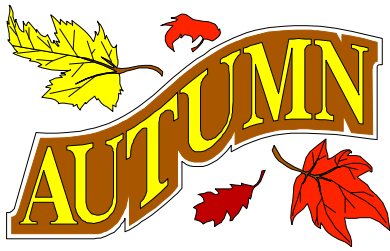


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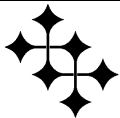
A Newsletter from the
Computer Integrated Food Manufacturing
Center and Pilot Plant
at Purdue University

October 2001
Volume 3, Issue 3

INProcess

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Contact us at:

CIFMC / Pilot Plant
Department of Food
Science

1160 Food Science Building
Purdue University
West Lafayette, Indiana 47907
Tel: (765) 494-9093
Fax: (765) 494-7953
E-Mail: CIFMC@purdue.edu
<http://cifmc.foodsci.purdue.edu>

Food Safety Engineering Research

Over the past year, CIFMC engineers have been working with microbiologists to develop a process for pasteurizing packaged, sliced bologna.

Low levels of food-borne pathogens such as *L. monocytogenes* on the surface of ready-to-eat (RTE) meats can be life threatening, particularly to immune-compromised individuals, the elderly and unborn fetuses. Under current manufacturing practice, surface contamination of sliced RTE meats can occur before final packaging via aerosols or handling after the product has been pasteurized.

Clearly, packaged RTE meat products must be free of all viable pathogenic microorganisms. Yet, there are currently no suitable methods available for rapid (under one minute) detection of *L. monocytogenes* in concentrations of 1 CFU/g or less that could be used to segregate contaminated product in a production environment.

This research is a part of the effort to develop a "virtual" sensor, using validated microbiological and engineering models, that predicts the reduction of microorganisms during heat pasteurization of post-packaged sliced bologna.

Last month the preliminary results of our research in this area have been presented at a USDA Symposium in Indianapolis, Indiana. At this point, we have completed and validated a numerical model to predict the evolution of the temperature field over time during pasteurization and a thermal-death-time model for *L. monocytogenes* in high and low fat formulations of bologna. Over the next several months, we expect to complete our research and have a viable post-package pasteurization process for the RTE meat industry that optimizes safety, product quality and shelf life. ☐

Inline Viscosity and pH sensor research

The CIFM center at Purdue is continuing its research on inline sensors. Recently, the CIFMC completed a series of experimental studies characterizing the properties of yogurt during fermentation and production using inline sensors.

Continuous measurement of pH during fermentation has not been possible in commercial manufacturing because of (1) the inability to use glass electrodes in products and (2) the damage to pH electrodes from clean-in-place (CIP) procedures.

Endress+Hauser (Greenwood,

Log onto <http://cifmc.foodsci.purdue.edu> for previous issues of *INProcess*.
Send e-mail to CIFMC@Purdue.edu for an e-mail subscription

IN) has been developing a non-glass pH electrode that uses solid-state microelectronics technology called Ion-selective Field Effect Transistor (IsFET). The electrode can be placed in direct contact with food for pH measurement and the probe can be retracted into a sealed compartment for specialized cleaning.

Within the last several months, the CIFMC has been conducting various studies on the IsFET electrode. When compared to a traditional glass electrode, the IsFET electrode performed comparably during continuous monitoring of pH during yogurt fermentation. Thus, the IsFET probe represents a viable solution for manufacturers who would like to continuously and automatically monitor the progress of fermented dairy products. The results of these studies will be presented at the WorldExpo Trade Show in Chicago this month. Further research projects with the IsFET probe will include cleanability studies and development of guidelines for using the non-glass pH sensor for specific food industry applications.

After yogurt fermentation is complete, it is often useful to know the rheological properties of the product. The rheological properties of yogurt are a particularly difficult to measure on-line owing to the fact that yogurt is shear-sensitive and exhibits a yield stress.

We have conducted studies that compare the performance of various inline process viscometers to that given by offline instruments. The results of our

research in this area are expected to help food manufacturers decide which methods are most appropriate given their product characteristics. We are planning to submit the results of our experimental research in viscosity measurement during yogurt fermentation for presentation at the 2002 Institute of Food Technologists meeting in Anaheim, CA. ☐

For more information about the CPS401 IsFET probe please visit the Endress+Hauser web site at <http://www.us.endress.com>

Rockwell Automation and JCS Controls Donate Products

The CIFM center at Purdue has recently received a \$50,000-worth equipment donation from Rockwell Automation Inc. (Milwaukee, WI). This donation included a state-of-the-art Allen-Bradley ControlLogix system to be used as a supervisory control and data acquisition station in the pilot plant facility. The system will bring DeviceNET and ControlNET capabilities to the industrial control infrastructure at the pilot plant. The system will also be capable of transferring live processing data via OPC/SQL/Ethernet and Foundation Fieldbus networks. The system will have a large number of different Input/Output modules for various pilot plant and research applications.

The new ControlLogix system will replace the existing Programmable Logic Controller (PLC) system and will become an

integral part of the fully integrated industrial network at Purdue. The CIFM center, however, will keep its existing PLC system to be used for PLC-specific research activities.

JCS Controls Inc. (Rochester, NY) has agreed to manufacture a stainless steel NEMA-4 mobile enclosure for the ControlLogix system and associated equipment. The new system will be used for class demonstrations, research projects and outreach activities, including the food process automation workshop. The system is to arrive at Purdue shortly! ☐

For more information about the ControlLogix automation system please visit the Allen-Bradley web site at <http://www.ab.com/plclogic/clogix/controllogix.html>

Please make sure to visit the Rockwell Automation Inc. web site at <http://www.rockwell.com>

Please make sure to visit the JCS Controls Inc. web site at <http://www.jcs.com>

Conference on Food Engineering

Dr. Tim Haley, Director of the CIFMC, will be giving a presentation entitled "Control System Validation, A Food Industry Perspective" during the *Sensors and Controls in the Food Industry Tutorial* session at the 7th Conference on Food Engineering (CoFE) to be held November 4-9, 2001 in Reno, Nevada. The presentation on November 8th will highlight the food industry's response to the recent 21 CFR 11 regulations required documented evidence of control system validation for

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systems designed to keep processing records electronically.☺

More information about the conference can be found at <http://www.aiche.org/annual/topical/cofe.htm>

CIFMC manager presents at FRSUG

Sasha V. Ilyukhin, manager of the CIFMC center, recently gave a presentation at the Fisher-Rosemount Systems Users Group Meeting in New Orleans, LA. The presentation was entitled "Benefits and Challenges of Using the Delta V System in an Academic Environment". Mr. Ilyukhin was a keynote speaker at the Food and Beverage session meeting. Attendees included representatives from various food manufacturing companies, equipment vendors and system integrators.

In his presentation Mr. Ilyukhin discussed how the Delta V system is used in various activities conducted by the CIFMC center at Purdue University including research, education and outreach endeavors. Currently, the Food Science Department at Purdue operates most of its batch and continuous processes in the pilot plant by using the Delta V control system. The system is also a logical center of the Department's control network that employs advanced industrial communication protocols such as Foundation Fieldbus.

The presentation covered various functional aspects provided by Delta V that are of timely importance to the food

industry, including control system validation, good automated manufacturing practice, electronic record-keeping, integration with legacy control systems, change control, audit trails and security.

Mr. Ilyukhin also described the benefits of using the Delta V system in a pilot-scale food-processing environment. The system allows process automation projects be conducted quickly and easily, which is a tremendous quality for a pilot plant operation. The system also allows deep customization of both its hardware and software, which is extremely beneficial for conducting scientific research. The Delta V system support a wide variety of industrial standards and communication protocols, thus providing its users with the freedom of utilizing the cutting-edge automation technology available on today's market.

Mr. Ilyukhin also demonstrated how Foundation Fieldbus technology is used at Purdue University and the potential benefits that digital bus communication protocols can bring to the food industry. Foundation Fieldbus currently serves as a backbone of the process control network of the Food Science Department at Purdue. Because of the advanced capabilities of the Foundation Fieldbus transmitters, the CIFMC center reduced the device maintenance time by at least 50%.

Finally, the challenges faced by the food industry in adopting cutting-edge automation technologies offered by the Delta V system, have been discussed. A

few suggestions to be included in the next version of the Delta V system have also been presented.☺

Please make sure to visit the Fisher-Rosemount Systems Users Group web site at <http://www.frsug.org/>

For more information about the Delta V automation system please visit <http://www.easydeltav.com>.

For more information about Foundation Fieldbus please check the Fieldbus Foundation website at <http://www.fieldbus.org>.

New Equipment

• Borden Research Center donation

Recently, the food science pilot plant has received a significant equipment donation from Borden research Center in Columbus, OH. Most of the equipment has been donated due to the closure of Borden's research facilities in Columbus.

As a part of this donation, the following equipment has been received by the Food Science Department at Purdue:

- Stephan Bench top mixer,
- APV Homogenizer
- Various high shear mixers
- Four Waukesha Sine and Parastaltic Pumps,
- Bench top fryer
- Hobart Vertical Chopper
- Pasta cooker
- Two variable speed Lee agitated kettles
- Hobart mixers and attachments
- Induction sealer
- Colloid Mill
- Coating drum
- Miscellaneous items: stainless pails, brushes, trays, plastic containers,

bags, carts, gloves, hoses and spoons. ☐

• **Con Agra donates filler system**

Con Agra Inc. (Indianapolis IN) has recently donated a glovebox filler system to Purdue University Food Science pilot plant. This system will be combined with an aseptic processing system already existing at Purdue, and will be used for research projects in aseptic processing of foods. ☐

• **Companies donate cut-away equipment sections**

Waukesha Cherry-Burrell Inc. (Delavan, WI) has recently donated several cut-away sections of heat exchangers to Purdue University. These sections will be used for demonstration purposes during lectures, laboratory sessions, and workshops, such as the Aseptic Processing and Packaging Workshop held at Purdue once a year.

Fristam Pumps Inc. (Middleton, WI) has donated a cut-away centrifugal pump to Purdue University to be used for teaching and outreach activities conducted by the Food Science Department and the CIFM center at Purdue. ☐

Advanced Manufacturing Summit

Purdue University will host an Advanced Manufacturing Summit on March 19-20,2002. This event will bring together professionals from a wide variety of manufacturing sectors to discuss

Upcoming Aseptic Workshop

We are gearing up for our 19th annual aseptic processing workshop to be held in the new Food Science building and pilot plant on May 13-16, 2002. The workshop will consist of lecture and hands-on laboratory session. Some of the topics will include:

- Microbiological Principles in Aseptic Processing
- Chemical Considerations of Aseptic Processing
- Aseptic Packaging Technology
- Principles of Thermal Processing as Related to Aseptic Processing
- Thermal Process Calculations
- Quality Assurance and FDA Regulations for Aseptic Processing and Packaging

The hands-on laboratory sessions will include quality evaluation, packaging, engineering concepts and equipment features. A Social Mixer and Dinner are included. For more information, contact Steve Smith at (765) 494-8256 or smithrs@foodsci.purdue.edu.

common problems and issues in manufacturing.

The Summit is free and open to anyone interested in manufacturing issues. Various sessions will focus on the following topics: Legislative Issues, Worker Issues, Distribution, Processing Technology, Environmental Issues, Information Technology Development, Community Issues, Engineering and Technology, Production, Logistics and Emerging Technologies.

In addition, there will be opportunities to discuss issues specific to various industry sectors such as: Agricultural Products, Steel/Aluminum and Base Materials, Automotive, Health Products and Food Processing. It is anticipated that speakers will include representatives from the

Indiana State Government, Purdue University administration and executives from large and small Indiana-based manufacturing industries.

The CIFMC is actively participating in the Summit and will co-chair the Food Processing sessions. More information will be available in the coming months. If you are interested in attending this Summit, please contact the CIFMC at CIFMC@Purdue.edu. Please indicate your desire to be placed on a mailing list to receive an invitation and other materials as they become available. ☐