



Power Engineering and Manufacturing LTD Seeks Controlled Growth

Power Engineering and Manufacturing (PEM) LTD, Waterloo, is an example of an Iowa manufacturing company with a worldwide market. PEM gearboxes are used in a wide range of industries across the United States and in 48 countries around the world. Aeronautics, agriculture, construction, gas, oil, transportation, and wind are among the many industries served by PEM.

The company specializes in the custom design and production of heavy-duty gearboxes. "We make gearboxes for unique applications," says John Warren, PEM president. "They can't be ordered out of a catalog, so we have new challenges every day."

Saul Herscovici and members of the Warren family founded the company in 1975 to serve the growing need for gearboxes that could withstand high shock loads while being both durable and efficient. The Warren family purchased full ownership of the company following Herscovici's death in 2007, and John Warren has led the company since then.

The current plant was specially designed and built in 1992. Subsequent additions brought the facility size to more than 110,000 square feet. In recent years, PEM has experienced rapid growth and now has 81 employees, 26 of whom were hired in 2012.

While companies must continually grow to survive, CIRAS account manager Sean Galleger emphasizes the importance of controlled growth. "We try to help companies manage and support their growth," he explains. "We want to make sure

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On the Cover: Machinist Ted Woods of PEM uses calipers to measure the span of the gear teeth.

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

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they can manufacture their products efficiently and effectively and with on-time delivery to their customers.”

CIRAS first worked with PEM to provide Training Within Industry programs. The company completed the three core programs—job instruction, job methods, and job relations—with the goals of increasing sales and production.

From spring 2011 to spring 2012, CIRAS conducted a Theory of Constraints (TOC) Business Improvement Generation (BIG) project with PEM to support its controlled growth objectives. Warren put together a leadership team of 12 people from across the company to work with CIRAS project manager Mike Willett.

The 12-month BIG project included five phases. The first phase was educational—that is, establishing a common understanding and agreement of the problem. Willett provided the team with the policies, measurements, and behaviors needed to generate improvement.

Phase two identified the priority problem areas and what needed to be done to correct them. A key concern for PEM involved backlog of product, according to Willett. “We had to find ways to increase throughput by identifying constraints in the system that were restricting the flow of throughput. Every dollar they could ship out on time would have a huge impact on their bottom line.”

Phase three focused on strategies and tactics needed to exploit those constraints to get more movement. The team developed a future state process map and reality tree to identify what needed to be done and when it needed to be done to improve the process.

In phase four an implementation plan was developed to move the company from the current state to the future state.

A critical aspect of implementation is buy-in from staff, Willett points out.

“One of the most noticeable differences at PEM is that before the project a lot of people worked in silos—that is, on their own,” Willett says. “Now the focus is on working as a team. This is particularly important when you are dealing with TOC.”

Phase five is implementation of the plan. The company continues to work on that, in what Warren describes as an on-going process.

“Mike led us through to where we are now,” Warren says. “He helped us see what needed to be done and in what order. We’ve been able to make changes without having a lot of chaos along the way. We are still in the process of getting to where we want to be.”

One of the changes that led to improvement has been implementation of an advanced accounting and production software package that is based on TOC. “Working through the BIG program

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—John Warren

prompted us to work harder to figure out how to get the software to work and out into the plant,” Warren says.

The BIG leadership team continues to meet weekly to discuss different projects currently being addressed. The

champion or lead person for each project gives the status and, if needed, asks for help or suggestions from the rest of the team.

Between four and six people are assigned to each project. “We make sure the group addressing a particular problem are those who work in that area day to day,” Warren adds. “They have a better perspective on it than management, and you get better buy-in when the people directly affected are working to resolve an issue.”



Left: A gear blank being turned on PEM's You Ji Vertical Lathe by machinist Brian Oman. **Right:** PEM's Hofler Rapid 2000 Geargrinder cutting teeth into the gear blank.

While PEM continues to work toward their goals, Warren says they wouldn't be where they are now without CIRAS' assistance. Per Warren these projects have generated \$6.1M sales gained or retained, \$2.4M new investments, and \$3.4M costs saved or avoided over the past three years.

PEM has other interactions with CIRAS as well. Warren is currently in his third year as a member of the CIRAS Advisory Council. He describes it as a valuable experience as he has gained perspective listening to other members talk about what is happening in their businesses.

In addition, Warren has learned about other resources available from CIRAS. For example, when a problem occurred with a gearbox, PEM realized they did not have in-house expertise to determine

a solution and turned to CIRAS. "We have had different issues come up where we have needed help analyzing what caused the problem," Warren says. "We have customers who want to know why something happened, and having research from the university lends a lot of credibility to the analysis and the potential solution to the problem."

PEM has also worked with Iowa State University mechanical engineering students in the senior capstone course. One project involved development of a test stand that could be adjusted to meet a variety of specifications.

"We are basically a development company and oftentimes we only produce one or two boxes of a particular model," Warren explains. "We need to be able to test these to see how well

they hold up and how we can improve them. The students gave us some interesting possible solutions to consider as we move forward."

The second student project focused on development of an electronic monitoring system to record run time, temperature, torque, and shock load out in the field. That way, if a box were returned to PEM, the company would have a history of what happened and would be able to see the impact on the box. For this project the students researched what components could withstand the harsh environment of the gearbox.

All in all, Warren says PEM has gained a lot from working with CIRAS and Iowa State. "We wouldn't have made the progress we have without CIRAS' help," he says. "I'm positive of that."

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Harrisvaccines, Inc.—Getting a Revolutionary Vaccine Company Off the Ground

In 2005 Dr. Hank Harris, an Iowa State University College of Agriculture and Life Sciences professor in animal science and veterinary diagnostic and production animal medicine, founded a start-up company at the university's Research Park. The purpose: develop, market, and sell a new vaccine that would prevent Porcine Reproductive Respiratory Syndrome.

This was the first step in building the company—Harrisvaccines, Inc.—that is working to revolutionize animal health vaccines with its unique SirraVax™ technology. Traditional killed or modified live vaccines require isolating a live virus from the infected animal. In contrast, with SirraVax technology vaccines can be manufactured without handling the infectious virus.

“All we need is the genetic sequence of a virus isolated from an infected herd,” says Joel Harris, vice president of operations. “From that sequence, we can generate a specific antigen that we place into our production platform. It only takes us four to six weeks to produce the custom vaccine.”

The road from start-up company with one product and two scientists to an established corporation with 22 full-time and 3 part-time employees has been challenging.

“As we grew, we began turning to CIRAS as an external resource to help us meet some of the challenges,” says Harris. Subsequently CIRAS worked with the company on market research projects while some managers began attending various CIRAS classes and workshops, according to Derek Thompson, CIRAS account manager.

The relationship became more targeted in 2012 when the company realized that its four-year effort to obtain United States Department of Agriculture (USDA) licensure was about to come to fruition.

“As we approached licensure,” Harris explains, “we realized we needed to change our business model to better differentiate ourselves from traditional vaccine companies that are about our size and also trying to market rapid-response, farm-specific vaccines.” That meant finding ways to make the production process more efficient.

The company contracted with CIRAS to have project managers Jeff Mohr and Susan Clark guide them through a Lean management technique called value-stream mapping (VSM).

This process focuses on the length of time it takes a manufacturer to produce its final product from the receipt of an order to shipment to the customer, while documenting, analyzing, and improving the flow of information and materials. Mohr and Clark worked with an 11-member Harrisvaccines team

that included representatives from administration, research, production, shipping, and sales.

“We trained the team on the VSM process and then worked with them to create their current state map,” Mohr explains. The discussion included actual processing time as well as non-value added time, which is any time the product is not being worked on but is still in the facility. The goal is to carefully analyze what is currently happening in order to find ways to reduce waste and be more efficient in the value-added processes.

“Then we work through the ideas they generated to improve the process and identify a future state map,” Clark

adds. “We coached them to find the big improvement ideas and then create a plan on how to implement the proposed changes. That means determining who is going to do what and when so they can reach their target.”

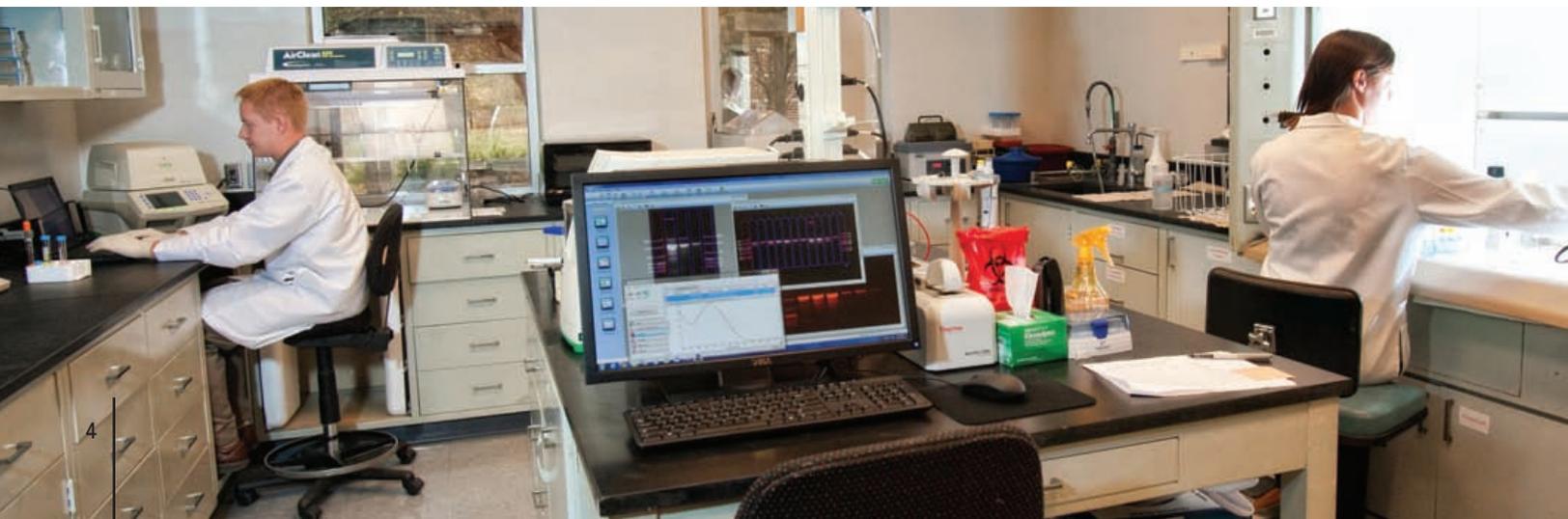
“Jeff and Susan went through the entire value-stream mapping

process with us,” Harris says. “It was really helpful to have fresh eyes look at

“It was really helpful to have fresh eyes look at our process and help identify bottleneck areas. Prior to doing this, we took eight to ten weeks to get a vaccine delivered; now we have cut that down to four to six weeks.”

—Joel Harris

Production staff at Harrisvaccines, located at the Iowa State University Research Park, work in a lab used for RNA production.



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“Not only is it a competitive advantage for us, but it helps us react quickly to what is happening out in the field,” Harris continues. “Strains of these viruses mutate constantly so the faster we can crank out a vaccine, the faster we can respond to an outbreak of a new disease.”

The camaraderie and teamwork that develops during the process is an added benefit. “It is huge because you get all of those cross-functions in the room working together,” Mohr explains. “They start to understand what each others’ jobs are like and that they are all working toward the same goal.”

Harrisvaccines has also worked on marketing strategy with CIRAS’ Paul Gormley. Marketing personnel attended a workshop on optimizing the company website where they learned how to bring Harrisvaccines to the top of the list when people are doing Internet searches.

Gormley has also helped them optimize their social media and news releases by using certain words that help trigger responses. Harris notes that placement of words, photos, and videos have all helped increase the number of views to their pages.

Overall, the past year was very good for Harrisvaccines. Year-to-date sales revenue increased by 65 percent, according to Harris.

Just this past September, the company’s four-year effort to obtain licensure came to fruition when the USDA’s Center for Veterinary Biologics approved licensure of the company’s swine flu vaccine—Swine Influenza Vaccine, RNA—the first vaccine to be licensed using SirraVax technology.

More good news came in October when the U.S. Department of Homeland Security Science and Technology Directorate awarded Harrisvaccines a 34-month, \$1.1 million contract. The purpose is to develop a vaccine using SirraVax technology that would potentially protect the United States from the foot-and-mouth disease virus (FMDV). Production of the FMDV vaccine using traditional methods is not allowed in the United States because of the risk of the virus being released.

“It is a great opportunity for us to prove to another government entity that we can produce a safer and effective vaccine faster than anybody else,” Harris adds.

Harris says their recent successes can be attributed to a number of factors. These include development of new products, USDA licensure, and the addition of a vice president of sales and customer service staff along with the help CIRAS provided in improving the company’s response and order-filling time.

➤ **For more information, contact Derek Thompson at 515-419-2163 or thompson@iastate.edu.**

CIRAS Annual Review of Manufacturing

An annual review of manufacturing by the Iowa State University Center for Industrial Research and Service shows that Iowa’s manufacturing sector continued its postrecession recovery, adding jobs through 2011. Employment in this sector, however, is still 10 percent lower than prerecession levels in 2007.

While manufacturing remains a vital part of Iowa’s economy, future manufacturing employment standings may not return to historical levels. With global competition, technological change, and evolution in staffing practices, the manufacturing sector requires fewer workers than in the past. Consequently, even a healthy and growing manufacturing sector in Iowa might not be a source of as many new jobs as historically expected.

Highlights

The CIRAS annual manufacturing review is based on analysis of data from the Bureau of Economic Analysis, Bureau of Labor Statistics, U.S. Census Bureau, and International Trade Administration. Key findings from the report include the following:

- There are more than 5,980 manufacturing firms in Iowa.
- Manufacturing contributed \$27.6 billion to Iowa’s economy in 2011.
- Iowa ranks sixth among all states in its percentage of gross domestic product from manufacturing.
- More than half of Iowa’s manufacturing jobs are located in nonmetro areas.
- The average manufacturing job in Iowa paid \$51,120 in wages and salaries in 2011.
- Iowa exported \$11.7 billion worth of manufactured goods to other countries in 2011.

Other notable findings

Manufacturing in Iowa remains diversified. The state’s manufacturing sector is about evenly split between durable and nondurable goods production. Recent employment growth has been concentrated in the durable goods sector. During 2010–2011, employment in nondurable goods—such as food, printing, and chemical manufacturing—declined by half of a percent.

The report also found that nearly half of the manufacturing firms in Iowa are “non-employer firms” with no paid employees other than the owner/operator. Only 293 firms—or approximately 5 percent—have more than 500 employees.

To view the entire report, go to www.ciras.iastate.edu/Manufacturing_In_Iowa_2012.pdf.

Defining U.S. Business Cycles by Liesl Eathington

According to the National Bureau of Economic Research, the most recent U.S. recession began in December 2007 and ended in June 2009. That 18-month period of contraction was the longest since the 43-month Great Depression, which ended in March 1933.

For many businesses and households, the recession felt even longer than its official 18 months. An examination of business cycle peaks and troughs by detailed industry sector sheds some light on the disparity between official pronouncements and popular perceptions about the recession.

The U.S. Bureau of Labor Statistics identifies industry-specific business cycles using monthly employment data. Business cycles are identified using key turning points, which mark the beginning of sustained periods of growth or contraction in employment and are distinct from seasonal or other short-term fluctuations. An examination of the timing of employment peaks and troughs reveals interesting disparities by broad economic sector.

- The United States reached its peak nonfarm employment in January 2008, one month after the official start of the U.S. recession. The contraction in employment continued until February 2010, which was eight months after the recession officially ended.
- Manufacturing employment had been contracting since August 2004. The sector's lengthy contraction period finally ended in January 2010, but not before it had shed 20 percent of its jobs. Since reaching its trough, the manufacturing sector has regained about 3.7 percent of its 2004 peak level employment.
- The construction sector reached peak employment in April 2006 and did not reach its trough until January 2011. The sector lost 29 percent of its jobs during that time. Construction employment has grown by just 2 percent during the sector's current period of expansion, but it is still 28 percent below its 2006 peak level.
- The information sector reached peak employment in May 2007, seven months before the recession began. The sector has remained in a period of contraction ever since. Information sector employment is down nearly 14 percent from its 2007 peak.

Business Cycles in the U.S. Manufacturing Sector

Industries within the manufacturing sector had widely differing experiences during the recession. Many nondurable goods industries had already been contracting since 2001 or earlier. First among those to reach its bottom was plastics and rubber products (October 2009), followed by textile mills (January 2010), chemicals (January 2011), paper and paper products (May 2011), and textile product mills (January 2012). Apparel manufacturing and printing and related support industries have yet to reach trough-level employment.

A few durable goods industries, some with close ties to the housing sector, have also continued to lose employment even after the recession ended. Furniture and related products reached its most recent peak in April 2004 and has yet to reach a trough. Wood products peaked in February 2006, followed by nonmetallic mineral products in April 2006. Neither of those two industries has begun to recover jobs.

Other manufacturing industries experienced an earlier or longer period of contraction compared to the overall nonfarm economy, but they are now regaining jobs. They include computer and electronic products (68 months of contraction), primary metals (58 months), transportation equipment (48 months), electrical equipment and appliances (43 months), petroleum and coal products (37 months), and fabricated metals (31 months).

Machinery manufacturing, Iowa's second-largest manufacturing industry in terms of jobs, experienced a relatively later and shorter period of contraction. United States machinery manufacturing employment peaked in May 2008, reached a trough 20 months later in January 2010, and has grown by nearly 14 percent since then.

Food manufacturing, Iowa's largest in terms of jobs, experienced 30 months of contraction beginning in July 2007. A brief 15-month period of expansion ended in April 2011, followed by eight months of contraction. The most recent expansion in employment began in December 2011. Current U.S. food manufacturing employment is 2.4 percent lower than the 2007 peak level.

Sector	Contraction Period (Peak to Trough)		
	Start Date	Duration in Months	% Loss in Jobs
Total nonfarm employment	Jan-08	25	-6%
Goods-producing sectors†	Apr-06	46	-22%
Manufacturing	Aug-04	65	-20%
Construction	Apr-06	57	-29%
Service-providing sectors	Jan-08	23	-4%
Financial activities	Dec-06	43	-9%
Information*	May-07	67	-14%
Retail trade	Nov-07	25	-8%

† Goods-producing sectors include natural resources, mining, manufacturing, and construction

* Contraction period continues as of December 2012



David Swenson and Liesl Eathington have a goal of helping Iowa's rural regions stabilize their economies. The two Iowa State University scientists in the College of Agriculture and Life Sciences use their expertise to help Iowa communities understand their strengths as well as their weaknesses.

"We believe more information will lead to better decisions and better outcomes," says Swenson, who has been analyzing Iowa's economy as well as its social economic structure for close to 25 years.

Swenson is an associate scientist in economics and a lecturer and graduate faculty member in community and regional planning (CRP). His focus is community economics education and research.

"I began to understand in the '80s that there are lots of things affecting government and government decisions that I could only explain to people using economic methods," Swenson explains. To do that he relied on the economics he had learned in school and later began specializing in subsets of economic analysis.

Eathington has been a full-time researcher in economics since earning her MBA at Iowa State in 1998. She also coordinates the Iowa Community Indicators Program, which provides demographic and economic data and analysis to Iowa's communities. Coursework in CRP inspired her interest in economic and demographic data.

It is a focus that keeps her looking for data in new and different places. "My work is constantly changing, whether it's the new kinds of data that are available or the things that data describe such as the economy or where people live and work or technology that's making access to data so much easier and faster," she says.

Swenson and Eathington have done multiple projects with CIRAS, including the Sustainable Economies Program, funded by the Economic Development Administration. The goal is to help selected regional trade centers identify and target opportunities for sustainable growth.

For their part, Swenson and Eathington conducted in-depth economic and demographic analyses and compiled 100 indicators of financial, social, and environmental well-being. In their meetings with community leaders and stakeholders, they provided comparisons to help the participants understand whether they are gaining or losing relative to other similar-sized regions.

"Our goal was really to increase awareness so they have a more holistic view of social, environmental, and economic issues in their decision making," Eathington says. "We want them to be able to characterize their economics, their workforce, and their communities based on quantifiable data, not impressions," Swenson adds.

New CIRAS Advisory Council Members

John Lang is the general manager at Seabee, located in Hampton, Iowa. Established in 1976, Seabee Cylinders & Chrome designs and manufactures custom hydraulic cylinders for original equipment manufacturers (OEMs) and provides bulk chrome plating for OEMs and steel warehouses. The Seabee Foundry supplies complex steel castings to a variety of customers. Seabee's primary markets are mobile cranes, marine cranes, waste management, mining, offshore oil drilling, land drilling, and military applications.

They received ISO 9001:2008 certification in February 2013. Seabee is one of thirteen manufacturing companies owned by Ligon Industries in Birmingham, Alabama. Ligon is a private company that invests in key strategic markets with a primary focus on hydraulic cylinders and aluminum castings.

Steve Roesner is president and CEO of Quatro Composites, an Iowa-based advanced manufacturer offering a full line of services from design to analysis, prototyping, and production of advanced composite products for the aerospace, military/defense, and medical markets. He is based in the corporate office located in Orange City, Iowa. Steve brings more than 25 years of strategic and operational leadership to Quatro Composites. He has a BA from Northwestern College and an MBA from the University of South Dakota; he is certified in strategic management. Steve began his management career as a product manager with an apparel company. Additionally, he worked seven years as director of operations with Den Hartog Industries. Steve has been part of senior management teams that have made acquisitions, divestitures, and mergers of organizations with sales ranging from \$22 million to \$185 million in annual revenues. He brings a commitment of integrity, passion, and excellence to Quatro Composites.



John Lang



Steve Roesner



Left: Plant manager Kendall Spies (left) and lathe engineer Tim Bengard set up new automated production equipment at Quality Machine of Iowa, Inc. **Right:** Tim Greene, president of Quality Machine of Iowa, Inc., at QMI's production plant in Audubon.

Lean Practices/Government Contracts Help Quality Machine of Iowa, Inc., Move Forward

Tim Greene, president of Quality Machine of Iowa, Inc. (QMI), sees Lean Manufacturing as a key for continuous improvement, being globally competitive, and winning government contracts. He has led the full-service precision machining company—which was started in Minneapolis, Minnesota, by his father in 1968—for nearly 30 years.

Today, with headquarters and main plant in Audubon, Iowa, and a smaller production facility in Minneapolis, QMI produces a wide range of products such as service tools for the automotive and agricultural industries as well as components for the hydraulic, medical, and defense industries.

Greene has been working with CIRAS since 2010 to incorporate Lean principles in his business and to expand his customer base to include the federal government.

"It's only wise to take all of the excess costs out of things," Greene explains. "If you have any wasted time or effort, your prices will be too high and you will lose business. No customer wants to continuously pay for movement or waste that is unnecessary."

CIRAS account manager Bob Coacher, along with project manager Jeff Mohr, guided QMI through the 5S process. "The goal is to improve throughput capacity in the facility," Coacher says. The process includes everything from organizing and cleaning the work area and equipment to learning problem-solving tools to improving communication between

company leadership and those operating the equipment.

Greene notes that the process has led to a positive culture change. "We use Lean practices in terms of shop organization and all of the processes on the machine side as well as the practices of employees from the front office to the person shipping out products. If something isn't working right, we'll do a corrective action on it and go after it."

While implementation of Lean principles is ongoing, QMI also credits CIRAS for assistance with government procurement. Government contracting specialist Gordon Bonnes guided Greene through the bidding process from researching the market to creating a capability statement to understanding the regulations and how to comply.

"We point out the things they don't need to be concerned with and emphasize those that must be addressed," Bonnes explains. He also helped identify the appropriate buying offices or agencies in the targeted market. "We want to help companies have a thorough understanding of the market as well as the competition," Bonnes says.

"This has been a big plus for us," says Greene. "We weren't aware how important it is to state your capabilities briefly. That is key when you want people to understand your core business and what relates directly to them and their needs."

QMI's efforts are already paying off. In fall of 2011, Greene was asked to partner in bidding a new defense weapons system designed to clear land mines. A five-year contract was awarded in January of 2012. Since then the forecasted quantities for this system have increased.

Overall, Greene reports \$2 million of impact—\$1 million in increased sales and \$1 million in retention of sales—thanks to Lean practices and government contracts. "We have to keep people wanting to do business with us, and CIRAS has helped us do that," he says.

Greene's efforts in moving QMI forward have been recognized in Iowa and nationally. The Iowa State University Small Business Development Center presented Greene with the 2011 Neal Smith Entrepreneur of the Year Award, and last spring the U.S. Small Business Administration honored him as the 2012 Iowa Small Business Person of the Year.

➤ For more information, contact Bob Coacher at 515-419-2162 or coacher@iastate.edu.

Helping to Grow the Biobased Economy

From biobased disposable cutlery and cleaning products to adhesives and engine oil, the U.S. Department of Agriculture's (USDA) BioPreferred® Program helps consumers identify certified biobased products and requires federal agencies to give preference to purchasing biobased products. Through a cooperative agreement with the USDA, CIRAS and Iowa State University have worked to leverage resources and the university's expertise in biofuels, biobased chemicals, and end-use biobased products to develop the rules, procedures, and infrastructure needed to operationalize the BioPreferred Program, which was created by the 2002 Farm Bill and expanded by the 2008 Farm Bill.



"Our ability to work hand in hand with the USDA enabled us to create a program that addressed the details of the legislative mandate and incorporated the voice of industry," says Steve Devlin, a CIRAS project manager serving as the director of the Manufacturing Extension Partnership in Iowa. "I'm proud that we were able to pull together an interdisciplinary team to engage numerous federal agencies, private vendors, and other universities to develop the program and support the biobased product industry."

CIRAS Director and Associate Dean for Extension and Outreach in the College of Engineering Ron Cox echoes Devlin's assessment. "USDA staff told us we were one of the most efficient and effective contractors they have worked with on a project of this magnitude, particularly because of our industry knowledge."

"USDA staff told us we were one of the most efficient and effective contractors they have worked with on a project of this magnitude, particularly because of our industry knowledge."

—Ron Cox

Throughout the past decade, CIRAS played a key role in research and information gathering for the BioPreferred Program. CIRAS identified biobased products, developed systems to collect and access information on the biobased industry, and worked with the ASTM International standards committee to perfect the methodology for determining biobased content. CIRAS also cooperated with the USDA to establish programmatic policies to support operations, rules for designating biobased product categories, and regulations for the biobased certification labeling program. Currently, 900 biobased products are program certified and therefore obtained the rights to use the BioPreferred label.

Before the program began, a lack of knowledge about the biobased industry existed. One of CIRAS' biggest accomplishments was identifying the companies that make end-use biobased products. "We now know where they are,

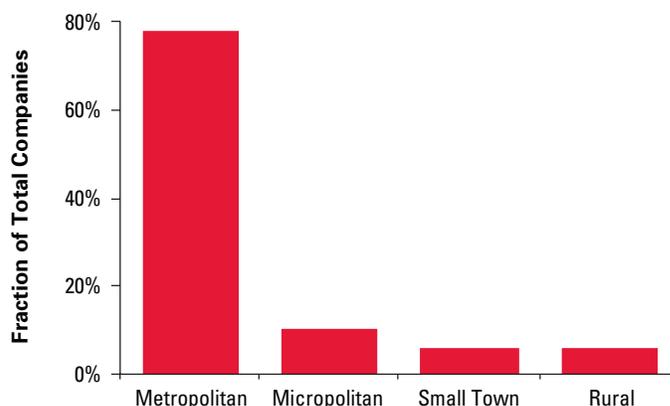
what they make, how many employees they have, and what's affecting their growth. We know more about this industry than anyone in the country," Cox says.

In fact, Devlin says CIRAS identified more than 3,500 different companies across the country, representing about 27,000 biobased products.

To help expand the program, CIRAS employed Iowa State undergraduate and graduate students. The students helped with background research on biobased companies, tested products, and prescreened applications for biobased product certification.

CIRAS' knowledge of industry best practices was put to good use in designing the processes the USDA now uses to run the program. The BioPreferred Program infrastructure that CIRAS developed is certified by the International Organization for Standardization (ISO)—only the second program at Iowa State to achieve this certification.

CIRAS' involvement with the BioPreferred Program ended in October 2012, but its contributions will allow the USDA to take the next step of operationalizing the systems that were developed and helping the biobased industry thrive by gaining access to government markets.



Location of U.S. biobased product companies responding to a 2012 CIRAS survey.

➤ **More information about the program is available at www.biopreferred.gov.**

Appanoose County Making Strides with Support from the Sustainable Economies Program

Two years ago, Appanoose County found itself in the public eye with a series of news events that broadcast the region as Iowa's poorest, Iowa's least healthy, and Iowa's highest child abuse county.

Rather than continuing to accept the tolls waged on the area, Centerville community members rallied behind the belief that they could improve their county's stature.

Bill Burch, president of Commercial Resources, Inc., a Centerville-based business, urged the community to reverse the fortunes of their low ranking among all 99 Iowa counties. Burch helped launch the 10.10.10 Project, a grassroots effort to move the region from the bottom ten to the top ten rural counties in Iowa, and accomplish this goal within a ten-year period.

CIRAS Provides the County with Resources and Technical Support

CIRAS recognized signs of economic growth potential in Appanoose County while identifying candidates for the Sustainable Economies Program, funded by the Economic Development Administration University Center Program (EDAUCP) administered by CIRAS. Existing businesses were stable, and the active presence of the 10.10.10 Project proved that community leaders were committed.

After discussions with several groups of key stakeholders in the region, the Sustainable Economies Program team selected Appanoose County as a participant in the program.

The team performed in-depth research on the regional economy. Iowa State University economists performed an analysis of the region's industrial and occupational structure, wages, commuting patterns, and other traditional economic analysis measures. The team also assessed the region's economic sustainability using indicators of financial, social, and economic well-being.

Economic development and business experts from Iowa State continued discussions with businesses and local organizations to better understand perceptions, challenges, and opportunities in the region.

Sustainability Summit Launches the Process

In July 2012, the Iowa State team held a Sustainability Summit in Centerville. Slightly more than 100 individuals from across the county—citizens, community leaders, business leaders, and elected officials—gathered at the recently restored Majestic Theatre for the meeting.

Iowa State economists David Swenson and Liesl Eathington shared the results of their study examining how Appanoose County performs on 100 financial, social, and environmental indicators and explained how they relate to the region's ability to sustain economic growth. Mark Reinig, CIRAS economic

development project manager, detailed how sustainability is being used in economic development. Abbey Gaffey, an Iowa State Extension and Outreach community development specialist, explained how to use indicators in local government, economic development, and nonprofit planning processes.

Keynote speakers Ed Andrews and Bob Henningsen of Smart Solutions Group engaged participants and shared examples of best practices that communities are using across the country in economic development.

The afternoon concluded with identifying the most important issues facing the community and possible projects that could support long-term sustainability.

"The summit was a great opportunity for us to start working together on common goals and for future planning strategies," says Tod Faris, executive director of the Appanoose County Economic Development Corporation.

The final session of the summit was a facilitated discussion to establish the region's priorities and goals. Small groups provided input on the top three issues in the region and specific near-term actions to begin regional economic improvement.

"This summit brought together participants from the business sector,

Left: Steering committee members use the backward mapping process to determine program priorities.

Right: Tod Faris, executive director of the Appanoose County Economic Development Corporation, participates in backward mapping sessions for the marketing and finance committee.



government, nonprofits, education, and citizens interested in sustainability issues,” says Mike O’Donnell, CIRAS EDAUCP program director. “Part of creating sustainability is developing synergy around shared concerns and shared opportunities. Continued discussions will help the community focus on the steps needed for long-term success.”

Based on the outcomes of the summit, CIRAS then facilitated additional planning sessions to move the priorities into action.

Last fall, they led a “backward mapping” exercise to identify the goals and determine the steps needed to reach those goals. “These planning meetings focus on taking the ideas, aligning them with the region’s strengths and weaknesses, and developing plans for implementation working toward economic sustainability,” explains Reinig. Going forward, Reinig and Gaffey will work with the county for the next year on improving various economic aspects of the region.

Moving Forward with Results and Progress

With assistance provided by CIRAS and partners, the region’s stakeholders formulated an improvement plan and have already taken several steps in response to direct findings in the sustainability study. Their areas of focus include the following:

- **Leadership Development**—The region is working together to address the need for effective leadership, a key gap identified in the assessment process. Local stakeholders worked with CIRAS to launch a regional leadership development program in February designed to maximize the strengths and skills of current and future community leaders.
- **Financial Competency**—This group is working with Iowa State’s Department of Human Development and Family Studies as well as the area’s school districts to improve financial competencies and literacy.
- **Marketing**—Efforts of all local and county government entities should be coordinated and a unified branding strategy should be created to fully promote the region.
- **Natural Resources**—The existing strengths of the region, such as Honey Creek Resort State Park and Lake Rathbun, need to be capitalized on with improved trail systems and wayfaring signage. This group also identified unified trash pickup within the Centerville community and other Appanoose County communities as an issue and is working toward implementation.

Community leaders, partners, and businesses in the area are now engaged and are proactive participants in moving toward economic sustainability.

➤ **For additional information, contact Mark Reinig at 515-231-4150 or mreinig@iastate.edu.**



Thermal and Mechanical Analysis—Polymer Composites Lab

The lab offers a full range of state-of-the-art thermal analysis and mechanical characterization services as well as viscoelastic properties of polymers, dispersions, and gels.

Example Applications

- In-depth material characterization
- Properties and performance of materials under specified conditions
- Material identification
- Optimizing material composition for desired performance
- Cure and degradation kinetics
- Rheological characterization and gelation behavior of polymers, dispersions, and gels
- Characterization of delicate structures in liquids, polymer melts, and solids
- Characterizing molecular weight distributions in polymers
- Composition and thermal stability of compounds
- Impact characteristics of nonmetallic samples

For more information, contact

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Lomont Molding Is an Industry-Leading Manufacturer of Plastic Components



Based in Mt. Pleasant, Iowa, and established in 1982, Lomont Molding creates custom plastic molding and molding design services for a wide number of industries with a global reach.

Lomont Molding, Inc., specializes in structural foam and high-pressure injection molding. Working from a 100,000+-square-foot state-of-the-art facility, they process all types of thermoplastic resins.

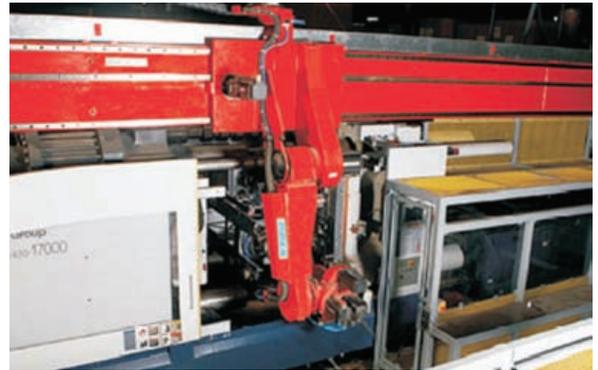
Lomont IMT, a product of Lomont Molding, Inc., features the next generation of safety signage and identification products for the safety marking industry.

In-mold technology utilizes robotics and a patent-pending method that capitalizes on the advanced properties of plastic materials in the molding process.

Paragon Products, a division of Lomont Molding, Inc., specializes in concrete accessories. High-quality rebar accessories are used in commercial, highway, and precast construction markets.

In addition, Lomont Molding offers complete in-house engineering and design services, tooling, quality assurance, in-mold technologies and decorating, assembly, and secondary operations.

The company operates 24 hours a day, seven days a week. "We take great pride in helping our customers create opportunities and finding solutions to their problems," says Jason Bender, the vice president of sales and marketing. "We have more than 150 dedicated



Left: In-plant Lockout Tag and Sign Application. **Right:** State-of-the-art molding facility complete with robotics.

employees who strive for constant innovation, quality management, and cutting-edge technology."

"We have been partnering with CIRAS for many years now," says Bender. "They were a tremendous asset to us when we recently utilized their product testing services." Comparison testing of original materials versus new proposed materials was performed and resulted in substantial cost savings and retained sales for the company.

"We have been partnering with CIRAS for many years now. They were a tremendous asset to us when we recently utilized their product testing services."

—Jason Bender

Several years ago, Lomont Molding went through the certification process and was established as a HUBZone (Historically Underutilized Business

Zone) entity. Small businesses in a designated low-income area receive the benefits of limited-competition contract preferences and special consideration for subcontracting opportunities. Beth White, a CIRAS government contracting

specialist, has worked with Bender over the last year. She provides information on changes within the program and how to target customers by showcasing their HUBZone status.

"As an active member of our advisory council, Bender frequents many of our workshops and strategic planning events," explains Sean Galleger, a CIRAS account manager for southeast Iowa. "He has an excellent business and marketing sense and is a great addition to the council."

Galleger also appreciates the willingness of Bender and other Lomont Molding staff to assist new proprietors and start-ups in getting their products into the marketplace.

To learn more about Lomont Molding, Inc., and their custom molding and design engineering services, visit their website and those of their subdivisions—www.lomont.com, www.lomontimt.com, and www.paragonproducts-ia.com.

➤ For more information, contact Sean Galleger at 515-290-0181 or galleger@iastate.edu.

CIRAS Provides Tools to Optimize Plastic Processes and Products

In the last few decades, polymers have emerged as a cost-effective solution for numerous applications in the materials and chemical processing industries. Because of their desirable characteristics—light weight, impact strength, and ease of processing at relatively low temperatures—plastics have experienced a surge in demand.

The use of polymers for a variety of engineering, medical-device, pharmaceutical, and general consumer applications continues to grow. And with global competition continuing to put pressure on profit margins and time to market, manufacturers are constantly looking for ways to innovate in the areas of product performance and production efficiency. CIRAS is here to assist with these challenges.

As one of the many services offered by CIRAS, Polymer Processing Assistance provides manufacturers with the tools to innovate and optimize plastic processes and products.

Shankar Srinivasan, a project manager with CIRAS, specializes in the areas of bioplastics, polymer processing, testing, and characterization. He works with CIRAS clients to increase polymer process efficiency, improve product quality, and enhance the employee knowledge base of polymers, which in turn helps improve product performance.

Polymer processing of thermoplastics commonly relies on heat, friction, shear force, and pressure to shape and mold polymers into desired products. Some common processes include the following:

- **Extrusion**—converts plastic materials from solid to liquid states and reconstitutes them as extruded finished components
- **Injection Molding**—forms products by injecting molten polymer into a mold
- **Compression Molding**—uses compression along with heat to mold objects
- **Blow Molding**—uses hot air to form hollow containers
- **Rotational Molding**—relies on heat to melt the polymer and coat the interior of the mold that holds the resin

Srinivasan recently worked with Hy-Capacity, a Humboldt, Iowa, manufacturer and remanufacturer of agricultural parts, to assess their knowledge base of plastics processing. He created training modules, such as Plastics 101 and Thermoplastics (thermoforming process and technologies), for the production staff. He also provided

cab kit polymer production assistance and worked directly with the Hy-Capacity staff. The end result was a high-quality product and a production crew that was well versed in polymer processing methods.

In the last year, Srinivasan met with Mo Lockwood, the manufacturing manager of Thombert, a Newton, Iowa-based manufacturer of polyurethane wheels and tires for narrow-aisle lift trucks. He helped Thombert understand the basic

“The collaboration between CIRAS experts and our engineers has resulted in enhanced knowledge that translates into improved product quality.”

—Mo Lockwood

mechanisms involved in the polymerization of their polyurethane wheel production. Srinivasan conducted random sampling and characterized the polymers to determine any possible irregularities.

“The collaboration between CIRAS experts and our engineers has resulted in enhanced knowledge that translates into improved product quality,” explains Lockwood.

Srinivasan enjoys the opportunity to provide technical expertise and facilitate interactive sessions that identify root causes of manufacturing problems.

“When working with a manufacturing team, we can help improve material selections to balance product requirements, manufacturing capabilities, and cost effectiveness,” says Srinivasan.

As a CIRAS project manager specializing in polymer processing, Srinivasan has the opportunity to extend his scientific expertise to Iowa manufacturers.

“Any knowledge learned is only truly valuable when shared,” explains Srinivasan.



Above: Trademarked Thombert wheels, used on electric forklifts, are made from polyurethane materials.

➤ For additional information, contact Shankar Srinivasan at 515-290-6702 or srigshan@iastate.edu.



Devlin Accepts New Position

Since 1999, Steve Devlin has been instrumental in the transformation and growth of CIRAS. During his tenure at CIRAS, he has orchestrated more than \$10 million in external funding. His experience encompassed work as the director for the Manufacturing Extension Partnership (MEP) and as the program director of the BioPreferred® Program, industrial project management in the area of biobased products, and industrial design. He also facilitated communications between federal, state, and foreign agencies, manufacturers, consultants, and testing organizations.

Devlin has accepted the position of assistant dean and extension program director for business development in the College of Engineering at the University of Missouri–Columbia effective April 8.

In his new role, Devlin will provide visionary leadership and creativity to business and economic development programming throughout Missouri. He will also be responsible for the initiation and growth of collaborative education and research programs between extension and the College of Engineering.

UPCOMING EVENTS

Taking Care of Business: Attend the Annual ABI Conference

To celebrate its 50th anniversary of helping Iowa businesses, CIRAS is proud to be a sponsor for this year's Iowa Association of Business and Industry (ABI) Taking Care of Business Conference June 11–13 in Okoboji, Iowa. The conference offers excellent opportunities to learn about current business trends and ways to improve your business and profitability, as well as to network with other Iowa business leaders.

During the conference's Thursday session, CIRAS will present a workshop on the innovation cycle. The workshop, conducted by Mike O'Donnell, interim director of the CIRAS Manufacturing Extension Partnership, and project managers Paul Gormley and Pete Nadolny, will focus on how to leverage key aspects of the innovation cycle to improve profitability and provide a competitive advantage. It will also cover ways to diagnose gaps in your business, improve creativity, and make more effective investment decisions.

During the conference, CIRAS will be recognized for its 50 years of helping Iowa communities and companies.

To register for the conference, visit www.iowaabi.org.



- **Problem Solving to Align Purpose, Process, and People—Tracey Richardson**
May 7, 2013 • 9:00 a.m.–4:00 p.m.
Ames, Iowa
- **The Role of Leadership in Integrating Your Lean and Safety Cultures—Ernie Richardson**
May 8, 2013 • 8:00 a.m.–4:00 p.m.
Ames, Iowa
- **Discover Profitability Through Innovation**
May 21, 2013 • 9:00 a.m.–3:00 p.m.
Spencer, Iowa
- **Midwest Small Business Government Contracting Symposium**
May 22–23, 2013
Moline, Illinois
- **ABI Taking Care of Business Conference**
CIRAS 50th Anniversary Recognition
June 11–13, 2013
Okoboji, Iowa
- **Developing and Implementing HACCP in Food Manufacturing**
June 20–22, 2013
Ames, Iowa
- **35th Annual Sausage and Processed Meats Short Course**
July 14–19, 2013
Ames, Iowa

For details, see the events section of the CIRAS website, www.ciras.iastate.edu.



Since 1963, we have been improving the profitability of businesses. We partner with companies and communities to help them prosper and grow. A typical partner achieves a 2,000% return on its investment—an astonishing \$20 of impact for every \$1 invested. A vast network of university and industry experts brings years of professional experience to CIRAS, making us a leading integrator of solutions in Iowa, contributing more than \$1.2 billion of reported impact over the past 5 years.

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 Engineering Career Services

Engineering-LAS Online Learning
 Industrial Assessment Center
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 Meat Science Extension

Des Moines Area Community College
 Iowa Area Development Group
 Iowa Association of Business and Industry
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 Iowa Central Community College
 Iowa Farm Bureau Federation
 North Iowa Area Community College



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THE INNOVATION CYCLE

Leveraging the Innovation Cycle by Mike O'Donnell

Innovation is complex—there is no easy set of instructions every company can follow to become innovative. Successful innovation systems, however, do have a variety of common activities that can improve the reliability of innovation within your company. CIRAS describes this process as the innovation cycle and divides these activities into four key phases: definition, discovery, development, and delivery.

In the *definition* phase, companies create, refine, and document many ideas. This can include using proven, repeatable ideation techniques to generate unique ideas for any business. Ideas are then reviewed by a cross-functional team and the best concept(s) is/are selected to pursue. In this stage, strong problem statements and goal definition are critical, since this information will be used to develop a concept with an initial value proposition.

Discovery is a frequently overlooked step in the innovation cycle. Many companies do not have a robust way to decide whether to invest, shelve, or kill a concept. Executed well, companies not only further define and quantify the opportunity, but also understand how their capabilities can create a sustainable competitive advantage that justifies investment. Typically, cost-effective pilot studies are executed to validate major assumptions, which result in a valued concept that drives commitment of resources.

In *development*, the goal is to evolve the valued concept into a ready solution. This phase focuses on up-front planning, solution design, and verification/validation. A key step in this process is to establish the infrastructure to deliver the ready solution—preparing the business and supply chain to integrate the innovation into daily efforts. When the concept is a product, this phase also includes traditional product development processes.

The final phase, *delivery*, is where the company executes the ready solution and produces business value. When the previous three phases are executed well, this phase requires minimal effort. Many businesses, however, have gaps in the previous three phases that lead to significant problems in this phase. Poor transition to manufacturing, incorrect sales forecasts, and supplier delays are often experienced at this time. The remedies to these issues are usually found by improving the processes and decisions in the previous phases.

Companies who want to improve their ability to innovate on a systematic basis should evaluate their internal processes, searching for gaps in the innovation cycle. Sometimes adding simple tools and checks to key points in the cycle can be the strategy to nurturing an innovation culture and achieving profitable growth.



To participate in the innovation discussion, join our LinkedIn group at [linkd.in/12tVLY1](https://www.linkedin.com/groups/12tVLY1).