



## Iowa Spring Utilizes CIRAS Services to Improve Productivity and Increase Profitability

*It all started with a simple phone call several years ago to CIRAS asking for assistance with the plant layout of a second manufacturing facility that was in the planning stages at Iowa Spring.*

Since 1977, Iowa Spring has been engineering, producing, and delivering springs for various agricultural equipment, construction machinery, overhead garage doors, and appliance industries worldwide. Iowa Spring is owned and operated by their original founders in the midwestern town of Adel, Iowa.

In 2007, Iowa Spring opened a garage door spring division, Southern Atlantic Spring, located in Granite Quarry, North Carolina. "This was the catalyst for us to come to CIRAS for assistance with plant layout simulations," explains Brian Setchell, vice president of operations and 32-year veteran at Iowa Spring. "We were looking for ways to improve our

material handling processes at our Adel facility by rearranging our existing floor plan and the addition of a new building."

With the success of the plant layout simulation project, soon CIRAS was assisting Iowa Spring with many other facets of their business. Derek Thompson, the account manager working with Iowa Spring, is quick to praise their leadership and management team. "They are a very proactive and innovative group, and they welcome the assistance and resources provided by CIRAS," explains Thompson.

### Other Cost-Saving and Quality-Control Services

Recently, Iowa Spring received a customer inquiry regarding their spring cycle life. CIRAS enlisted the help of Dave Utrata, program manager at the Institute for Physical Research and

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**On the Cover:** Production of a custom garage door spring

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**CIRAS Mission:** *Every day we will enhance the performance of industry through applied research, education, and technical assistance.*

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Technology's (IPRT) nondestructive evaluation group, who performed spring cycle testing via nondestructive evaluation.

Nondestructive evaluation is a collection of powerful methods such as ultrasound and x-rays that can be used to detect defects in and measure physical or mechanical characteristics of a material or component. It is suited to the demands of today's manufacturing processes, where it can help improve product quality and production performance.

CIRAS also connected Iowa Spring with Greg Maxwell, director of Iowa State University's Industrial Assessment Center (IAC). This center provides no-cost assessments in energy use, productivity enhancement, and waste reduction to qualifying manufacturers. The IAC conducted an energy audit at the Iowa Spring facility in Adel with a recommendation to switch the type of lighting utilized in the plant. This resulted in a 40 percent reduction in light energy costs, a rebate from MidAmerican Energy, and a brighter light source illuminating the plant floor.

"We offer many resources to our clients with the provision of staff expertise as well as an extensive menu of services within CIRAS, and we provide links to great partners such as IPRT's Center for Nondestructive Evaluation and Iowa State's Industrial Assessment Center," explains Thompson.

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*—Derek Thompson  
CIRAS Account Manager*

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### Theory of Constraints Project Results in Big Outcomes

The most intensive assistance provided by CIRAS is a project that started a little more than a year ago. Iowa Spring recognized they needed to increase throughput to stay competitive in the current economic climate. The paint production area of the plant was continually working overtime, and they couldn't get enough product



**Above Left:** Mini warehouse springs ready for shipment. **Above Center:** Residential garage door spring assemblies ready for shipment. **Above Right:** Harrow Tine production line.

out the door. A new paint line was being considered, but before they made that investment they wanted some outside assistance and perspective.

Thompson met with Setchell to discuss the challenges that Iowa Spring was encountering and the opportunities available to assist them.

It was decided that Mike Willett, a CIRAS project manager, would provide a company-wide workshop on Theory of Constraints (TOC) concepts followed by a business improvement generation project. Theory of Constraints is a management philosophy geared toward increasing profits. The theory is that only a few factors in a business limit the achievement of the business toward its goals. The TOC tools are used to identify these constraints and then to implement a process of ongoing improvements.

In other words, every business or system has something preventing it from reaching its full potential—a weakness that limits its performance and output. This weakest point or constraint determines the maximum capacity of the entire system.

As a result of the discussion provided during the workshop, constraints were identified and several ideas were generated that Iowa Spring could immediately apply to the paint production area, eliminating the need to invest in a new paint line. Modifications to the scheduling were adopted, which led to an increase in product through that line, a growth in sales, and a reduction in lead time.

The TOC improvements that the company made were so positive that six months later they had CIRAS assist them with a full TOC implementation project. The goal of this project was to change the way employees think about the business and to develop new measurements to track company performance. With the implementation of the objectives from this project, Setchell anticipates further reductions in lead times from seven weeks to potentially one day in some cases.

With the increased throughput attained, Iowa Spring has realized greater market share through reduced lead times and more throughput capacity due to realigning their focus to shipped (throughput) product and not just produced product.

Overall, these TOC projects identified what to change, what to change to, and how to cause the change. The management at Iowa Spring is still working through the final stages of the implementation plan, but they have already recognized \$300,000 to \$500,000 annually in increased sales, realized a 10 percent labor and scrap level savings in the garage door line, and hired 10 additional employees. They also had a significant increase in investment in inventory and project implementation.

“CIRAS provided us with the experienced outside perspective we were after,” says Setchell. “The majority of our management team has been together several years, and we were finding it difficult to step back and look at our operation from a different perspective. CIRAS provides that input for us and helps us identify areas to focus our efforts to improve the business and throughput in the current challenging market environment. With the education CIRAS provided, we are confident we will be able to implement future TOC projects on our own.”

# CIRAS Offers Guide to Supply Chain Sustainability

Successful companies constantly seek ways to increase their competitiveness. The relatively new concept of supply chain sustainability, which merges the practice of supply chain management with sustainability, is gaining attention as a way to increase profits while being socially and environmentally responsible.

Supply chain management encompasses managing the flow of a product from the raw-material stage through processing and delivery to the consumer. Sustainability focuses on the triple bottom line—assessing financial, social, and environmental performance—and how these factors interact.



Triple bottom line

Taking a systematic approach to supply chain sustainability can garner major financial benefits, according to Mike O'Donnell, CIRAS Economic Development Administration University Center (EDAUC) program director. "Many times, sustainability means eliminating waste," he says. "Waste costs money whether it's water, energy, or solid waste. If a company reduces waste within its own facility, that saves some money; but if it is reduced throughout the entire supply chain, the savings will be even greater. Plus you're doing the right thing."

Last May, O'Donnell with Jennifer Blackhurst and Dave Cantor, faculty in the College of Business, began a project designed to help Iowa manufacturers understand and implement supply chain sustainability practices. With funding from the EDAUC Program

and the Manufacturing Extension Partnership Program, they developed a report, *Sustainable Supply Chains: A Guide for Small- to Medium-Sized Manufacturers*. The report is available at [www.ciras.iastate.edu/CIRASSupplyChainSustainability.pdf](http://www.ciras.iastate.edu/CIRASSupplyChainSustainability.pdf).

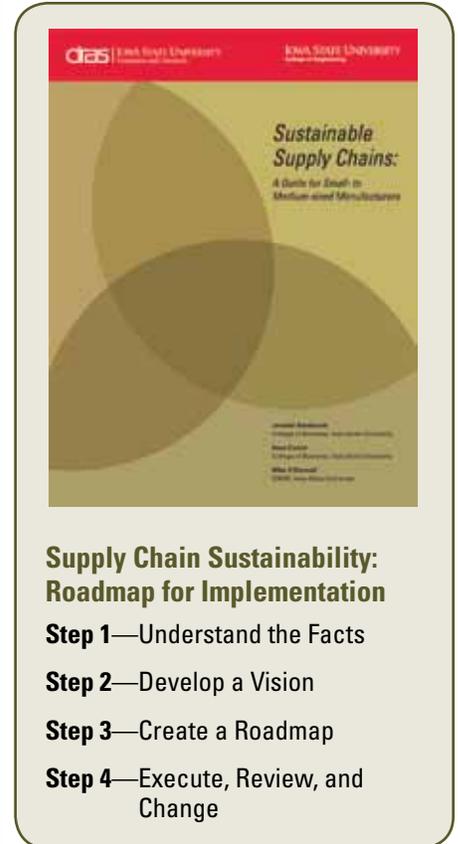
"Our goal is to provide companies with an understanding of the big picture and then how they can take action," O'Donnell says.

Blackhurst and Cantor, whose academic focus is supply chain management, summarize what large international corporations such as Walmart, John Deere, and ConAgra Foods are doing as well as what consulting firms say is going well and what is presenting challenges. An assessment tool, devised by combining research and CIRAS's understanding of Iowa manufacturers, is included to help companies determine where they are relative to supply chain sustainability.

A four-step process—Understand the Facts; Develop a Vision; Create a Roadmap; and Execute, Review, and Change—is provided to help companies implement initiatives.

The collaboration between CIRAS and the College of Business is a win-win situation, according to Blackhurst. "Iowa firms benefit from this best practices guide, and our connection to these companies will help us explore additional research. In addition, our teaching is enriched because we're able to use real-life examples in the classroom."

A second part of the project is a survey of 60 firms across Iowa to see where they stand on supply chain sustainability. Blackhurst and Cantor are particularly interested in the companies' motivations.



## Supply Chain Sustainability: Roadmap for Implementation

- Step 1**—Understand the Facts
- Step 2**—Develop a Vision
- Step 3**—Create a Roadmap
- Step 4**—Execute, Review, and Change

"Companies can get pressure from a variety of stakeholders," says Cantor. "It could be customers demanding green products, suppliers wanting to ensure they are contributing to a green product, or local governments. It could also be internal, the company's employees. We want to understand who is exerting the influence and what impact that has on the supply chain."

The survey will allow the researchers to compare Iowa with the national scene, and those results will be shared in a supplement to the original report.

*The report is funded by the EDA University Center Program and the Manufacturing Extension Partnership Program.*

➤ For more information, please contact Mike O'Donnell at 515-294-1588 or [modonnll@iastate.edu](mailto:modonnll@iastate.edu).

## Iowa State University Extension and Outreach 2011 Annual Report Released

### People Advancing People 2011 Quick Facts

- Last year about 1.8 million people benefited from Iowa State University Extension and Outreach educational programs, and nearly 17,000 volunteers worked with us.
- Some 94,000 youth were involved in 4-H programs. That's one in five Iowa school-age youth.
- Companies who have worked with our Center for Industrial Research and Service (CIRAS) reported making \$43 million in new investments and creating or retaining more than 6,000 jobs.
- Our field agronomists consulted one-on-one with more than 10,000 crop farmers.
- Our community development specialists helped Iowa communities leverage more than \$29 million in grants and resources to complete infrastructure, building, and other projects.
- More than 196,000 Iowans increased their understanding and skills on family issues through noncredit workshops and conferences.

The report is available at [www.extension.iastate.edu/communications/2011annualreport](http://www.extension.iastate.edu/communications/2011annualreport).

## Competition for High-Skill Manufacturing Workers

by Liesl Eathington

*In Iowa and nationwide, attention focuses on a perceived shortage of high-skill manufacturing workers. Many employers are calling for public assistance to fill their skilled worker pipelines; however, the challenges may run deeper than what state and local educational policies can address. Following are a few economic and demographic realities that may make it difficult for manufacturers to entice new workers.*

### Weak Signals to Potential Workers

When young people choose an occupation, they consider inducements such as wage value and perceived job security. Compared to many fields, production occupations are not sending a strong welcome to potential workers.

- The U.S. economy shed nearly 34 percent of its production jobs during the last decade. Among these were thousands of high-skill jobs, defined here to include the top third of production occupations ranked by median wage. These high-skill production jobs declined by 29 percent, far exceeding the average 2 percent decline for all U.S. occupations.
- The 10-year projected growth rate for production occupations is 4.2 percent, compared to a rate of 14.3 percent for all U.S. occupations. Even high-skill production jobs are projected to grow at just 6 percent during the next decade, less than half the average rate for all occupations.
- The median annual wage for production occupations was \$30,330 in 2010, which was 10 percent lower than the \$33,840 median for all U.S. occupations.

Although wage rates and growth projections in specific production occupations may exceed U.S. averages, the overall picture for manufacturing can look less promising to potential employees.

### Size of the Young Adult Population

Iowa manufacturers are competing with other industries and states for a limited pool of young workers. Whether due to long-term birth rate trends or the out-migration of young adults, the fact remains that Iowa's population between the ages of 25 and 34 years is 11 percent smaller today than it was in 1990. Near-term prospects for Iowa's employers aren't much brighter. The population under 18 years of age, representing the state's future

labor force, was only 1 percent larger in 2010 than in 1990.

### The Lure of Higher Education

Some employers argue that students who are not on track for a postsecondary education should be encouraged to pursue careers in high-skilled production occupations. National labor force trends suggest that this potential pool of recruits is shrinking. The percentage of the U.S. labor force members with a high school diploma and no college education fell from 40 percent in 1990 to 29 percent in 2010.

### Demands on Educational Institutions

Educational institutions must balance budgetary constraints with curriculum and program demands that evolve with the economy, both in terms of its industrial structure and its labor force composition. For example, today's workforce is more gender balanced than in the past. Women accounted for 47 percent of the U.S. labor force in 2010, suggesting that schools have less incentive to focus on traditionally male-dominated educational programs.

More to the point, women accounted for 56 percent of students enrolled in postsecondary education in 2010. Their representation in educational institutions is twice their representation in manufacturing occupations, where they account for just 28 percent of workers. The differences are even more striking in several high-skill manufacturing occupations: only 5 percent of U.S. machinists and 4 percent of welders are women.

### Conclusion

Given the growth and wage prospects of production occupations relative to many other vocations and trends in demographics, Iowa's young workers will likely need greater inducements to pursue skilled production occupations.

# Taking Measure of the Bioeconomy

There's no question that the markets for products and energy based on bioproducts is growing, but how do you measure the overall state of this "bioeconomy?" That's what CIRAS and the U.S. Department of Agriculture endeavored to answer in a jointly prepared report showing what types of information give the best measures of the condition of the biobased economy. It is hoped the study will provide the foundation for a standard set of indicators.

"This was a very extensive study to help set the stage for good policy development at the federal and state level," says Ron Cox, CIRAS director. Such indicators should help industry, investors, and policymakers make more informed decisions, resulting in improved sustainability and national security and expanded economic development opportunities.

Cox says CIRAS was chosen to author the report because of its extensive knowledge of biobased products as well as Iowa State University's understanding of biobased fuels and chemicals.

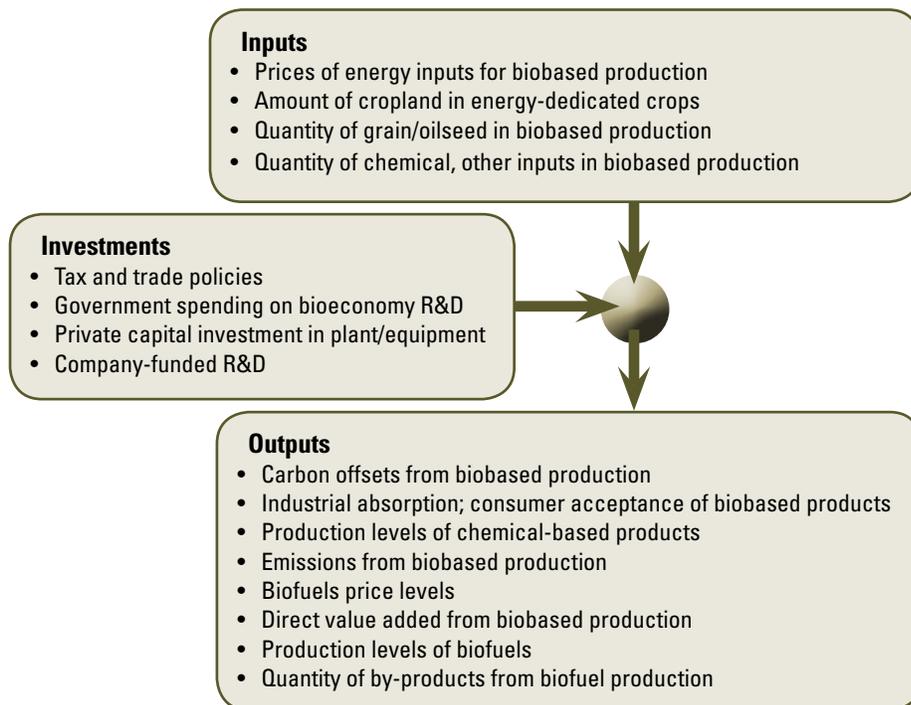
*Biobased Economy Indicators: A Report to U.S. Congress* was undertaken to address the requirement of The Energy Policy Act of 2005, which requires the analysis of economic indicators of the biobased economy. The full report can be downloaded from <http://www.usda.gov/oce/reports/energy/index.htm>.

The report looked at four types of biobased products: (1) biofuels, focusing on ethanol and biodiesel; (2) end-use biobased products, which are items sold directly to consumers or to businesses; (3) biochemicals, which are chemical products manufactured using enzymes, microorganisms, or renewable resources; and (4) biopower, including the generation of electricity and the production of heat.

## Winnowing Down the List

Work on the report began with development of an extensive list of

## Key Economic Indicators of a Biobased Economy



The *Biobased Economy Indicators* report co-authored by CIRAS selected 16 indicators that can be used to measure the overall condition of the biobased economy. This list is not meant to be all inclusive, but rather it is a starting point for future discussions and studies.

potential economic indicators of the bioeconomy. Two public forums, one in Washington, D.C., and one in Chicago, were held for input on the importance of the various indicators. The forums were attended by representatives from a number of federal agencies, industry associations, and private companies, both large and small.

According to Cox, the indicators are similar to those used to measure any industry and include inputs, investments in the industry, and outputs. "Of the dozens and dozens of indicators we came up with, we picked 16 to look at in depth," he says.

In the end, the report's authors selected four input indicators, four investment indicators, and eight output indicators. Each of these indicators was studied to understand where data-gathering methods are inadequate, the relevance of each

indicator to the growth of the bioeconomy, and how that relevance is or might be measured. Further analysis was conducted to explore how indicators can be combined to assess growth, profitability, and uncertainty in the bioeconomy.

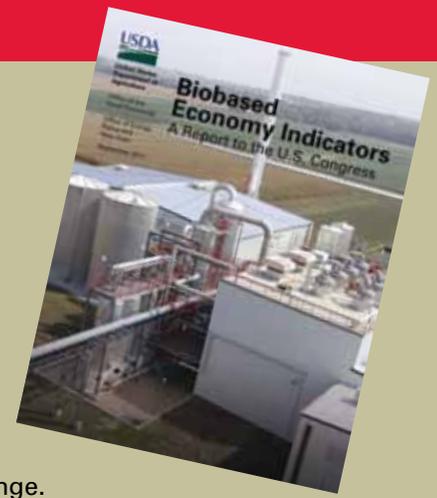
The input indicators address concerns related to the availability and prices of production inputs, either of which could constrain future growth in biobased industries. The selected indicators included the prices of energy inputs, the amount of cropland in energy-dedicated crops, the quantity of grain and oilseed inputs used in biobased production, and the quantity of chemical and other inputs used in biobased production processes.

Four investment indicators made the final list. These indicators gauge the level of private sector willingness and public sector support for investment in

# Report Recommendations

The *Biobased Economy Indicators* concludes by making a number of recommendations to support development of a variety of accurate indicators to measure the nation's bioeconomy:

- An advisory and policy planning committee with membership from the federal government should be established to regularly communicate on the topic of bioeconomy indicators.
- Formalizing biobased industry measurement standards between government agencies and the private sector should lead to more consistent estimates of data.
- Development of a biobased industry and commodity usage survey could be undertaken to expand the amount of information available on nonfuel segments of the industry.
- A revision of the North American Industry Classification System may be necessary to more effectively gather biobased industry data.
- Policymakers and planners should concentrate on measuring a few key indicators that give a sense of the scope and depth of biobased product usage and change.
- Industry should lead development of standardized and regular industry measures designed to provide planning and guidance information for the industry. This could include biobased industry performance, workforce needs, product acceptance, and regulatory issues.

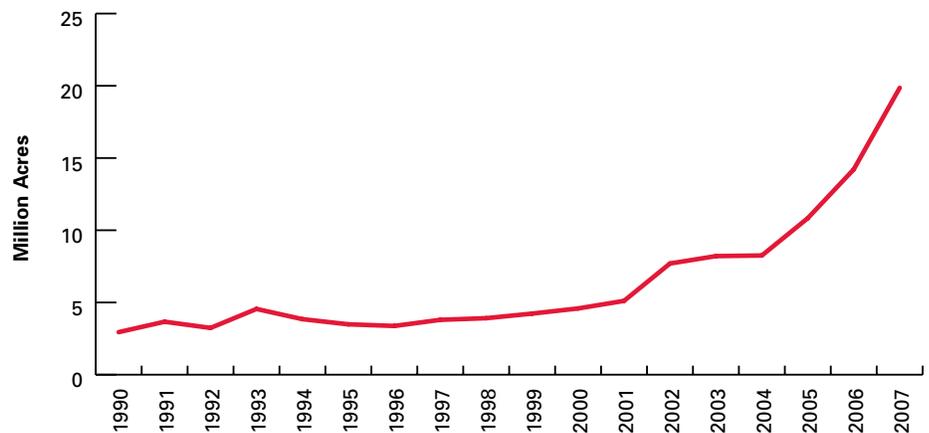


biobased industry development. They were tax and trade policies, government spending on bioeconomy research and development (R&D), private capital investment in plant and equipment, and company-funded R&D.

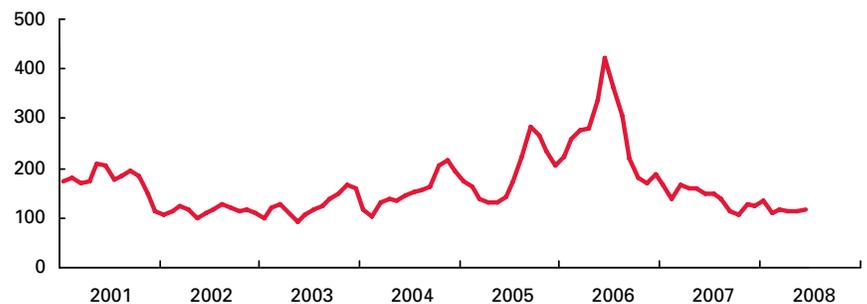
The output indicators quantify various economic and environmental consequences of biobased production activities. The output indicators were carbon offsets from biobased production; emissions from biobased production; industrial absorption and consumer acceptance of biobased products; production levels of chemical-based products; and direct value added from biobased production. The last three output indicators focused on biofuels, including biofuels price levels, production levels of biofuels, and quantity of by-products from biofuel production.

Cox adds that the report also looked at some higher-level aggregate indicators. These composite indicators could be used to reflect changes in the overall state of the bioeconomy.

Principal authors of the report were CIRAS's Cox and Liesl Eathington, Dave Swenson and John Miranowski of Iowa State University, and Marvin Duncan of the Office of Energy Policy and New Uses.



The authors of the report studied a number of input, investment, and output indicators. One example of an input indicator is the number of corn acres harvested for ethanol production, as shown here.



The report proposed that a composite bioeconomy index, such as the hypothetical one shown here, would provide a focal point to facilitate and enhance public- and policy-oriented discussions regarding the state of the bioeconomy.

➤ For more information, please contact Liesl Eathington at 515-294-2954 or [leathing@iastate.edu](mailto:leathing@iastate.edu).

# Iowa Firms: Get Products Biobased Certified

*Iowa companies can now market their products using the “USDA Certified Biobased Product” label thanks to a program being managed by CIRAS for the U.S. Department of Agriculture (USDA). The effort also includes a program in which federal agencies give preference to procuring products labeled as “BioPreferred.”*

Unlike those using fossil-based carbon, biobased products contain significant amounts of carbon from renewable biomass such as soybeans, corn, and other agricultural resources. Consumers are increasingly recognizing the benefits of biobased products and are seeking them out. Biobased products also have the potential to reduce the amount of greenhouse gases emitted into the atmosphere and lessen demand for fossil fuels.

## Bringing the Program Home

Although CIRAS runs the program for the entire nation, there is great need in Iowa, according to CIRAS’s Steve Devlin. “Iowa ranks 12th in number of companies registered in the BioPreferred Program with 97 (4th per capita) but ranks 21st in number of companies participating in the certification and labeling program.”

Many companies offering biobased products are small, developing businesses, so the labeling program can help bring increased visibility to their products’ performance and environmental characteristics. Moreover, these small companies are often located in rural areas, so the program can also serve to boost the rural economy and provide new markets for farm commodities.

B4 Brands of Lisbon, Iowa, has recently earned the BioPreferred label for several of its products, including hand sanitizers, soaps, and lotions. “The process of certification was rather simple and straightforward,” says John Rhomberg, CEO, although he adds that the formulation development to prepare for certification required a tremendous amount of work and investment. CIRAS handled the front and back ends of the process. B4 Brands earned the certification in early 2012, and Rhomberg says the company intends to use the label in all of its marketing efforts.

The BioPreferred label makes biobased products more accessible and visible. Devlin points out that there is no cost to register for the program. Companies only cover testing costs—done by an outside company—at approximately \$650 per sample.

## Boosting Federal Procurement of Biobased Products

The effort also includes a preferred procurement program for federal agencies. The USDA designates categories of biobased products. Federal agencies and their contractors are then required to give preferential consideration to these designated product categories when making purchases. As a part of this process, the USDA establishes the minimum biobased content for the category. Information on the technical, health, and environmental characteristics of these products is also considered.



## Earning the Biobased Label

To be eligible for USDA certification and labeling, the USDA asks that a product meet two criteria: (1) the product must be biobased, and (2) the biobased content must be at or above a minimum level. Minimum levels have been established as part of the BioPreferred Program and are subject to change. Products that do not belong to designated items are still eligible if they are at least 25% biobased. At the beginning of the program in early 2011, the USDA estimated that there were 20,000 commercially available biobased products created in the United States. For more information on earning the certification, see [www.biopreferred.gov/labeling.aspx](http://www.biopreferred.gov/labeling.aspx).



Above: With assistance from CIRAS, B4 Brands was able to get its Avant Hand Sanitizer certified as a biobased product. B4 Brands of Lisbon, Iowa, offers a complete line of hand hygiene products.

➤ For more information, please contact Rudy Prusko at 563-583-6496 or [rprusko@iastate.edu](mailto:rprusko@iastate.edu).

# What Iowans Think about Biobased Products

*Gauging the opinions of Iowa consumers was the purpose of a consumer survey undertaken by Iowa State University Extension and Outreach in the summer of 2011. The survey results will help industry and government better understand the perception and acceptance of biobased goods among Iowa consumers, according to CIRAS's Steve Devlin, program director for the Biobased Product Testing Program and one of the authors of the survey. The survey is especially important in Iowa because biobased products combine manufacturing and agriculture.*

For the survey, biobased products were defined as those that “are commercial or industrial products (other than food or feed) that are made of renewable agricultural materials.” In their conclusion of the survey results, the researchers said that Iowa consumers have a favorable attitude toward environmentally friendly products and a willingness to purchase biobased products and fuel, depending on price.

“While there is a significant number of Iowans familiar with biobased products, there is a large potential pool that would benefit from additional education and market outreach,” Devlin says. He adds that the survey showed that consumer acceptance for biobased products continues to be driven by cost effectiveness regardless of environmental, regional, or nationalistic traits.

## Digging into the Findings

The genesis for the report was a similar one done on behalf of the Ohio Soybean Board in 2009. The Iowa version surveyed a representative random sample of registered voters in the state. In all, over 750 responses were received, a response rate of about 30 percent. The survey consisted of 20 questions about consumers' views of biobased products. Five questions covered demographics, job status, and the like, as well as Iowans' attitudes on current economic conditions in the state. The survey results also included a statistical analysis to determine the response differences between various demographic groups.

The first set of questions gauged the level of Iowans' familiarity with biobased products. For instance, one question asked about familiarity with various biobased products such as cleaning supplies, building materials, and office supplies. The results showed that the majority of respondents are not generally familiar with everyday biobased products—quite the opposite of their familiarity with biofuels.

The survey also attempted to answer the question, “Are Iowans using biobased products?” While about half of all Iowans said they are, another one-third said they were unsure if a product they are currently using is biobased. A large majority of respondents (approximately 82 percent) also felt that it was important for Americans to use environmentally friendly products.

## Biobased Use by the Government

A number of questions were also asked to assess Iowans' attitudes about the use of biobased products within various government agencies. For instance, approximately two-thirds of respondents reported that they thought it was important for local government agencies to use biobased products in their offices and biofuels in their vehicles.

The report is available at [www.ciras.iastate.edu/bioindustry/biobasedproducts/publications.asp](http://www.ciras.iastate.edu/bioindustry/biobasedproducts/publications.asp).

# Sustainable Economies Program Targets Lee County

With two cities—Ft. Madison and Keokuk—just 23 miles apart, Lee County is the focus of the second CIRAS Sustainable Economies Program. Funded by a three-year Economic Development Administration University Center (EDAUC) grant, the program is designed to help regional trade centers (RTCs) identify and target opportunities for sustainable growth at the regional economic level and at the local business level.

An RTC is typically defined as a small-to medium-sized city (5,000–49,999 in urbanized population) that serves as a regional center for manufacturing, transportation, retail trade, business services, and health and education services.

“While Ft. Madison and Keokuk are separate cities, their proximity means they act as one region,” says Mike O'Donnell, CIRAS EDAUC program director. “We chose this area because it presents some unique challenges and opportunities. What is good for one could negatively impact the other, but working together could help bring sustainable growth for both.”

Early in February, some 75 individuals from the public, private, and nonprofit sectors of the region participated in a daylong summit to learn what analysis of financial, social, and environmental data says about the area and how it compares to other areas of similar size. The attendees then discussed the key aspects of sustainability including industry structure, unemployment, education levels, and family well-being.

“This is the first step toward growth,” says O'Donnell. “They are working together to set potential priorities, and we will continue to work with them to help them develop an actionable plan.”

➤ **For more information, please contact Steve Devlin at 515-490-0439 or [sdevlin@iastate.edu](mailto:sdevlin@iastate.edu).**



## Security Literacy: Your Best Computer Security Defense

*Are you educating the computer users in your organization to be more security literate?*

Doug Jacobson, director of Iowa State's Information Assurance Center, has witnessed the progression and sophistication of computer security attacks over the years. Today's cyberattacks are not just about exploiting software vulnerabilities, but also about human liabilities. Unlike software vulnerabilities, many of these human "bugs" cannot be simply fixed with an Internet patch. They require formal security awareness and education to mitigate.

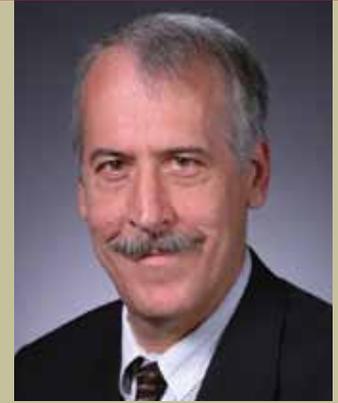
During an average day, the computer users in your organization enter passwords, connect to the Internet, and are inundated with alerts and pop-ups informing them about patch updates, antivirus signatures, and firewall exceptions, but they lack the proper education or vocabulary to make smart decisions regarding the benefits and consequences of taking specific actions.

It has long been recognized by security experts that the end user is in fact the most vulnerable link in the security chain and that technical measures by IT personnel alone cannot solve current security threats. So why not target the weakest information security links in your organization and address them in a formal educational environment?

The traditional education method about cybersecurity has been to provide information regarding password protection and phishing campaigns. This approach is not effective because it is based on the fact that individuals can remember, understand, and apply knowledge when given nothing more than single-page, top-ten bullet-point lists of security measures.

Jacobson believes that formal computer security education is the key to combating the risks and vulnerabilities associated with the Information Age. Everyday users need the proper education and vocabulary provided in context in order to make smart decisions regarding the benefits and consequences of specific actions when using the Internet.

"Your most important computer security defense is to go beyond awareness and actually teach security literacy in terms the average user will understand, use everyday activities and current events, and help users understand that they have a primary role in their own safety," says Jacobson.



*Doug Jacobson, a University Professor in the Department of Electrical and Computer Engineering, is the director of the Information Assurance Center (IAC)*

*and the newly formed Information Systems Security Laboratory (ISSL). Jacobson teaches network security and information warfare. He is also a computer forensics analyst for the Iowa State Police Division.*

Jacobson has received two R&D 100 awards, recognized as the "Oscars of Innovation," for his security technology, and he holds two patents. In 2010, he was named an IEEE (Institute of Electrical and Electronics Engineers) fellow and a Cyber 7 award winner from Symantec Corporation, honoring him for his efforts as a pioneer in developing new, important, and impactful security educational programs at all levels.

Through a partnership with CIRAS and the College of Engineering, the ISSL was created to provide an unbiased evaluation of a corporation's system security, benchmarks of system performance, and training for companies in security compliance. The ISSL will offer corporate training to provide staff the tools they need to be the company's front line defenders in computer security through specialized security training for corporate IT staff and security literacy training for all staff.

The ISSL invites and welcomes interaction and collaboration with industry members through student-driven testing, product testing, product comparison testing, and product reviews. Facilities include ISEAGE: Internet-Scale Event and Attack Generation Environment and specialized traffic generation and analysis tools.

The ISSL is one of many outreach activities run by the IAC, which is also dedicated to administering graduate degrees, graduate certificates, and undergraduate student group experiences. The center is one of the original seven National Security Agency's certified National Centers of Academic Excellence in Information Assurance Education.

► **For more information, please contact Doug Jacobson at 515-294-8307 or [dougj@iastate.edu](mailto:dougj@iastate.edu).**

# Companies Can Save Money through Energy Management

*Energy management is a significant way for companies to save money, according to Colin Christy, CIRAS energy management specialist. An effective energy management system includes developing an energy policy, designating who is responsible for energy, and monitoring energy usage.*

“Most manufacturers are pretty unique,” Christy explains. “The EPA [Environmental Protection Agency] has benchmarks for a few industries like milling wet corn and manufacturing automobiles, but for most plants there isn’t anything that says, ‘this is the amount of energy you should be using.’ With good monitoring techniques, plant managers can determine if they are improving efficiency.”

Christy is currently developing a plan for monitoring techniques. It entails looking at billing information every month, charting energy usage, and then comparing usage with previous months and years. He emphasizes that the data must be normalized for weather, since temperature has a big impact on energy usage.

While monitoring usage tells manufacturers if they are improving energy efficiency, an energy audit can provide specific recommendations on cost-effective changes.

“Manufacturers often just pay their energy bills and don’t look at what affects those costs,” says Bob Coacher, CIRAS account manager who works with companies on the western side of Iowa.

“Pumps and motors may be running inefficiently or there might be new technology available that could have a significant impact. Getting an outside perspective could lead a company to significant savings.”

CIRAS partners with the Iowa State University Industrial Assessment Center (IAC) to provide that outside perspective by conducting 20 energy audits a year. Since its founding in 1991, the IAC has performed 476 audits at manufacturing companies throughout the Midwest, says Greg Maxwell, associate professor of mechanical engineering. Maxwell, who has been involved with the audits since the beginning, has served as IAC director since 1996. Christy points out that Maxwell has been instrumental in ensuring the continuation of the IAC through his interactions with the Department of Energy (DOE), which funds the audits, and with hiring and training students.

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“Manufacturers often just pay their energy bills and don’t look at what affects those costs.”

—Bob Coacher

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**Top:** Kevin Mann, junior in mechanical engineering, checks the nameplate specifications on an electric motor and pump. **Bottom:** Industrial engineering senior Ryan Frahm checks the nameplate ratings of a backup generator.

“CIRAS and the IAC form a great partnership,” adds Christy. “CIRAS account managers, like Bob Coacher, market the IAC services as they call on companies. Then they contact me, and I work with IAC to schedule the audits.”

A new five-year DOE contract began in October with an emphasis on educating students on energy efficiency while providing companies with recommendations for potential savings. Twenty audits of small- and medium-sized manufacturers will be completed each year.

Approximately 20 engineering students are being hired to conduct the audits. Christy, along with Maxwell and Frank Peters, IAC assistant director and associate professor of industrial and manufacturing systems engineering, prepares the students to conduct the audits. “We hire students from a variety of engineering disciplines,” Christy says. “They have

*Continued on page 12*



*Frank Peters is an associate professor of industrial and manufacturing systems engineering. A member of the Iowa State faculty since 1996, Peters earned his undergraduate and*

*graduate degrees at Penn State University. Since 2004, he has also served as assistant director of the Industrial Assessment Center (IAC), which partners with CIRAS to conduct energy audits for medium-sized manufacturing companies.*

Peters' research and teaching interests focus on manufacturing system and process improvement. He has worked extensively with the steel casting industry. His recent research efforts include the development of new heat treatment instrumentation and control strategies to reduce energy consumption and increase throughput.

"My goal in my teaching and research is to improve the competitiveness of U.S. manufacturers," Peters says. "The IAC is one way that I am able to help companies."

Students benefit from Peters' work on audits as well. "I get to experience a wide variety of manufacturers from food to electronics to metals to glass to polymers to wood," he explains. "When students ask questions in class, I can draw on this bank of knowledge I've gained from working with all of these different manufacturers to illustrate answers."

In his work with the energy audits, Peters says he approaches them with a focus on how to get more parts through the system for a given amount of energy. "For example, if a bottleneck exists in an operation that utilizes process heating," he explains, "we can improve the combustion of that heating unit to utilize less energy and improve the throughput to produce more parts for the given amount of energy."

to learn a lot about the different subsystems—for example HVAC (heating, ventilation, and air conditioning), compressed air, lighting, and electric motors—and then learn ways to make them work efficiently."

A group of six students and one of the faculty members conducts each daylong audit. After touring the plant, they divide into three teams to take a close look at the various subsystems to determine if they are working properly.

After returning to campus, the students do calculations to determine how much energy could be saved by making various changes. "Every plant is different, so there is a range of recommendations," Christy says. "For example, in one plant we might figure out that with some minor modifications, waste heat could be used for climate control; and in another plant a modification to the lighting system might easily pay for itself in energy savings."

Approximately a month after the audit, the recommendations are compiled in a report and sent to the company. The

Kaitlyn Garon, a sophomore in mechanical engineering, measures the airflow from a fan.



company is later surveyed to find out which recommendations have been implemented.

Bradley Coffman, a graduate student in industrial and manufacturing systems engineering, is one of the students working on the audits. "This is a great opportunity to learn about green manufacturing and sustainability," he says. "Air compressors, for example, are very costly to run, but understanding how they operate helps you find ways to make them work more efficiently."

With an ultimate goal of becoming an engineering consultant, Coffman says the audits are giving him experience working with a variety of companies and learning about a wide range of manufacturing processes. As a graduate student, he is also gaining experience managing the undergraduates who are working on the audits.

In January an audit was conducted at NSK-AKS Precision Ball Company in Clarinda, Iowa. Howard Cabeen, technical leader

at the company, says Coacher brought up the idea of an audit to the plant manager at just the right time.

"We are looking at upgrading our building management system, HVAC, and air compressors," Cabeen explains. "And our energy rates are being raised for the first time in 18 years. When that happens, you look at ways to help yourself. We hadn't had an energy audit for some time, so we decided it was a good time to revisit that."

Cabeen adds that he was very impressed with how the audit was conducted and how enthused the team was as they toured the plant and learned about the manufacture of steel balls.

"Anytime someone comes in and is excited about what we do, it is awesome," he says. "The team had great questions that helped them come up with ideas on how we could save money. We see these things every day, so getting their perspective is really valuable. It was amazing how much I learned just being involved that day. I am looking forward to getting the report."

## The EPRC: A Great Industry/University Partnership

*The Electric Power Research Center (EPRC) at Iowa State University is a consortium of companies working to ensure continued advancements in electric power and energy-related fields through support of the university's research and educational program.*

The EPRC is a model of the industry and the university engaging in meaningful research and education, according to Colin Christy, EPRC program manager and CIRAS energy systems specialist. "This interaction sharpens everyone involved and makes our work more meaningful," Christy emphasizes. "I admire and appreciate our member companies' foresight in investing in the university."

"Our entire economy depends on having reliable electric power," says Richard Polesky, director of electrical engineering for MidAmerican Energy and chair of the EPRC Technical Advisory Committee (TAC). "Research and a well-educated workforce are essential elements of reliability."

The EPRC currently has 11 member organizations ranging from rural electric cooperatives to large utilities to two international companies. Membership fees support two-year research projects.

Companies and professors propose research topics. "The TAC prioritizes the ideas and provides feedback," Christy explains. "The professors write proposals based on that feedback. The research teams are often

interdisciplinary with faculty and students from such areas as electrical engineering, industrial and manufacturing systems engineering, economics, materials science and engineering, and metallurgy. The TAC then votes on which projects to fund."

Current projects include designing a transmission superhighway to send wind power from Iowa and the western states to load centers in the east, developing an improved conductor for transmission lines, and investigating the potential opportunities of the Smart-Grid.

While the EPRC provides direct support for graduate students through funding research projects, the interactions between faculty and industry professionals also helps strengthen the undergraduate program, which prepares tomorrow's engineers.

"Over the next five to six years, experts predict that 30–40 percent of engineers in the electric power industry will retire," says Polesky. "Iowa State has one of the premier power programs in the Midwest, and their efforts benefit the entire industry."

## Bioplastics/Biocomposites Workshop Planned for August

The Iowa State University Center for Crops Utilization Research (CCUR), a CIRAS partner, is sponsoring the third Biopolymers and Biocomposites Workshop on Tuesday, August 14. Hosted by CCUR's interdisciplinary Biopolymers and Biocomposites Research Team (BBRT), this workshop will focus on topics related to developing and using biobased materials including formulations, processing, product design, and manufacturing.

The workshop, which draws international participation, is held every other year. It will feature technical presentations, poster sessions, and industry exhibits as well as the opportunity for researchers, technicians, engineers, designers, and other industry representatives to network. "Our goal is to engage industry and build collaborations with and among researchers and companies," says David Grewell, BBRT team leader and agricultural and biosystems engineering associate professor.

Developing and increasing the use of biobased materials is an integral part of the CCUR mission to add value to Midwest crops, according to Lawrence Johnson, CCUR director. "This workshop provides an excellent forum for companies to interact with researchers and gain knowledge critical to the growth of this industry."

In conjunction with the CCUR workshop, the CIRAS-sponsored Plastics Manufacturing Technical Resources Workshop for Iowa-based plastics companies will be August 13 and the Bioplastics Container Cropping Systems Conference will be August 15.

➤ **Information on all three events is available at [www.biocom.iastate.edu/workshop/index.html](http://www.biocom.iastate.edu/workshop/index.html).**

- **HACCP Plan Updates Based on New Food Safety Regulation**  
May 17, 2012  
8:00 a.m.–5:00 p.m.  
Ames, Iowa
- **Lean Product Development**  
May 21, 2012  
8:00 a.m.–4:30 p.m.  
Cedar Falls, Iowa
- **Internet Marketing Strategy**  
May 22—Dubuque, Iowa  
May 23—Cedar Rapids, Iowa  
May 24—Burlington, Iowa  
8:00 a.m.–5:00 p.m.
- **Midwest Small Business Government Contracting Symposium**  
May 23–24, 2012  
8:00 a.m.–4:00 p.m.  
Moline, Illinois
- **ABI Taking Care of Business Conference**  
Keynote Speaker: Jim Collins, author of *Good to Great*  
June 13–15, 2012  
Des Moines, Iowa
- **Green 101**  
June 19—Council Bluffs, Iowa  
July 17—Dubuque, Iowa  
8:00 a.m.–5:00 p.m.
- **Dumpster Dive**  
June 20—Council Bluffs, Iowa  
July 18—Dubuque, Iowa  
8:00 a.m.–5:00 p.m.
- **Iowa's Advanced Manufacturing Conference**  
October 4, 2012  
8:00 a.m.–5:00 p.m.  
Ankeny, Iowa



## Engineering Career Fair

The 2012 Iowa State University Spring Engineering Career Fair on February 7 drew 215 companies, up 10 percent over 2011. More than 2,800 students from freshmen through graduate students and alumni attended the fair to talk with employers about internships, co-ops, and full-time positions.

The fair provides a great opportunity for employers and students to network and interact, according to Roger Bentley, Engineering Career Services manager of student and alumni professional development. "The employers can really engage the students and tell them about their companies in a proactive way," he says.

Engineering Career Services is a valuable resource for employers and students throughout the year. Through Iowa State's online Career Management System (<https://ecms.eng.iastate.edu/employers/>), employers can post positions, set up interview schedules, schedule workshop and information sessions, and register for future career fairs. The 2012 Fall Engineering Career Fair is Tuesday, September 25.

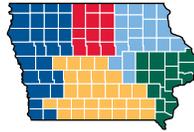
➤ **For more information, please contact Brian Larson, Engineering Career Services director, at 515-294-0252 or [blarson@iastate.edu](mailto:blarson@iastate.edu).**

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 Engineering Career Services  
 Engineering-LAS Online Learning  
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## Iowa State Offers Diverse STEM Activities

*Science, technology, engineering, and mathematics (STEM) education for K–12 is attracting a lot of attention these days, and Iowa State has a lot to offer. You probably know Iowa State is the birthplace of the first electronic digital computer, starting the world's computer technology revolution. The computer was created by physics professor John V. Atanasoff and graduate student Clifford Berry. What you might not know:*

- Iowa State anthropologist Jill Pruetz's discovery of chimps hunting with tools was No. 2 on *Wired* magazine's "Top 10 Scientific Breakthroughs of 2007."
- Iowa State engineer Xinwei Wang discovered spider silk conducts heat as well as metals.
- The Iowa State Meat Science Extension Program is ranked first in the nation by *Meat & Poultry* magazine.
- Iowa State and Ames Lab engineer Iver Anderson developed the patented lead-free solder that's most likely in your cell phone.

Who will discover the next big idea? With the state of Iowa providing additional resources to engage more students in STEM, maybe it will be a young neighbor living next door.

Governor Branstad's Executive Order 74 created the Governor's STEM Advisory Council. This council is charged with advising the governor on ways to improve STEM education, STEM innovation, and STEM careers in the public and private sectors.

Iowa State University is uniquely positioned to educate youth throughout the state in STEM skills. Frankie Laanan, Jay Staker, and Camille Schroeder create and coordinate programs designed to engage K–12 students in STEM.

Laanan is the interim director of the Center for Excellence in Science, Mathematics, and Engineering Education, which is

committed to translating research to practice and policy. That means working with the Iowa Department of Education as well as directly with schools to focus on learning why students are not successful in math and science and determining the best ways to increase interest and success in these topics.

Staker is the director of Extension Science, Engineering, and Technology (E-SET), a shared program with 4-H and the Iowa Space Grant Consortium. This program is involved with a wide range of activities, including more than 100 after-school science clubs, the annual State Science and Technology Fair, and an annual robotics challenge at the Iowa State Fair. "Extension takes what happens in the STEM research areas and translates that into learning experiences for kids across Iowa," Staker explains.

Schroeder, the College of Engineering assistant director for undergraduate recruitment, creates and coordinates STEM programs. Schroeder directs about 100 STEM activities a year, including everything from day camps that bring youth to campus for a hands-on look at engineering and technology to helping train teachers to teach a middle school engineering curriculum to helping create Moms Night Out—a way to help caregivers understand STEM. "Parents are the most important influence in children's lives, and if we can engage them it will make a difference," Schroeder says.

➤ For more information, please contact Camille Schroeder at 515-294-9965 or [camilles@iastate.edu](mailto:camilles@iastate.edu).