Deboned breast fillets are one of the most popular further processed poultry products. However, sometimes bones missed during screening end up in the final product. This may be due to the fact that current screening methods are carried out post production by visual/manual or x-ray screening. The manual technique is error prone, and while the performance of x-ray systems has improved significantly, they are still expensive. Additionally, in most installations, it is difficult to tie the occurrence of a bone back to the root cause of the problem. Researchers at the Georgia Tech Research Institute (GTRI) believe they may be on the verge of having a solution. Their Cone Line Screening System automatically inspects for bones on the frame on the deboning line, providing immediate feedback to deboners on their individual performance and the overall efficiency of the line.

The screening system is also being adapted to estimate yield. Currently, the GTRI team is working on reliably measuring the yield of deboners in training, so that the poultry plant is able to monitor the performance of each individual. The team is also working on parametrizing deboner fatigue based on the yield, so that plants can implement objective rotation schemes.

“We are proposing a new approach to product screening that allows for automatic screening on the cone line for bone and other process parameters to enhance line efficiency in a holistic way. This is accomplished by inspecting the frame on the cone immediately after the meat has been removed,” says Dr. Wayne Daley, associate division chief of GTRI’s Food Processing Technology Division. “This not only allows for quicker detection of bones remaining on the frame, but also provides an opportunity for real-time monitoring of production yield and other significant process parameters that influence overall productivity.”

Daley and a team of fellow researchers together with a local equipment manufacturer began the development effort in early 2008 in response to the poultry industry’s concern of missed bones in final product, particularly the clavicle and fan bones.

A Spring 2008 PoultryTech article (http://www.atrp.gatech.edu/pt20v1sp08/20-1_p2.html) detailed the proof-of-concept “Missed Bone Screening System” and its potential as an automated alternative for quality control. In a nutshell, the system uses a special cone with internal illumination that backlights the frame producing the continued on page 2
appearance of an x-ray image that clearly shows any bones remaining on the frame. These suspect fillets can then be removed for closer examination, which would reduce the probability that bones would end up in the output product. The system was tested off-line and found to be 92.5 percent accurate, with a false positive rate of 0.5 percent.

Encouraged by these results, the team proceeded to further develop the system for actual implementation in a production environment. This required several modifications to the original prototype system design.

In addition to integrating the system onto a fully functional cone line, the research team redesigned the illuminated cone in an attempt to improve its maintainability. Besides the plastic cone developed for the proof-of-concept design, the team designed a hollow stainless steel cone. The design of the cone was improved by setting a single light source, rather than setting a light source on each cone, which reduces cost and complexity. In operation, the hollow cone passes over the light source, where a signal triggers the system’s near-infrared cameras and LEDs to capture an image of the frame.

Tests at a Georgia poultry processing plant were recently conducted to evaluate the system’s performance in an actual production environment, specifically its ease of use, detection accuracy, and yield characterization ability. Results are pending.

If successful, researchers believe the system will provide processors the ability to exercise more control over their production by obtaining real-time control on the condition of the frames, which would provide information on the status of their production process (whether or not it is in or out of control). This should improve yield and reduce the possibility of bones and other undesirable products from the process ending up in the downstream output, decreasing the need for additional screening. This would also be a perfect solution for automated deboning systems to implement feedback control in the operation of devices.

One of the things that stands out as I reflect on the past twelve months of activity within the Agricultural Technology Research Program (ATRP) is the incredible level of support that we receive from our industrial partners. The members of the ATRP Advisory Board are an invaluable resource as they provide guidance on the overall direction of the research, outreach, education, and technical assistance activities of the program. They serve as trusted advisors helping us to identify the key issues and technical hurdles that need to be addressed in order to keep the poultry and food industries strong here in the state of Georgia. While the Advisory Board serves as the collective sounding board for the program, I have gotten to know many of the individual members and gleaned significant insight into the complexities of the industry from their years of experience. To the members of the Advisory Board, we want to say “Thank You” for investing your time and resources into both the people and activities that make ATRP a relevant and effective program.

There are also many others who support ATRP by providing industry expertise, supplying sample product for testing, providing access to people and facilities for systems evaluations, partnering on projects, collaborating on systems designs and manufacturing, and by providing essential feedback on ideas and approaches. All of you are an integral part of delivering topnotch research and service through ATRP. We sincerely appreciate the many friendships we have and the support you provide to the ATRP program.

We certainly don’t say it enough, but we are extremely thankful for all of our industrial partners and for all that you do in support of ATRP and our researchers and staff. Thank you!

Dr. Doug Britton
ATRP Program Manager

Email any suggestions, comments, or questions to: poultrytech@gtri.gatech.edu

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Novel Separation Technologies: Capturing Value-Added Byproducts from Poultry Processing Liquid Streams

Millions of gallons of water are used daily in poultry processing operations. To help conserve this natural resource, federal guidelines provide that water from processing liquid streams can be reused as long as measures are taken to prevent product contamination or adulteration. As such, treatment technologies are designed to filter and disinfect the water to ensure its safe reuse. In an effort to further foster environmental sustainability, researchers at the Georgia Tech Research Institute (GTRI) are investigating techniques to more selectively capture target impurities from the liquid streams in a way that facilitates the recovery of value-added byproducts while still meeting or exceeding reuse guidelines. They believe the answer may lie in two novel separation technologies: adsorption chromatography and dynamic filtration.

**Project Overview**

“This project seeks to enable recycling and/or reuse of poultry processing liquid streams and capture of entrained contaminants, preferably in a manner that yields value-added byproducts such as fats, proteins, oils, and free fatty acids,” explains John Pierson, GTRI principal research engineer and project director.

According to Pierson, methods similar to those used in biopharmaceutical protein purification may hold keys to advancing liquid stream reuse in poultry processing. However, two key challenges must be overcome. First, there is the need to improve yields with continuous separations combined with lower costs through new and/or improved resins and buffers. Here, he believes adsorption chromatography can play a role. Second, there is the need to improve membrane flux rates for separations, for which dynamic filtration may be the answer.

**Adsorption Chromatography**

Adsorption chromatography (adhesion onto the particle or adsorbent surface) is being investigated as a method for separating proteins and fats from processing liquid streams. Researchers are using relatively inexpensive silica media to perform adsorption tests on surrogate chiller water.

“To get a higher yield, we are functionalizing the silica with acid groups and others to remove the target groups, in this case protein. We then separate the protein by shifting the pH,” explains Robert Wallace, GTRI research chemist.

The method appears promising not only for protein separation but also for process water reuse, says Wallace.

**Dynamic Filtration**

Membrane filtration technology is recognized as an effective method for separating organic and inorganic impurities from water streams. It is widely used in the pharmaceutical industry in both upstream and downstream applications. For use in poultry processing applications, challenges include limitations on throughput and membrane degradation with time as the concentration increases leading to cake buildup.

“Membrane separation is differentiated via the associated pore sizes used for target impurities and distinguished from filtration where media are used to capture contaminants. In both cases, surface contaminant buildup decreases flux, so innovations are sought that decouple flow from separation and filtration rates,” explains Aklilu Giorges, GTRI research engineer.

Giorges conducted a computational fluid dynamics (CFD) analysis of a dynamic filtration process. He found that the cake buildup is strongly affected by the balance of the shear force, transmembrane pressure, and the cake strength and firmness at the membrane surface.

**Initial Results and Future Directions**

“Our preliminary assessment is that adsorption and dynamic filtration novel separation techniques can be applied to selected poultry processing liquid streams,” says Pierson. “The expected outcomes are combined liquid quality improvement, front-end sampling, and target contamination reduction and concentration at specific insertion points.”

The research team is currently expanding adsorption work to functionalized adsorbents and simulated moving bed technologies, while dynamic filtration research is examining methods to improve separations, especially when pre-treating liquid streams in advance of adsorption systems.

Longer term the team hopes to develop a pilot-scale system to demonstrate dynamic filtration with preparative chromatography for improved liquid stream quality and safety.
Greenhouse Gas Regulation and Required Reporting Update

Written by Paul Bredwell

Roughly one year ago, the Congress was intently focused on passing a bill to regulate the emission of greenhouse gasses (GHGs). The American Clean Energy and Security Act of 2009 passed the House of Representatives in June of 2009 but stalled in the Senate. During this process, EPA made a proclamation that the agency did not want to regulate GHGs through rulemaking. Instead, the agency preferred to see the issue addressed through the development of legislation by Congress.

As the likelihood of enacting a federal law began to fade, the EPA seemed to re-evaluate its position and released a notice of proposed rulemaking to regulate GHGs by “tailoring” a rule to fit within the boundaries of the Clean Air Act. The “Tailoring Rule,” finalized in May of 2010, initially focuses on the largest emitters of GHGs by “tailoring” a rule to fit within the boundaries of the Clean Air Act. The Tailoring Rule,” finalized in May of 2010, initially focuses on the largest emitters of GHGs. Facilities affected by the rule are those that emit 100,000 metric tons of carbon dioxide equivalent (CO2e) per year and currently hold a Title V permit for exceeding thresholds for criteria pollutants or hazardous air pollutants or newly constructed sources or existing sources that are modified in a way that significantly increase emissions of criteria pollutants or hazardous air pollutants.

Looking ahead to phase two, which will go into effect between July 1, 2011 and June 30, 2013, the rule will regulate new facilities that emit more than 100,000 metric tons of CO2e or existing facilities that incur modifications that increase GHG emissions by at least 75,000 metric tons per year. Although the Tailoring Rule is left open-ended to allow the EPA to lower the current thresholds, it appears that agriculture and the vast majority of the poultry processing facilities will not be affected by the rule as it currently stands.

In October of 2009, the EPA finalized a second and separate rule that has the potential to affect a larger population of the poultry industry facilities in operation. This rule requires all sectors of the economy, EPA did not finalize Subpart M, which address food processing facilities, or Subpart II, which addressed industrial wastewater treatment. At that time, the rule did point out that reportable emissions include those that are generated in on-site wastewater treatment sources. However, because of comments submitted during the rulemaking process, EPA decided to consider alternatives to procedures outlining data collection contained in the subparts of the proposed rule that addressed the food processing industry and wastewater treatment.

On July 12, 2010, the EPA promulgated a rule that added four source categories to the list of sources already required to report greenhouse gas emissions. This rule became effective on September 10, 2010. One of the four sources included was industrial wastewater treatment. Although the rule did not include an individual subpart for the food processing industry, it did clarify that food processing was a source category that was covered under the rule if the aggregate emissions from the facility exceed the threshold of 25,000 metric tons of CO2e. Calculation of the aggregate emissions must include emissions from stationary combustion sources and on-site industrial wastewater treatment facilities. The rule also indicated that EPA is establishing an electronic reporting system, and all facilities covered by the rule would be required to use this reporting system to submit the required data.

In addition to reporting the emission of GHGs from each stationary combustion unit, the rule requires facilities that operate anaerobic processes within the wastewater treatment plant to report methane (CH4) generated, emitted, and recovered from each anaerobic lagoon and anaerobic reactor. The rule requires a substantial amount of monitoring and data collection in order to calculate the mandatory reporting data. A partial list of the monitoring and data collection requirements established by the rule is shown below.

- Weekly composite COD or BOD5 concentration of anaerobic lagoon influent.
- Flowrate of wastewater entering the anaerobic lagoon.
- Continuously measure the gas flowrate of the biogas recovered.
- If biogas is recovered, determine the CH4 concentration of the biogas recovered.

A full copy of the rule, which specifies mandatory monitoring and data collection requirements, can be downloaded from the USPOULTRY website at the following link:
http://www.poultryegg.org/environment/

A facility covered by the rule requires monitoring of GHG emissions to begin on January 1, 2011. The initial yearly report must be submitted by March 12, 2012. Information that must be included in the yearly report is delineated in the original rule. This rule along with an informational sheet and industrial wastewater monitoring checklist can also be downloaded at the link provided above.

While the actual volume of GHG emissions will vary at all facilities depending on the number and size of stationary combustion sources on-site, the likelihood of exceeding the 25,000 CO2e metric ton threshold increases at facilities that operate anaerobic waste treatment processes as well. Exceeding the threshold is almost certain for facilities that operate anaerobic lagoons without a cover, gas collection system, and a mechanism to destroy the methane gas. Although a facility with a covered anaerobic lagoon, biogas collection system, and biogas destruction equipment should be able to minimize actual CO2e emissions and reduce its exposure to the rule, a facility may incur considerable expense to install the necessary equipment needed to collect data and monitor the system.

Paul Bredwell is vice president of Environmental Programs for the U.S. Poultry & Egg Association.
Supervisory Control and Data Acquisition is a term used to describe industrial control systems, and is more commonly referred to by the acronym SCADA (pronounced sке – dа). SCADA was initially developed as an extension of programmable logic controllers (PLCs) and has since evolved to become a standard used across many industries ranging from water processing facilities to nuclear power plants. The food processing industry has been slow to adopt SCADA for many viable reasons related to cost vs. benefit and safety. However, as control systems within food processing plants become increasingly complex, the need for an automated system similar to that offered by SCADA software providers becomes more evident.

Before discussing any tradeoffs to be made when implementing a SCADA system, let us discuss the core goals and highlights of SCADA. For instance, a high-volume operation where a recipe is to be controlled carefully for quality purposes may require decisions to be made each second as various flow rates and temperatures change within the process. SCADA addresses this by creating a master terminal unit (MTU) that monitors several lower level operations, referred to as remote terminal units (RTUs). These RTUs typically operate at high data rates within the local subsystem, but frequently report process information to the MTU so that parameters can be adjusted to streamline the overall process. It is at the MTU where the high-level control algorithms can be implemented to optimize the performance of the system.

For example, consider a typical poultry processing operation. There are several automated steps that occur throughout the process such as cage loading, evisceration, water chilling, weighing/sorting, and packaging. This is by no means an exhaustive list for a poultry process, but allows us to visualize how a networked system could benefit with this type of automated process. First, one must consider the number of sensors that exist in these processes and the information they convey such as equipment faults, water temperature, air temperature, weight, and packaging material remaining. The complexity involved in managing this type of operation is tremendous, and any one of the parameters potentially has a substantial impact on the overall throughput of the facility. For example, if the chiller water temperature was too high, a large number of products could be affected, thus bringing the process to a halt. It is apparent that a high-level controller could add considerable value to this process. Figure 1 illustrates a high-level block diagram of how SCADA could be implemented in a typical poultry processing operation.

If you would like to learn more about SCADA, there are several informative books, such as SCADA: Supervisory Control and Data Acquisition by Stuart A. Boyer or Practical Modern SCADA Protocols: DNP3, IEC 60870.5 and Related Systems by Gordon Clarke and Deon Reynders, that may be of interest.

With an overview of SCADA, one can begin to realize the pros and cons of SCADA specific to food processing industries. The primary pros for food processing are related to the potential reductions in labor and tighter quality control. The first point is made due to the ability to automate many of the tasks currently performed by various staff required to handle quality control. The quality control aspect is not only related to product quality but could also be related to food safety. These improvements can be achieved with better sensor integration within the process and the ability to find problems sooner before entire lots of products are lost. The key cons are associated with safety and the additional complexity of integrating a SCADA system. Although the ability for safety increases is possible due to tighter process controls, there is a drawback related to creating what is essentially a network of an entire food processing facility. This is evident in the emergence of viruses such as the latest major attacks, namely Stuxnet. A proper security plan can address many of these risks, but with increased sophistication of processing comes an increased sophistication of threats.

The bottom line related to SCADA implementation is the decision between risk, quality of products, and long-term payoffs related to potential savings versus the cost of implementing a SCADA system. These decisions will be different for each process. The Georgia Tech Research Institute's Food Processing Technology Division has already evaluated several systems through a laboratory SCADA implementation study funded through the Agricultural Technology Research Program and can assist those interested in building a SCADA system.

Jonathan Holmes is a research engineer in the Georgia Tech Research Institute’s Food Processing Technology Division. His areas of expertise are mechanical design, thermal analysis, LEDs, LCDs, and avionics packaging. He can be contacted by email at jonathan.holmes@gtri.gatech.edu.
Chicken Executives Upbeat on 2011 Amid Rising Costs

More than ever, chicken industry executives are concerned about ‘success factors’ outside their control, but they foresee a positive start to 2011.

WRITTEN BY GARY THORNTON

U.S. chicken industry executives participating in a panel discussion in Washington, D.C., said they foresee a profitable start to 2011, despite worries over high grain prices and concerns about competitiveness in the global marketplace.

The panel at the National Chicken Council annual meeting addressed the profit outlook for 2011 and ‘success factors’ including grain supplies, competing proteins, global markets and competitors, the regulatory outlook, and more.

Beef, pork and chicken supplies

Tyson Foods CEO Donnie Smith predicted a “good environment” in the U.S. meat proteins markets in 2011, with the available supply of poultry rising 2.5%.

Pilgrim’s Pride CEO foresees uptick in foodservice demand

Don Jackson predicted a 3% year-over-year rise in foodservice demand for chicken in 2011, based on an outlook for the supply of beef to be down 1.5% and pork supply to be flat.

Weak economy is dampening demand for poultry

Mike Roberts, president of food products business, Perdue Farms, said, “Unless grain prices get extremely high, the industry will grow.” The other factor that could stop growth in the near term, he said, would be a reversal in the economy.

Pilgrim’s CEO Don Jackson said the economy will be the biggest factor in industry profitability 2011. “The economy is having a dampening effect on demand and continues to be a bigger factor in the market than the supply of chicken,” he said. “Supply is lower than 2008 levels, yet pricing is still extremely sensitive. There will have to be strengthening in the economy before a return to historical supply-demand relationships in the chicken business.”

Differing foodservice outlooks

Both the Tyson and Pilgrim’s CEOs forecasted increases in foodservice demand for chicken in 2011, but Jackson’s outlook was more optimistic. He predicted a 3% year-over-year rise in foodservice demand for chicken.

“1% foodservice growth a win, says Tyson’s Smith

Smith forecasted only a 1% increase in sales of chicken at foodservice. He predicated his outlook on an expectation that the U.S. unemployment rate will continue to be 9.5% to 9.8% in the immediate future.

Referring to his forecast for 1% foodservice growth, Smith said, “From where the industry has been over the last two years that is a huge win.”

Regulatory outlook impacts economics

Jerry Lane, president, Claxton Poultry Farms, said industry production levels are headed upward but “how much upward depends on factors other than those we control in our businesses.”

There are more “unknowns” than usual affecting the business outlook, Lane said, including higher, more volatile corn prices resulting from government mandates for ethanol fuel production.

Another factor, he said, involves the proposed regulations covering poultry contracting by the Grain Inspection, Packers and Stockyards Administration (GIPSA). He speculated that the proposed rule could result in poultry companies using their limited capital for construction of company-owned growing facilities instead of for growth opportunities.

GIPSA rules threaten grower incentives, says Roberts

Perdue’s Roberts said, “The proposed GIPSA rules are set up to reduce incentives. We are concerned about not being able to incentivize our better producers, because it is going to hurt the quality of our product and the quality of the producers that we will be able to attract over the long term.”

“The vagueness in terms and provisions of the proposed rule would result, we believe, in increased litigation,” he said. “And of course I think all of us understand that we spend enough time with counsel today on various subjects, but the recordkeeping required by this rule and the contract disclosures and cost justification requirements would increase and create
U.S. poultry must rise to Brazilian competition, says panel

Panelists said their industry needs to pick up the competitive pace and be ready to compete in an increasingly global marketplace. Brazil’s poultry industry, for example, will continue to challenge U.S. producers in markets at home and abroad, and the U.S. poultry industry needs to rise to the competitive challenge, they said.

Brazil’s proximity to huge grain supplies will continue to drive that industry’s reach into global markets, including the U.S. market. The U.S. industry, they said, needs to learn how to compete with that challenge and must work politically to fend off a growing regulatory burden that threatens its competitiveness.

Warning about U.S. ‘regulatory overreach’

Donnie Smith said, “The reason the Brazilians and others are interested in the U.S. market is that this is a great market and still the world’s leading economy. It’s a great place to do business, and we don’t need to lose our competitiveness as an industry.”

He expressed concern over U.S. competitiveness in light of “regulatory overreach” which he said is “driving costs into the U.S. industry without providing a requisite value back for consumers.” If allowed to continue, he said, this will lead to the U.S. industry being less competitive globally.

Brazil positioned for continued success

U.S. producers have the home-field advantage of producing for the world’s leading poultry market, the panelists said, but the Brazilians enjoy cost advantages that will be difficult for the U.S. to match.

Mike Roberts said, “Brazil is going to be a factor globally. They can produce five crops of grain in two years, while U.S. farmers can at best produce three, most of the time two. Brazil will continue to be a factor, and we will have to learn how to compete with them.”

U.S. can learn from Brazilians, says Jackson

Don Jackson said, “The reality is that Brazil is in a unique position relative to the world’s meat supply, both in chicken and beef. There will continue to be Brazilian companies with interest in [producing and selling] chicken outside of Brazil.”

Jackson, whose company was acquired in 2009 by Brazilian meat and poultry producer JBS, S.A., said Brazilian companies bring a focus on costs and efficiency from which U.S. companies can learn.

“The Brazilian approach to this business has been very successful and brings a level of efficiency that in some respects we have ignored in the U.S. industry over the last several years. We’ve been successful, in some respects, in spite of ourselves. I think that the Brazilian approach to the meat business will allow us to reexamine how we approach the business,” he said.

Panelists’ top concerns

What are the U.S. poultry industry’s top challenges? The executives named the following as their top concerns:

Don Jackson: After experiencing decades of phenomenal growth, the industry needs to adjust to a tougher economic environment going forward. Companies must become more efficient operators and better marketers.

Jerry Lane: With increasing competition for a finite supply of grains, the industry needs to develop better strategies for sourcing feed grains at prices that won’t price poultry products out of customers’ reach.

Mike Roberts: Opportunities for the poultry industry are growing worldwide, and this is very positive for companies that get involved globally. Companies that don’t get involved in the global market are going to wake up one day and not be well positioned.

Donnie Smith: A new generation of consumers, lawmakers and regulators has little understanding or appreciation of conventional agriculture. The industry needs to educate society about the value of agriculture and vigorously defend farmers.

Gary Thornton is the content director-agribusiness for WATT PoultryUSA.

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Learning Events

National Safety Conference for the Poultry Industry
June 1-3, 2011
Marriott Savannah Riverfront Hotel
Savannah, Georgia

Mark your calendars today and plan to attend the only national conference focused on safety management in today’s poultry industry. Come hear presentations on an array of industry topics, participate in informative round-table discussions, network with other safety professionals, and visit with vendors as they display the latest safety equipment and services geared toward the poultry industry.

In addition to the conference, you will have the opportunity to enjoy the southern charm, fabulous dining options, shopping, and historic tours Savannah has to offer. The Savannah Marriott is located steps away from the world-famous River Street.

The annual conference is co-sponsored by the National Chicken Council, the National Turkey Federation, the Georgia Poultry Federation, and the Georgia Tech Research Institute’s Agricultural Technology Research Program.

For more information, visit www.2011_National_Safety_Conference.html

Workshop on Novel Sampling and Sensing for Improving Food Safety
June 16-17, 2011
GTRI Conference Center
Atlanta, Georgia

This workshop will feature two days of keynote presentations, poster discussions, and round-table breakout, networking, and social interactions. Presentations will address current challenges in food safety pertaining to sample preparation and sensing methods for the detection of bacteria, viruses, microbial toxins, and parasites in food. Particular emphasis will be placed on innovations in sample concentration and processing methodologies, ligand immobilization technologies, and novel transducer and biosensor technologies.

Participation will be limited to 200 people, with an equal number of slots reserved for academics, industry, government agency, and students to ensure that the discussions are not dominated by any particular sector. Registration is $125, $50 (students). The workshop is sponsored by the Georgia Institute of Technology, University of Georgia, Agricultural Technology Research Program - Georgia Tech Research Institute, and the Center for Food Safety - College of Agricultural Sciences, University of Georgia.

For more information, visit www.foodsensing.gatech.edu

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