ENGINEERING TOMORROW'S POULTRY INDUSTRY

AGRICULTURAL TECHNOLOGY RESEARCH PROGRAM

2011 ANNUAL REPORT

Georgia Tech Research Institute

ATRP MISSION STATEMENT

To promote the economic growth of Georgia agribusiness (especially the poultry industry) through:

- Research focused on the development of new technologies that improve productivity and efficiency;
- Exposure of students to the challenges of developing and adapting these technologies;
- Technical assistance to Georgia-based industry members with special problems;
- Release of information on emerging technologies and improved operational management through newsletters, articles, seminars, and presentations to speed ultimate commercial use.

The program is conducted in cooperation with the Georgia Poultry Federation with funding from the Georgia Legislature.

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Published by:
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ADVISORY BOARD

ATRP's Advisory Board is composed of poultry industry leaders who give their time to help the program identify research topics that best address priority industry needs. The committee meets annually to hear updates on program research efforts and to discuss challenges and future direction with program personnel.

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During Fiscal Year 2011, the Agricultural Technology Research Program (ATRP) launched a new vision statement:

> To be the Technology Innovation and Development provider that enables Georgia to be recognized as the undisputed leader in Poultry, Agribusiness, and Food Processing.

This encapsulates our aspirations to serve the state of Georgia and the greater poultry and agriculture communities through our strengths in technology and innovation. It has challenged us to think more boldly and creatively as we seek to not only develop solutions for current industry challenges, but to consider future processing needs as well. The latter has sparked an active conversation with other key academic, state and national association, and industry leaders about the rethinking of future poultry production and processing operations. Interest in this subject is growing, and we are excited to play an active role in furthering the effort.

In support of this newly refined vision, the ATRP mission remains to provide technical assistance, outreach, education, and research in the fields of automation and robotics, workplace safety, advanced fluid separations, energy and water conservation, and advanced sensing systems. In FY 2011, this included efforts on 8 full research initiatives with prototype systems at various levels of development and 4 special projects funded to develop concepts and ideas for later transition into full research projects. In addition, these research activities resulted in 2 invention disclosures and more than 40 published articles, papers, and presentations on discoveries and work being conducted through ATRP.

As part of ATRP's technical assistance component, researchers and staff responded to 32 requests from Georgia-based companies or individuals seeking information or help in addressing a specific issue.

In terms of outreach, the program once again hosted the annual National Safety Conference for the Poultry Industry; coordinated the annual Poultry World Exhibit at the Georgia National Fair; participated in the International Poultry Expo and other trade association events; and provided technology demonstrations to a variety of industry, government, and school groups.

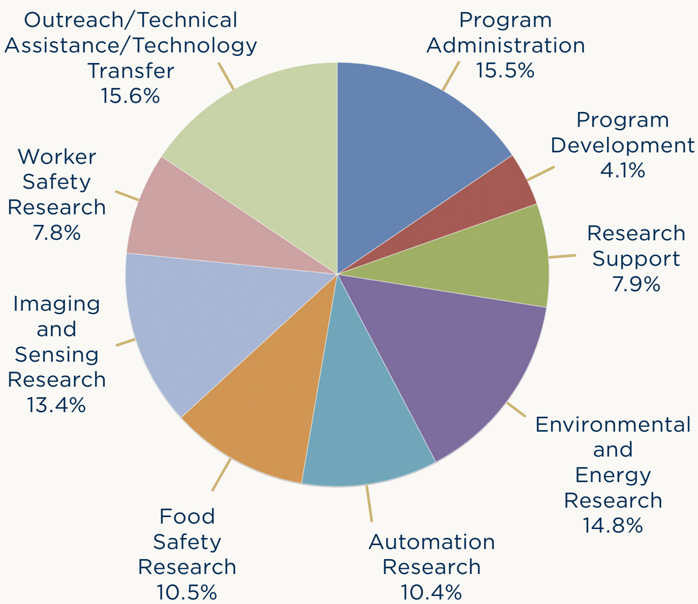
ATRP had the privilege of co-hosting the interdisciplinary National Science Foundation Workshop on Novel Sampling and Sensing for Improving Food Safety. More than 130 participants from academia, industry, and state and federal agencies participated in breakout sessions punctuated by key presentations from renowned experts on the topics of current food safety regulations and methods for product testing, novel sampling and preconcentration strategies, and emerging transducer technologies for food safety sensing. Overall response to the workshop was very strong with many participants commenting on the need for more conversations and collaborations between the engineering and microbiology/food safety disciplines.

The continuing decline in economic conditions for FY 2011 resulted in an 8% reduction of the ATRP budget for a third year in a row. This funding contraction was accommodated by cutting back on research projects and reducing efforts in our outreach activities. Despite these difficult times, the leadership within the Georgia Tech Research Institute and ATRP are committed to serving the poultry and agribusiness industries in Georgia. We also sincerely appreciate the continuing collaboration and support from our industry, academic, and state partners, and we look forward to building on these relationships to pursue new opportunities together. After all, our vision is to help make Georgia the "undisputed leader in poultry, agribusiness, and food processing."

Doug Britton, Ph.D.
ATRP Program Manager

FY 2011 FINANCIAL SUMMARY

Total Funding: $1,408,684



CONE LINE SCREENING SYSTEM

Background: Bone chips in deboned product continue to be an area of concern for poultry processors. Current techniques for screening are expensive or ineffective. Automated screening on the debone line has the potential to address this problem in addition to helping with process control and yield management activities.

ATRP researchers have developed and demonstrated a novel approach to perform these screening tasks. The Cone Line Screening System uses a special cone with internal illumination that backlights the frame producing the appearance of an x-ray image that clearly shows any bones remaining on the frame. The associated suspect fillets can then be removed for closer examination, reducing the probability that bones would end up in the output product. Recent research focused on evaluating the effectiveness of using a stainless steel cone as an alternative to the original plastic cone design, establishing bone detection algorithm accuracy, and demonstrating the screening approach in a production setting. A field test was carried out in December 2010 in a Perdue Farms facility. In addition to testing the stainless steel cone design and bone detection algorithm for accuracy, the system was demonstrated to and evaluated by Perdue personnel familiar with the deboning process. Bone detection accuracy using the stainless steel cone was lower than the performance of the plastic cone, having just 86% accuracy in detection of missing clavicle bones. Operators performing the deboning operation on the cone line also concluded that the stainless steel cone design was too difficult to manipulate, hindering the deboning operation.

Results from the field test led researchers to revert back to the plastic cone design for the remainder of the project. A new plastic cone was fabricated and evaluated on a small sample set, resulting in 90% accuracy in detection of missing clavicle bones and 60% for fan bones. Studies on the ability to use the system as an aide for process control and yield management were also conducted, showing that the system has great potential to be used for these tasks. Further work is needed to improve the accuracy of the bone detection algorithm and to develop further algorithms for yield classification.

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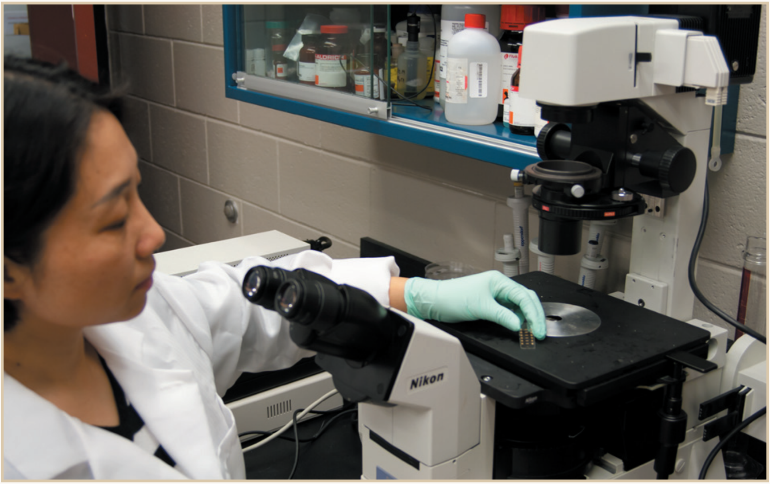
LATERAL FLOW IMPEDANCE TRANSDUCER FOR SALMONELLA DETECTION



Background: Pathogen reduction in poultry products is a priority of the poultry industry. New performance standards proposed by the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA/FSIS) aimed at reducing *Salmonella* and *Campylobacter* make the challenge more stringent.

The goal of this project has been to develop a rapid, multiplexed, and disposable field-usable device utilizing the combined lateral flow and interdigitated microelectrode (IDE) array as a single transducer for foodborne pathogen detection. Researchers fabricated an IDE array using the standard microfabrication technology and a covalently linked polyclonal antibody specific to *Salmonella* applied to the surface of the IDE. A high-flow membrane was added to the IDE for liquid application. The team successfully demonstrated the ability to use lateral flow to deliver a fluid sample containing 108 cfu/ml of *Salmonella* over the electrode array. In addition, the team confirmed that the bacteria cells were binding to the top of the electrodes using a scanning electron microscope and a confocal microscope.

Researchers are currently working on optimizing the electrode surface morphology, antibody surface concentration, and ionic strength of the buffer to improve sensitivity and lower the limit of detection. In an electrode array, multiplexing could be provided by immobilizing a different antibody to each electrode.

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INTELLIGENT CUTTING AND DEBONING SYSTEM

Background: Deboning represents a particularly labor-intensive operation in the poultry industry. Due to the natural deformation and variation of bird carcasses, automation of the cutting process has proved to be very challenging and has resulted in significant yield losses and bone chips.

Researchers have successfully developed force control algorithms for cutting around the bone. What makes this task so difficult is the speed at which the cut must be performed and the fact that the shape of the bone is not known in advance. The team used a published force control algorithm as a basis for their approach, but considerable work had to be done to filter the force data that fed into the algorithm. Using MATLAB, the team first built a model of the system and demonstrated the effectiveness of the algorithm with no noise in the data. However, the first test of the force cutting algorithm was less than successful. The input force data was collected and analyzed in MATLAB. It was quickly demonstrated that the noise in the data was the source of the error in the cutting test. The team was able to design and implement a filter in simulation to resolve the problem without generating a time-delay in the system. That algorithm was implemented in LabView, and the results matched the simulation perfectly. The team was able to demonstrate the sensitivity and effectiveness of the force feedback cutting approach by running the knife blade over the surface of an unknown object and maintaining a constant force along the trajectory. In one test they automatically navigated the blade along the surface of an egg, and in another test they automatically performed a cut through the meat on a drumstick and around the bone without cutting into the bone.

The other major accomplishment was the integration of the various system components into a functioning system. This effort required considerable resources as the integration is very complex, but the team overcame the obstacles that were presented to them.

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MONITORING BIRD STATUS IN BROILER HOUSING USING AUDIO AND VIDEO

Background: Reliable sensors to monitor the conditions and welfare of birds being raised in confined housing are not readily available. The goal of this project is to investigate the use of bird vocalizations to determine whether or not they are under stress.

An experimental system to collect audio and video data was installed in a research grow-out house on the University of Georgia (UGA) campus where broilers were raised from age 1 day to 6 weeks. Audio and video data was collected each week under normal and “stressed” conditions, where the UGA researchers manipulated the temperature (increased 10 degrees above normal), ammonia levels, and crowding conditions in the growout house.

An analysis of the data showed that it is possible to detect a change in the vocalizations of the birds due to a change in temperature. A filtering and extraction technique was developed to isolate the sounds being made by the birds (called vocalizations) from the background noises in the room (particularly the fans). Results showed that the number of vocalizations rose and fell commensurate with the change in temperature. Results from the video data, however, were not as conclusive. Air quality, as measured by ammonia levels in the poultry house, is an additional stressor that was included in this study, the results of which are currently being analyzed.

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NOVEL SEPARATION TECHNOLOGIES FOR POULTRY PROCESSING LIQUID STREAMS

Background: 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, ATRP researchers 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.

Researchers have considered two technological approaches that can work in concert or independently, based on the characterization of the liquid stream being treated. The first, adsorption separation, seeks to selectively separate target molecules (e.g., fats, proteins, microalgae, water-soluble impurities). The second, dynamic filtration, concentrates on improved physical separation of molecules smaller than 300-micron (0.0117-in) diameter at higher flux rates, possibly as a pre-treatment step.

Approximately 1,835 analyses were conducted in 73 separate experiments to evaluate adsorption separation. Of these, 68 data sets focused on the adsorption of protein on silica and five on 'salting out.' Results indicated that protein removal (initial concentration of ~300 mg as bovine serum albumin/L) could be obtained with acidified fumed or spherical silica adsorbents deployed in concert with selected conditioning of the liquid stream. Inconclusive results were found using 'salting out' or sand as an adsorbent. Surfactants did provide a limited but additional benefit.

To evaluate dynamic filtration, several experiments were conducted with and without shear using an impeller operated at various rotational speeds. Of particular interest was the effect of flow dynamics on the filter surface buildup (cake characteristics, shape, and associated resistance). Results indicated that the cake shape and character are affected by the flow dynamics that eventually influence filtration resistance. This work showed that the cake shape and amount depend on the process momentum and mass transfer. Thus, the next challenge is determining processes needed to reverse the cake buildup that formed during the filtration and identify a condition that optimizes the filtration and cake removal process.

Overall, results showed that both approaches are viable, although the dynamic filtration shows the greater promise in terms of near- to mid-term viability. Future efforts will focus more directly on dynamic filtration.

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NOISE ABATEMENT FOR VIBRATORY CONVEYORS

Background: Noise abatement is a growing concern in industrial settings that are increasingly filled with machinery and automation. Vibratory conveyors are used widely in the food processing industry, including in poultry processing plants. Compared to more traditional gear-and-belt conveyors, they contain far fewer moving parts and exposed surfaces, and thus offer the advantage of being significantly easier to keep clean and maintain. Vibratory conveyors operate by essentially shaking and throwing product small distances toward a forward-progressing direction. The ensuing noise is generated by both the actuation of the vibratory tray surfaces and the collision between the surfaces and the (often frozen) product. The goal of this research project is to explore noise abatement for vibratory conveyors.

Researchers designed, built, and tested a canopy-style enclosure on a test-bed vibratory conveyor. A noise reduction of more than 30 dBA was demonstrated. The canopy can be used as a canopy over the conveyor or as a small inspector station. Researchers believe that the majority of the noise exceeding safe levels is generated at the area where two conveyors meet and the product from one conveyor is being dropped/cascaded from a height onto the bare surface of the second conveyor. Situating a food-safe, localized, non-fully enclosed shroud, such as the canopy described above, will yield a portion of the noise abatement benefits noted earlier. In addition, the team placed a rectangular piece of silicone mat on the bare surface of the bottom conveyor where the frozen product strikes. Only a small piece was used since the strike zone is relatively localized. A dramatic reduction in audible noise from 116 dBA to 84 dBA was observed. As a result, it should be possible to devise a food-safe "mat" or insert that uses this concept for noise abatement as an alternative to the canopy-style enclosure.

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WORKER SAFETY RESEARCH FOR THE POULTRY INDUSTRY

Background: The Agricultural Technology Research Program at GTRI has several initiatives in the area of Worker Safety specifically targeted for the poultry industry. These include the development of an Ergonomic Work Assessment System (EWAS) and the use of Wii-type devices to measure the motions and exertions of workers performing various tasks. EWAS measures the posture, grip force, and muscle exertion of a worker while cutting tasks are performed on a poultry deboning line. Validation studies have shown the EWAS system is sufficient for data collection. This year a lab study using EWAS was started, and data collection for the WiiFit study was completed.

The EWAS lab study investigated various deboning techniques and the impact that line speed has on both yield and ergonomics and was conducted with four volunteer participants who are actual deboners at local poultry processing plants. A laboratory-scale cone line was set up in a temperature-controlled room (40°F). The deboners performed left shoulder cuts at randomly set line speeds of 25, 30, 35, and 40 birds per minute spaced 2 feet apart. A total of 50 cuts per line speed were made by each deboner, after which the breast meat was removed and yield was measured using standard industry practices. Initial results suggest that there were no significant relationships between line speed and yield. In addition, the results suggest that yield loss is independent of the size of the birds. Researchers are still analyzing whether there is a change in deboning technique (based on collected biomechanics data) as the line speed increases. Further tests with volunteer participants are needed to make definitive conclusions.

The WiiFit study investigated the use of the WiiFit gaming system as an intervention method to reduce the risk of lower back injuries during lifting compared to the traditional methods of strengthening hip flexor muscles. For the study, 25 subjects watched a safety video on proper lifting techniques and then were randomly assigned to one of three groups: a control group, a traditional exercise group, or a WiiFit group. All participants performed a set of lifting tasks at the beginning of the study and after a 5-week training program. The lifting tasks consisted of repetitively lifting a 20-pound weight between two different levels of approximately waist and knee height for 20 minutes. During the training program, the control group performed no exercises; the traditional exercise group, under the supervision of fitness coaches, performed normally prescribed exercises designed to strengthen the lower back; and the WiiFit group performed exercises using the WiiMotion system to strengthen the lower back. Full kinematic data analysis is not complete, but the initial results show that subjects in the WiiFit group found the training more enjoyable, and they also were more likely to finish the prescribed exercise plan than subjects in the traditional exercise group. Analysis comparing the leg and back motions of the subjects measured during the lifting tasks conducted before and after the training program is ongoing and expected to be published soon. The overall goal is to identify a low-cost and yet effective physical conditioning program for poultry plant workers, and the WiiFit gaming system shows promise.

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AUTOMATED WASHDOWN

Background: In order to ensure acceptable levels of food safety in the poultry processing industry, current standards require daily cleaning of all processing equipment. The washdown procedures currently employed at a typical poultry processing plant require a third shift of workers to manually clean all equipment. This is done using caustic chemicals (Quaternary Ammonia and highly caustic solutions) potentially at elevated temperatures of around 140°F. These chemicals are applied and the equipment is cleaned using pressure washers at pressures up to 600 psi. An automated system is desired that can remove some human labor from the process.

The research problem addressed in this project was: what is required for an automated washdown system to effectively clean a piece of poultry processing equipment? To this end, testing was proposed to determine the efficacy of an automated cleaning system based on a set of variables: nozzle type, angle of incidence, and distance to surface. Tests were performed on a piece of processing equipment and an articulating plate that highlighted the need for a high degree of freedom (DOF) system, and helped quantify the cleaning abilities of pressure washer heads at a varying set of conditions. Both sets of tests pointed to future areas of study that will be vital to the success of an automated cleaning system. Future areas indicated by the tests are: the development of a light and maneuverable mechanical arm that can reach all required cleaning areas; the development of a locomotion system that can position itself around the equipment at the required angles; sensors and a spatial awareness program that can determine where the equipment is to be cleaned and clean it while avoiding collisions; and a sensor system that can detect the presence of chicken and fat on the machine.

While not all of the goals of the project were met this year (time did not permit for the completion of an economic analysis), the project provided observations into the requirements and operation of an automated cleaning system that will provide a valuable foundation on which to continue the work.

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CHICKEN EGG FERTILITY DETECTION

Background: Detecting initial fertility quickly in eggs is of great interest. Wasting valuable time and space on eggs that will never produce a chicken is a costly problem. If a reliable, cost-effective fertility test could be performed quickly on every egg before it goes in an incubator, it would be a boon to the poultry industry.

ATRP researchers are attempting to identify detectable differences in E0 (pre-incubator) fertilized and unfertilized eggs and the best analytical approaches for making this determination. A number of analytical techniques were applied with mixed results. Gas chromatographs with a variety of detectors were used to analyze different internals of the E0 eggs. Liquid chromatography was also used for a few of the fluids and extracts of the egg. A range of spectrophotometric techniques were also applied including Raman, ultraviolet-visible, near-infrared, and reflectance.

A total of approximately 400 unfertilized and 750 fertilized eggs were examined by the methods described above. A few compounds of interest were discovered in varying amounts that seem to indicate the fertility condition of the ova in the Ross broilers that were used in this study. Results must be analyzed in further depth for differing conditions, i.e., different storage time and different hen types should be studied, etc., to determine if reliable and reproducible results can be obtained.

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SENSING FOR MANIPULATION USING ULTRASONIC HOLOGRAPHY

Background: The ability to sense and locate whole birds or parts for transfer and handling could significantly improve the automation of tasks such as cone loading, cut up, and deboning. Initial work has demonstrated that time-of-flight cameras can be used to generate 3D information for locating and handling product. In a separate initiative, ultrasonic holographic technology showed some promise for locating structures internal to the bird. The combination of these two technologies could help to address some of the sensing needs for current and future automation systems.

A holographic ultrasound system, developed and built for medical imaging by Frontier Technologies, was used to image the internal structure of chicken carcasses. The system works by generating an ultrasonic pulse that travels through a water bath and through the object of interest. Another source also generates a wave that serves as a reference. These two waves are then allowed to interfere on a sensing surface that is illuminated with a laser and then imaged with a standard video camera after filtering. The signal from the video camera that is digitized and stored includes the transmitted (and not absorbed), refracted, and diffracted components of the ultrasonic wave. These components enable reconstruction of a 3D representation of the imaged object.

Because the system can show the internal structure of the object being imaged, researchers can extract information from the image to aid in foreign object detection or machine guidance for material handling tasks. However, holographic images are prone to background noise. To reduce the noise, researchers employed a filtering technique using Fourier filters. The technique proved effective at reducing the noise and detecting any foreign objects present in the image. Further studies are needed to evaluate the system's performance as it relates to machine guidance for material handling tasks. In this area, the ability to detect 3D structures, such as tendons and ligaments, would enable an automated device to dynamically adjust to and handle the natural variability that exists in chicken carcasses.

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LED LIGHTING REPLACEMENT EVALUATION

Background: This last decade has seen a significant increase in the popularity of food processing imaging systems to perform tasks such as quality assurance, food safety inspection, or process control. Today, almost all major food processing enterprises have some kind of vision system in operation in their facilities. One thing almost universally required of these systems is a uniform and stable lighting configuration. ATRP researchers continuously evaluate advancements that could improve the performance and utility of delivered systems. In this case, a study was conducted to evaluate the performance of the latest Light Emitting Diodes (LEDs) for industrial imaging illumination.

ATRP researchers have developed several vision systems, all of which use a LUXEON batwing-style LED illumination source. The goal of this project was to identify and characterize (based on documented specifications) a suitable replacement LED for the existing LUXEON design, which has been discontinued by the manufacturer. The candidate LED tested was a Cree XLamp MP-L LED model number MPLEZW-A1-R100-0000C035H. In order to validate the LED, it had to meet or surpass the original LED specifications, have a consistent color profile between LEDs, and have an acceptable illumination profile. In all tests, the Cree LED demonstrated superior characteristics making it an ideal replacement for the original Luxeon LEDs.

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ENVISIONING THE POULTRY PLANT OF THE FUTURE

Background: Current methods of poultry processing are a combination of historical practices and labor-saving mechanization retrofitted with modern materials and technologies in an attempt to meet more stringent sanitation, worker safety, and environmental regulatory demands. This is not a viable long-term strategy for maintaining a secure poultry processing system in the future. U.S. poultry production faces growing international competition and regulatory pressure to produce products in larger quantities at lower costs with reduced input availability and shrinking labor pools while improving food safety and reducing overall environmental impacts. Transformational innovation in the development of new methods and systems that allows for the incorporation of these modern demands into the design of the actual processing systems is essential for a viable and secure future.

The goal of this effort has been to lay the framework and foundation for a major initiative focused on developing innovative approaches for improving the overall performance and efficiency of poultry processing. The strategy consisted of three primary tasks: (1) form an enthusiastic and capable team of industry, government, and academic partners; (2) begin to develop relationships with potential sponsor agencies (USDA, NSF, etc.); and (3) draft a compelling argument for the need for this kind and level of research investment in poultry.

The ATRP leadership and research team began working with industry entities and colleagues at other institutions (particularly the University of Georgia) building relationships and laying the foundation for a larger Poultry Initiative. Using an integrated systems methodology across the entire processing chain, this initiative would seek truly innovative concepts to be designed and evaluated by positive outcomes and measurable improvements in animal welfare, water consumption, sanitation, food safety, environmental impact, and worker safety. A small working group met several times to discuss ideas and approaches for building such an initiative, and meetings were held with many of the key industry stakeholders to discuss and receive input on the direction of the initiative. The coalition of participants is growing, and it is expected that a program proposal around this concept will be drafted in the near future.

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PROJECT COLLABORATORS

Industrial collaborators help provide direction and support to the specific research projects undertaken. They also participate directly in research projects by providing access to industry facilities for data collection and systems testing and contributing in-kind and cash support on an "as needed" basis. In addition, academic partners collaborate with research teams by providing cross-disciplinary expertise and experience as well as access to university research facilities.

Cone Line Screening System
- Cantrell Machines
- Mar-Jac Poultry
- Perdue Farms

Intelligent Cutting and Deboning System
- Marel Stork Poultry Processing
- Mar-Jac Poultry

Monitoring Bird Status in Broiler Housing Using Audio and Video
- Georgia Institute of Technology
- University of Georgia

Novel Separation Technologies for Poultry Processing Liquid Streams
- Mar-Jac Poultry
- Pilgrim's Pride

Noise Abatement for Vibratory Conveyors
- Keystone Foods

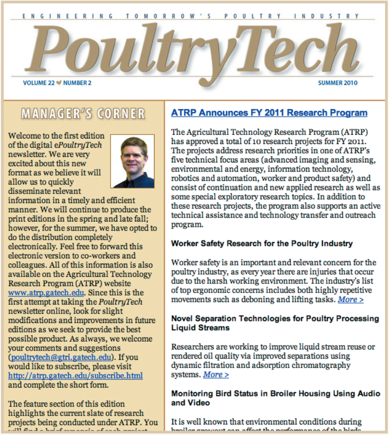
Worker Safety Research for the Poultry Industry
- Perdue Farms

Chicken Egg Fertility Detection
- Auburn University
- Pilgrim's Pride

Sensing for Manipulation Using Ultrasonic Holography
- Frontier Technologies

TECHNOLOGY TRANSFER

ATRP continued an active Technology Transfer Program in FY 2011. Three issues of the program's newsletter *PoultryTech* were published, with several articles reprinted in the trade press. Also, the first-ever e-news issue was published in August with the Summer edition of the newsletter. The electronic format was well received. A cover story on "Plant of tomorrow: Intelligent automation promises safety, efficiency," highlighting the program's robotics/advanced sensors research program and its potential to result in improvements in efficiency, food safety, and worker safety in poultry processing, appeared in the November 2010 issue of *WATT PoultryUSA* magazine. Research staff also generated 40 articles and technical presentations and filed 2 invention disclosures. The FY 2010 Annual Report was published, and the ATRP website was updated.



ENGINEERING TOMORROW'S POULTRY INDUSTRY

PoultryTech

VOLUME 22 NUMBER 2 SUMMER 2010

MANAGER'S CORNER

Welcome to the first edition of the digital *ePoultryTech* newsletter. We are very excited about this new format as we believe it will allow us to quickly disseminate relevant information in a timely and efficient manner. We will continue to produce the print editions in the spring and late fall; however, for the summer, we have opted to do the distribution completely electronically. Feel free to forward this electronic version to co-workers and colleagues. All of this information is also available on the Agricultural Technology Research Program (ATRP) website www.atrp.gatech.edu. Since this is the first attempt at taking the *PoultryTech* newsletter online, look for slight modifications and improvements in future editions as we seek to provide the best possible product. As always, we welcome your comments and suggestions (poultrytech@gtri.gatech.edu). If you would like to subscribe, please visit http://atrp.gatech.edu/subscribe.html and complete the short form.

The feature section of this edition highlights the current slate of research projects being conducted under ATRP. You

ATRP Announces FY 2011 Research Program

The Agricultural Technology Research Program (ATRP) has approved a total of 10 research projects for FY 2011. The projects address research priorities in one of ATRP's five technical focus areas (advanced imaging and sensing, environmental and energy, information technology, robotics and automation, worker and product safety) and consist of continuation and new applied research as well as some special exploratory research topics. In addition to these research projects, the program also supports an active technical assistance and technology transfer and outreach program.

Worker Safety Research for the Poultry Industry

Worker safety is an important and relevant concern for the poultry industry, as every year there are injuries that occur due to the harsh working environment. The industry's list of top ergonomic concerns includes both highly repetitive movements such as deboning and lifting tasks. More >

Novel Separation Technologies for Poultry Processing Liquid Streams

Researchers are working to improve liquid stream reuse or rendered oil quality via improved separations using dynamic filtration and adsorption chromatography systems. More >

Monitoring Bird Status in Broiler Housing Using Audio and Video

It is well known that environmental conditions during

OUTREACH ACTIVITIES

ATRP once again participated in the International Poultry Expo, the Georgia Poultry Federation Spring Meeting, and the Night of Knights, preparing exhibits for all three. Poultry World continued to be a major draw at the Georgia National Fair in Perry, Georgia. Working with the Georgia Poultry Federation, Georgia Tech helped coordinate the more than 150 volunteers who staffed the exhibit.

In conjunction with the Georgia Poultry Federation, the National Chicken Council, and the National Turkey Federation, ATRP hosted the 2011 National Safety Conference for the Poultry Industry in Savannah, Georgia, attracting 62 safety professionals and vendors representing 39 companies and organizations from 18 states. The program also provided support to the Information Systems Seminar for the U.S. Poultry & Egg Association.

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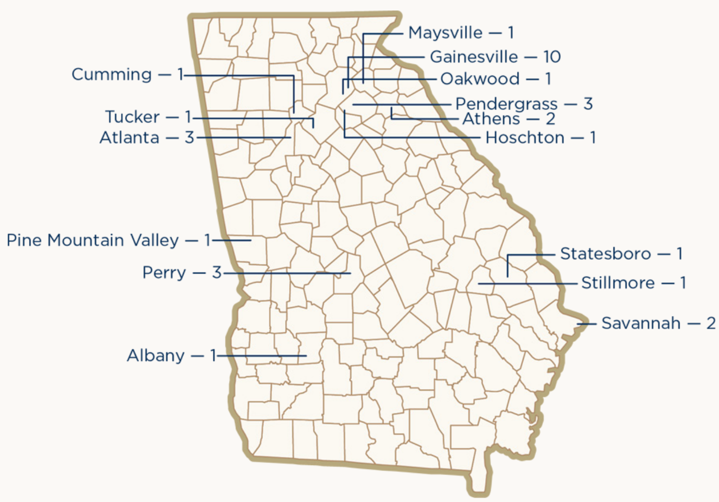
TECHNICAL ASSISTANCE

Thirty-two technical assists were provided to firms and individuals in the poultry industry across the state. These assists included simple inquiries regarding information or help needed to address a problem and extensive on-site consultations in which researchers collected data and provided a full report on their findings and recommendations. The program uses input from all assists to gauge situations calling for new research initiatives.

Categories
Energy: 3
Environmental: 16
Safety: 4
Other: 9



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Navaei, M., J. Xu, P.J. Hesketh, W. Daley, and S. Grullon. 2011. Lateral flow impedance transducer for *Salmonella* detection. ECS Transactions. (Submitted for publication).

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McMurray, G.V. 2011. Robotics and automation for poultry processing. In: Robotics and automation for food processing industry. (Woodhead Publishing). (Submitted for publication).

LECTURES AND PRESENTATIONS

Ahuja, K., D. Britton, and G. McMurray, 2010. Industrial noise abatement technologies and strategies. Web presentation for engineers and safety personnel with Keystone Foods, July 27.

Anderson, D. 2010. Overview of broiler growout house monitoring project. UGA Department of Poultry Science Lecture Series, Athens, GA, November 15.

Britton, D., W. Daley, G. McMurray, and J. Pierson. 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division. Visit by Gary Black, President of Georgia Agribusiness Council, Atlanta, GA, July 14.

Britton, D. 2010. Poultry research activities at the Georgia Tech Research Institute. Georgia Poultry Federation Summer Poultry Leadership Conference, Ponte Vedra Beach, FL, July 21-24.

Britton, D., W. Daley, G. McMurray, and J. Pierson., 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division. Visit by staff assistants to Senator Saxby Chambliss, Atlanta, GA, August 19.

Britton, D., 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division. Visit by Technical and Production Team staff for North Point Community Church, Atlanta, GA, September 8.

Britton, D., 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division. Presentation at the PTXchange Meeting of Industry Technical Experts, Deer Valley, Utah, September 13.

Britton, D. and G. McMurray. 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division. Visit by faculty and researchers from UGA's Food Product Innovation and Commercialization Center, Atlanta, GA, September 22.

Britton, D., J. Stewart, and R. Wallace. 2010. Overview of GTRI's Agricultural Technology Research Program and Food Processing Technology Division with discussions about Sensing Technologies and Opportunities. Presentation to Pfizer Poultry Health Biodevices Group, Durham, NC, September 28.

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McMurray, G. 2011. Overview of food safety research at GTRI. Visit by Rockwell Automation, Atlanta, GA, February 3.

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Wang, D.H., J. Guo, K.-M. Lee, C.-J. Yang, and H. Yu. 2011. An adaptive knee joint exoskeleton based on biological geometries. IEEE International Conference on Robotics and Automation, Shanghai, China, May 9-13.

INVENTION DISCLOSURES

Holmes, J.F. and W.D. Holcombe. Imaging technique to evaluate washing performance for food processing.

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ATRP

AGRICULTURAL TECHNOLOGY
RESEARCH PROGRAM

VISION STATEMENT

TO BE THE
TECHNOLOGY INNOVATION
AND DEVELOPMENT
PROVIDER THAT ENABLES
GEORGIA TO BE
RECOGNIZED AS THE
UNDISPUTED LEADER IN
POULTRY, AGRIBUSSINESS,
AND FOOD PROCESSING.

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