipment. Alloys containing lead, leachable copper, or other toxic metals should not be used.

J O-RING GROOVE RADII

TABLE 4 — Minimum Groove Radii Dimensions for Standard O-Rings

O-Ring Cross Section, Nominal (AS 568 ^a)	O-Ring Cross Section, Actual (AS 568)	O-Ring Cross Section, Actual (ISO 3601-1 ^b)	Minimum Groove Radius
1/16 in.	0.070 in.	1.80 mm	0.016 in. (0.406 mm)
3/32 in.	0.103 in.	2.65 mm	0.031 in. (0.787 mm)
1/8 in.	0.139 in.	3.55 mm	0.031 in. (0.787 mm)
3/16 in.	0.210 in.	5.30 mm	0.062 in. (1.575 mm)
1/4 in.	0.275 in.	7.00 mm	0.094 in. (2.388 mm)

K ENGINEERING DESIGN AND TECHNICAL CONSTRUCTION FILE

The following is an example of an engineering design and technical construction file (EDTCF) to be maintained by the fabricator as evidence of conforming to 3-A Sanitary Standards or 3-A Accepted Practices. (The file may contain more or less information as applicable to the equipment or system.)

K1 Purpose

K1.1 To establish and document the material, fabrication, and installation (where appropriate) requirements for the engineering design and technical construction files for all products, assemblies, and sub-assemblies supplied by the manufacturer thereof to be in compliance with the sanitary criteria found in 3-A Sanitary Standards or 3-A Accepted Practices. It is recommended that the engineering and construction file or files be submitted with applications for 3-A Symbol use authorization.

K2 Scope

K2.1 This EDTCF applies to equipment specified by:

K2.1.1 3-A Sanitary Standards for Non-Coil Type Batch Processors for Milk and Milk Products, Number 25-03.

K3 Responsibilities

K3.1 This EDTCF is maintained by: The Engineering Manager (or other company official) {name and title of responsible official} is responsible for maintaining, publishing, and distributing this EDTCF.

K3.2 Implementation: All divisions, specifically development engineering, standards engineering, sales engineering, and product departments are responsible for implementing this EDTCF.

K4 Applicability

K4.1 The 3-A Sanitary Standards and 3-A Accepted Practices are voluntarily applied as suitable sanitary criteria for dairy and food processing equipment. 3-A Sanitary Standards are referenced in the Grade A Pasteurized Milk Ordinance: "Equipment manufactured in conformity to 3-A Sanitary Standards complies with the sanitary design and construction standards of this Ordinance."

K5 References

K5.1 List any additional regulations that apply to the equipment or system covered by this EDTCF.

K5.2 Date of conformity or 3-A Symbol Authorization and certificate number, if authorized.

K6 Design and Technical Construction File

K6.1 The Engineering Design and Technical Construction File may consist of the following:

- a. an overall drawing of the subject equipment;
- b. full detailed drawings, accompanied by any calculations, notes, test results, etc. required to check the conformity of the equipment with the 3-A Standards or 3-A Practices;
- c. a list of:
 - (1) the essential requirements of the standards or practices;
 - (2) other technical specifications, which were used when the equipment was designed;
- d. a description of methods adopted;

^aThe document establishing these standard dimensions is Aerospace Standard (AS) 568, published by SAE, 400 Commonwealth Drive, Warrendale, PA 15086 (412-776-4970).

^bThe document establishing these standard dimensions is ISO 3601-1: published by the International Organization for Standardization (ISO), 1 Rue de Varembe, Case Postale 58, CH 1 1211, Geneva, Switzerland (41-22-734-1240).

¹Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017-2392 (212) 705-7722.

- e. if essential, any technical report or certificate obtained from a competent testing body or laboratory;
 - f. any technical report giving the results of tests carried out internally by Engineering or others;
 - g. documentation and test reports on any research or tests on components, assemblies and/or the complete product to determine and demonstrate that by its design and construction the product is capable of being installed, put into service, and operated in a sanitary manner (optional);
 - h. a determination of the foreseeable lifetime of the product (optional);
 - i. a copy of the instructions for the product (Instruction Manuals/Instruction Books);
 - j. for serial manufacturing, the internal measures that will be implemented to insure that the equipment will continue to be manufactured in conformity to the provisions of the 3-A Sanitary Standards or 3-A Accepted Practices;
 - k. engineering reports;
 - l. laboratory reports;
 - m. bills of material;
 - n. wiring diagrams, if applicable;
 - o. sales order engineering files;
 - p. hazard evaluation committee reports, if executed;
 - q. change records;
 - r. customer specifications;
 - s. any notified body technical reports and certification tests;
 - t. copy of the 3-A Symbol authorization, if applicable
- K6.2 The file does not have to include detailed plans or any other specific information regarding the sub-assemblies, tooling, or fixtures used for the manufacture of the product unless a knowledge of them is essential for verification of conformity to the basic sanitary requirements found in 3-A documents.
- K6.3 The documentation referred to in KY6.1 above need not permanently exist in a material manner in the EDTCF, but it must be possible to assemble them and make them available within a period of time commensurate with its importance (one week is considered reasonable time). As a minimum, each product EDTCF must physically contain an index of the applicable document of K6.1 above.
- K6.4 The EDTCF may be in hard copy or software form.
- K7 **Confidentiality**
- K7.1 The EDTCF is the property of the manufacturer and is shown at their discretion, except that all or part of this file will be available to the 3-A Symbol Council or a regulatory agency for cause and upon request.
- K8 **File Location**
- K8.1 The EDTCF shall be maintained at {address}.
- K9 **File Retention**
- K9.1 The EDTCF (including all documentation referred to in K6.1) shall be retained and kept available for 12 years following the date of placing the product in use or from the last unit produced in the case of series manufacture.

These standards are effective November 24, 2002.

Coming Events

DECEMBER

• **9-11, SQF HACCP/Quality Code Extension**, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.

• **16-18, Microbiology III: Foodborne Pathogens**. Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.

JANUARY

• **13-14, HACCP 1: Documenting Your HACCP Prerequisite Program**, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246, ext. 5028; E-mail: minglis@gftc.ca.

• **22-23, ServSafe® for the Food Industry and Food Service**, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246, ext. 5028; E-mail: minglis@gftc.ca.

• **26-29, National Mastitis Council 42nd Annual Meeting**, Fort Worth, TX. For more information, call 608.224.0622.

FEBRUARY

• **17-19, 29th Annual ABC Research Corporation Technical Seminar**, DoubleTree Hotel, Orlando, FL. For more information, contact Jim Rorie at 352.372.0436, ext. 337; E-mail: info@abcr.com.

• **18-20, California Association of Dairy and Milk Sanitarians Industry Conference**, Radisson Hotel, Stockton, CA. For more information, contact John Bruhn at 209.957.9090.

MARCH

• **12-14, Michigan Environmental Health Association 59th Educational Conference**, Valley Plaza Hotel, Midland, MI. For more information, contact Bruce DuHamel at 989.831.3637.

APRIL

• **2-4, Missouri Milk, Food and Environmental Health Association Annual Educational Conference**, Ramada Inn, Columbia, MO. For more information, contact Linda Haywood at 417.829.2788.

MAY

• **6-8, PACex International**, Toronto International Centre, Toronto, Canada. For more information, contact Maria Tavares at 416.490.7860 ext. 219; E-mail: mtavares@pacexinternational.com.

• **8-11, 3rd International Exhibition and Conference for Food Technology**, International Trade Fairs Ground (Hall 2), Cairo, Egypt. For more information, contact Mahmoud Helmy at 202.30.50.898; E-mail: info@agd-exhibitions.net.

• **13-14, Pennsylvania Association of Milk, Food and Environmental Sanitarians Spring Meeting**. For more information, contact Eugene Frey at 717.397.0719.

JUNE

• **14-18, Association of Food and Drug Officials**, Chicago, IL. For more information, call 717.757.2888.

• **25-27, South Dakota Environmental Health Association Annual Meeting**, Ramkota Convention Center, Pierre. For more information, contact Clark Hepper at 605.773.3364.

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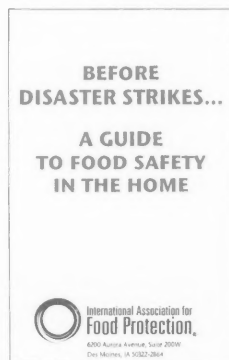
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