



Technology Assistance Program: A New Name in CIRAS Problem Solving

It might be a step too far to call Sears Manufacturing's problem a pain in the backside. But the evasive and mysterious cause behind an ongoing problem with a purchased component used in the company's vehicle seat suspension certainly proved annoying—until Sears called upon members of CIRAS' Technology Assistance Program (TAP).

The result? An in-depth analysis of cracked air compressors that early this year will lead to a design change on the pneumatically controlled seats that Sears, a 160-year-old Davenport firm, makes for construction and agriculture equipment around the country.

CIRAS "gave us the clarity and the necessary supporting data to understand what the root cause was," said Kelly Sheffler, strategic quality engineer at Sears Manufacturing. "The detail and the effort and the time that they spent with it mean their report-outs are phenomenal. . . . We are very confident this is the solution."

CIRAS' TAP (a relatively new name for a collection of long-standing services) has worked with more than 175 distinct businesses in 66 Iowa counties over the past five years. In 2015 alone, companies responding to surveys reported an economic impact from that work of more than \$18.5 million.

Technology assistance covers a wide range of programming, from traditional metallurgic analysis to contract research programs and helping companies expand their access to engineering expertise. The TAP umbrella also covers CIRAS' innovation services, efforts to expand Iowa's additive manufacturing

knowledge via a CIRAS-owned metal 3-D printer, and work that used to be done under the former Institute for Physical Research and Technology's Company Assistance program (before that program was absorbed into CIRAS in 2014).

In the case of Sears Manufacturing, CIRAS metallurgists evaluated some of the failed air compressors and diagnosed stress corrosion cracking. That analysis was backed up with an x-ray examination by Dave Utrata at Iowa State University's Center for Nondestructive Evaluation.

Continued on page 2

- 1 Technology Assistance Program: A New Name in CIRAS Problem Solving
- 3 New CIRAS Additive Manufacturing Machine—Getting Companies Ready to Take the Next Leap
- 4 Contract Research Helps Sioux City Company Prove That Its Ingredients Can Bring Home the Bacon
- 5 Made in Iowa
- 5 CIRAS Internet Marketing Boot Camp Brings Big Benefits
- 6 Capstone Courses Focus Fresh Student Eyes on Iowa Businesses
- 7 Working on Workforce: Productive Firms Have Fewer Problems Finding People
- 9 A Few Examples of How CIRAS Can Help
- 10 Engaging, Educating, and Embedding—Everywhere
- 12 State of the State
- 13 Simply Soothing Plots a Smoother Future with Help from CIRAS
- 14 IADG Receives USDA Award for Its Economic Development Work
- 14 GovTalk—B2G Sales
- 15 Upcoming Events
- 15 Staff News
- 16 Manufacturing Day Makes Iowa a Model for the Nation
- 17 Fabricated Metals to Be the Subject of CIRAS' Next Innovation Summit
- 17 New CIRAS Advisory Council Member
- 18 Iowa State Career Fairs—A Chance for Students, Companies to Put Their Best Feet Forward
- 19 Contact Information
- 20 The Innovation Cycle

On the Cover: Chris Hill instructs Iowa State engineering students on CIRAS' new additive manufacturing machine.

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

CIRAS is supported in part by the DoC/NIST Manufacturing Extension Partnership, the DoD/DLA Procurement Technical Assistance Program, and the DoC/EDA University Center Program.

CIRAS News is published quarterly by the Center for Industrial Research and Service and edited by the CIRAS publications team. Design and production is by Hobbs Designs, LLC. Please send questions, comments, or address changes to ciras.news@iastate.edu.—January 2016 HD15206

Articles may be reprinted with the following credit line: "Reprinted from *CIRAS News*, Vol. 51, No. 2, a publication of Iowa State University Center for Industrial Research and Service." Please send a copy of the reprint to *CIRAS News*, Extension 4-H Building, Ames, IA 50011-3632.

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3350 Beardshear Hall, Ames, Iowa 50011, Tel. 515 294-7612, email eooffice@iastate.edu.

Other projects don't require as broad an analytical team.

One recent project, for example, involved helping an Iowa company set up an internal lab to test the quality of its welding work in-house instead of having that work sent to a lab out of state.

In another instance, Scott Lundquist, a design engineer at Groschopp Inc. in Sioux Center, came to CIRAS seeking advice on what his company needed to set up its own metrology lab. Groschopp currently sends out some of the parts it uses to make fractional horsepower gearboxes and motors so they can be heat-treated and made harder. At times, customer-specific testing or design validation is required – beyond what is normally provided by the heat-treat supplier. Groschopp hopes its new equipment will eliminate the need for outside lab consulting, thus reducing costs.

Lundquist believes there will be "a 'cost-avoidance' to using the preparation and inspection equipment, but it is difficult to predict a dollar amount." Savings will be realized in time, money and convenience.

Groschopp plans to continue developing its on-site technology and may add more equipment later this year, Lundquist said.

CIRAS metallurgist Paul Berge said his group welcomes questions like the ones received from Groschopp and other companies. CIRAS experts aren't interested in doing regular

AT A GLANCE

Sears Manufacturing Co.

FOUNDED: 1855

LOCATION: Davenport, Iowa

EMPLOYEES: 500

IMPACT: A new design for air compressors is expected to eliminate a corrosion issue, reduce warranty work, and enhance Sears' reputation for reliability with customers, potentially leading to new sales.

OVERVIEW: Sears makes pneumatically controlled seats for construction and agriculture equipment around the country.

LEARN MORE: searsseating.com

Groschopp

FOUNDED: 1930

LOCATION: Sioux Center, Iowa

EMPLOYEES: 175

IMPACT: The company expects to save time, money and convenience by avoiding the need to send parts out for inspection.

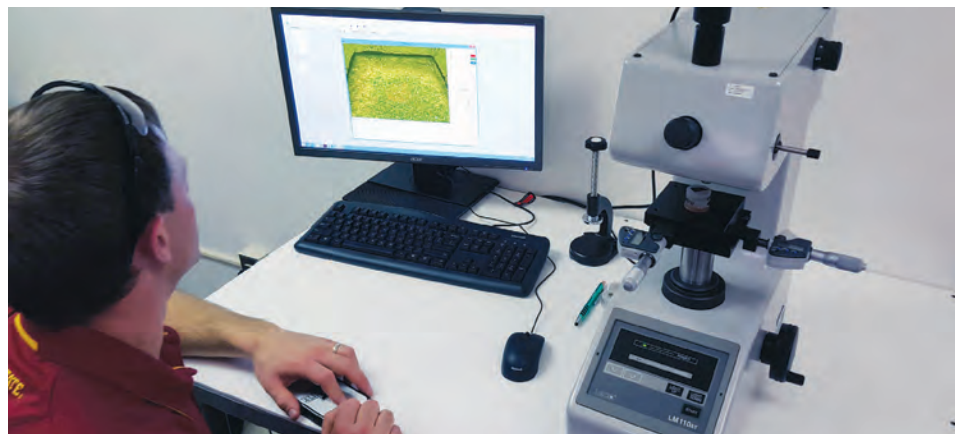
OVERVIEW: Groschopp is a manufacturer of highly engineered fractional horsepower electric motors and gearmotors.

LEARN MORE: www.groschopp.com

tests for companies, but they're happy to teach firms what they need to know and how to shop for equipment. Doing so adds new capabilities to Iowa industry, Berge said.

"Small- to medium-sized companies usually don't have the kinds of people on staff who have the kind of background you need to answer these questions," Berge said. "Slowly, we're trying to help them."

Part of Groschopp's lab to inspect heat-treated parts.



New CIRAS Additive Manufacturing Machine—Getting Companies Ready to Take the Next Leap

Jim Johnson sees enormous potential in metal additive manufacturing.

Johnson, chief operating officer at Angstrom Precision Molding in Ottumwa, believes metal versions of additive manufacturing machines (more commonly known as 3-D printers) like the one that arrived at Iowa State University in October are poised to help companies break new ground in the way they make metal parts and tools. Businesses, once freed of traditional design rules, will be able to make things cheaper and more efficiently. They'll get new products to market faster and update them more easily.

"Everybody has to change their way of thinking about how to make things work," said Johnson. "Otherwise, there will be some companies who change and take all the business."

Johnson, who also serves as COO of Frog Legs Inc., an Ottumwa-based company that makes suspensions for wheelchairs, is one of several Iowa business leaders now working with CIRAS to

explore the potential of its new direct metal sintering machine. The machine represents a \$900,000 investment made in October with money from CIRAS, Iowa State University's College of Engineering, the Iowa Economic Development Authority, and the federal NIST Manufacturing Extension Partnership. It uses the combination

of powdered metal and a laser to create metal parts or tools one 40-micron-thick layer at a time.

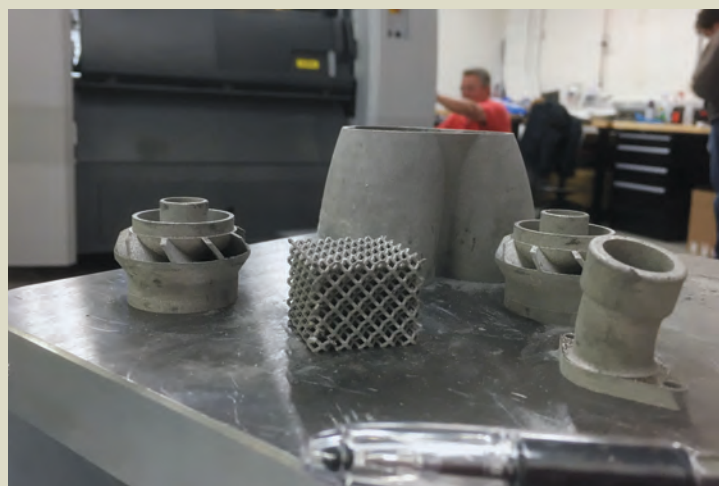
Chris Hill, head of CIRAS' Technology Assistance Program, said CIRAS wants to help manufacturers understand how metal additive technology will let them use geometries and internal structures that simply aren't possible using traditional methods. Parts and products can be made with less material and less time—days instead of the traditional weeks.

"Is the technology there yet for everyday use? No," Hill said. "But if I as a manufacturer can start getting educated now, then I kind of know what I can do with it. And when the technology gets a little better, then I can take advantage of it while my competitors are still thinking, 'OK, now I need to start learning about this.'"

Jack Ward, a program manager at Quatro Composites in Orange City, recently worked with CIRAS to build a five-axis fixture that will help Quatro employees drill holes in the proper places and assemble parts more rapidly.

"To be able to send something out (to be built) and get it back quickly is awesome," Ward said. And the potential is tremendous for a company keen on complicated fixtures.

"Now the design rules are broken," Ward said. "So now I can go do all kinds of crazy stuff, and I can actually build it. Because I can print it, I can do stuff that I couldn't actually do before."



Above Top: Jim Johnson and the CIRAS additive manufacturing machine. **Above Middle:** A view inside during construction of a Quatro Composites fixture. **Above Bottom:** Sample parts made in the machine sit next to a ballpoint pen for comparison.

➤ For more information about additive manufacturing, contact Chris Hill at chill@iastate.edu or 515-294-5416.

Contract Research Helps Sioux City Company Prove That Its Ingredients Can Bring Home the Bacon

Eventually, with any innovation, there comes a time when you have to prove that a new product is worthwhile. Over the years when that time has come, Terry Waugh has turned frequently to CIRAS.

Waugh is sales manager at Kay Dee Feed Company, a Sioux City-based company that makes ingredients for animal feed. Waugh recalls the company seeking out CIRAS “four or five times” in recent years to help with contract research projects aimed at proving the effects of Kay Dee ingredients.

“We’re a biotech company, and the products we sell are value-added products that require having research data in order to sell them to people,” Waugh said. “People have to be shown that it does what you say it does. That’s why we do research—to determine its value in a given situation.”

One recent project involved substituting a soy product for the commonly used fish protein found in feed for weanling pigs. Results from the CIRAS-arranged Iowa State University research showed that Kay Dee’s product was an effective (and lower cost) substitute. A different, recently launched project involves studying “a natural way to reduce pathogen loads in the digestive tracts of animals,” Waugh said.

CIRAS program manager Brian Muff said CIRAS, through its recently reorganized Technology Assistance Program, has the capacity to support several cooperative research projects each year—projects in which companies essentially pay for a portion of the time and expenses of a neutral Iowa State University researcher. CIRAS can help companies find the best faculty person to participate in the research, and the center has money available to contribute half the company’s cost up to \$40,000, Muff said.

“Feeding trial-type projects like this can be expensive, because Iowa State is purchasing animals and managing them for several months,” Muff said. “This is where the TAP cost-share funds can be really valuable to companies by offsetting half their costs.”

The research program is not limited to agriculture, however.

“Companies can tap the expertise of any Iowa State faculty and staff,” Muff said. “That’s the other thing about the program—we can use faculty from any discipline at Iowa State, whether it’s vet med or chemistry or design or business. If we can find a faculty member with the right expertise, we can set up a cost-sharing project.”

Right: Iowa State researchers are testing a Kay Dee Feed Company product and its effects on pathogen loads in the digestive tracts of animals.

➤ **For more information, contact Brian Muff at bmuff@iastate.edu or 515-520-1033.**



“We can use faculty from any discipline at Iowa State, whether it’s vet med or chemistry or design or business. If we can find a faculty member with the right expertise, we can set up a cost-sharing project.”
— Brian Muff

AT A GLANCE

Kay Dee Feed Company

FOUNDED: 1928 as Nutra-Flo Co., a feed and fertilizer company. The fertilizer business was sold in May 2015.

LOCATION: Sioux City, Iowa

EMPLOYEES: 100

IMPACT: A recent contract research project provided scientific proof that a Kay Dee soy product was an effective and lower-cost substitute for fish protein in hog feed.

OVERVIEW: Kay Dee provides its customers with a full line of livestock mineral and protein supplements and has grown to be the largest independent manufacturer of mineral and protein supplements in the United States.

LEARN MORE: kaydeefeed.com

Look closer at Iowa's rolling landscape and you may be surprised to discover what is made here—everything from refuse trucks and powered machinery to buckets and pastries. When you buy products manufactured in Iowa, more money stays in our local communities.

Diamond V

Overview: Diamond V is a global company that manufactures natural, fermentation-based products to support animal health, animal performance, and food safety worldwide. The company's Embria Health Sciences subsidiary manufactures EpiCor®, the human nutritional supplement that provides research-proven immune support.

Location: Headquartered in Cedar Rapids, Iowa, with offices in Europe, China, Latin America, Asia, and Africa

Founded: 1943

Employees: 250

Website: www.diamondv.com



Stellar Industries, Inc.

Overview: Stellar is an employee-owned and operated manufacturer of hydraulic truck mounted equipment. Products include hooklift hoists, cable hoists, container carriers, telescopic cranes, articulating cranes, work truck accessories, and the X-Tra-Lift pickup loading device. Stellar also offers complete mechanic-service truck and tire-service truck packages.

Location: Corporate headquarters in Garner, Iowa, with additional manufacturing facility in Kanawha, Iowa

Founded: 1990

Employees: 425

Website: www.stellarindustries.com



Woodlink

Overview: WoodLink manufactures and markets recycled plastic GOING GREEN™ bird feeders and birdhouses, as well as a traditional line of cedar bird feeders, houses, and accessories. The company sells a wide array of hummingbird feeders, nectar, metal squirrel-resistant feeders, and purple martin houses. It also imports and markets bird-related products made from cedar, plastic, glass, and metal.

Location: Mount Ayr, Iowa

Founded: 1988

Employees: 30

Website: www.woodlink.com



CIRAS Internet Marketing Boot Camp Brings Big Benefits

A three-day program, now in its fourth year, is paying off in page views, clicks, and sales for Iowa businesses.

The Internet Marketing Strategy Boot Camp, first launched in 2012, has benefitted Iowa firms of all sizes, said CIRAS project manager Paul Gormley. The course covers five main points: Marketing Message Development, Web Development Best Practices, Search Engine Optimization, Social Media Marketing, and Analytics.

"The Internet allows small- to medium-sized companies to compete with larger companies with much larger advertising budgets," Gormley said. "But, if they can't be found, have a lousy message, ... or don't take full advantage of the information available from analytics, then they probably won't do as well as they could with their online presence."

Gormley preaches that it's OK for small companies to use outside help, "but it is not OK to divorce yourself from the message and strategic vision of your online presence." Boot camp participants learn "to instruct those they hire, not simply allow them to do whatever they want."

Geri Wester, owner of Affordable Buckets in Victor, attended two Internet marketing events in 2012. She translated that into a \$325,000 economic impact for her business. Wester said she learned how to target potential clients and make her business stand out online.

A key was focusing on the correct search terms, she said, because "if you're on the Web and you're not getting on that first or second search page, you're kind of lost."

For Rod Rensink, owner of Double R Industries Inc., a Boyden-based maker of hydraulic jacks for farm equipment, the camp proved that a better Internet presence is vital. Rural businesses don't get much drive-by traffic or visibility.

"You learn about how to define content, why Internet marketing works, how to promote yourself online, and how not to promote yourself," Rensink said. "It teaches you all the wheres, why-for's, and how-to's to make it work."



➤ For more information, contact Paul Gormley at gormley@iastate.edu or 319-721-5357.

Capstone Courses Focus Fresh Student Eyes on Iowa Businesses

Iowa State University College of Engineering students wrapping up their academic careers are providing a vital tool to Iowa businesses: fresh eyes.

A growing number of Iowa companies are partnering with students to examine business needs—via capstone course projects that study things such as space usage, functionality of equipment and production processes, and the potential for growth.

CIRAS project manager Carey Novak said student teams work with 30 to 40 Iowa businesses each year. Novak coordinates with engineering faculty and the businesses to match students to company needs.

The program has “a nice impact for Iowa companies,” Novak said—to the tune of \$10 million a year in increased sales and avoided costs, according to data aggregated from company surveys.

Students spend one or two semesters on the projects, demonstrating they can apply what they learned over three years of study—how to analyze an issue, understand it, and solve a real-world problem. Businesses, meanwhile, get an outsider’s look at issues and processes that employees may be too close to see.

Last spring, a team working with Seneca Tank, which builds bulk fuel and lubricant delivery trucks in Des Moines, was asked to present viable and profitable alternative layouts to the production floor of the manufacturing facility. Students ultimately found cost savings and helped greenlight construction of a 45,000-square-foot production facility north of Des Moines, said S. J. Risewick, director of unit sales and production.

Seneca Tank currently has another student team working to better organize manufacturing cells in the production of fuel trucks. The goal is to find a 4 percent to 8 percent reduction in the time needed to build trucks by improving storage for tools and fasteners.

“Reduction in non-value activities will allow us to significantly increase quality,” Risewick said.

Another project at Adair-based Agri Drain Corporation last

spring asked students to explore a long-pondered idea for a new piece of equipment called a multispool trailer.

“They started from ground zero and ... provided a couple of concepts we hadn’t looked at,” said Jim Moore, the company’s maintenance and engineering supervisor. “Once we started pursuing it, from the outside looking in, we saw it wouldn’t have worked for us.”

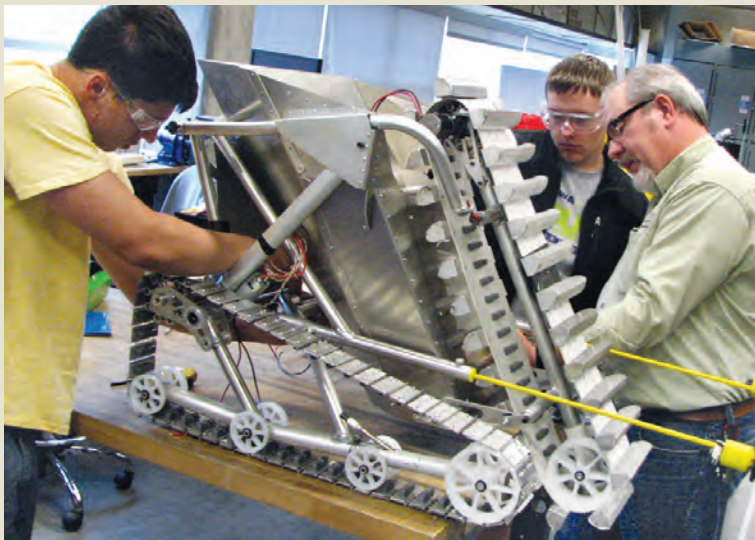
Moore said working with students to make that determination provided a tremendous benefit to the business. The company is now working with electrical engineering students to explore other needs.

“I’m a giant advocate of the capstone program. The students are so knowledgeable....”
— Jim Moore

“I’m a giant advocate of the capstone program,” Moore said. “The students are so knowledgeable.... I enjoy working with young people like that.”

How to Participate

Have a project idea? Businesses involved in the capstone program pay a project cost, which varies within each College of Engineering department.



➤ For more information, contact Carey Novak at cenovak@iastate.edu or 515-408-4257 for details.

SPECIAL REPORT: WORKING ON WORKFORCE



IOWA'S WORKFORCE SHORTAGE

(Seventh in a Series of Articles)

THE PROBLEM: At current pay levels, Iowa has a gap between its share of “middle skill” jobs and the number of people who have those skills.

HOW WE GOT HERE: Decades of low unemployment; plus, young people tend to leave rural Iowa. Now experienced workers are approaching retirement.

PREVIOUS ARTICLES: Iowa businesses have been reaching out to schools, recruiting from other companies or locations, and recruiting women. They've boosted training, learned to share employees, and replaced some jobs with machines.

THIS TIME: The benefits of being Lean

Working on Workforce: Productive Firms Have Fewer Problems Finding People

by Ron Cox and Jeff Eckhoff

For Nancy Jacobs, it boils down to a tale of two departments.

In April, Jacobs became human resources manager for Misty Harbor, a Fort Dodge boat manufacturer that has been working with CIRAS for several years to get leaner and improve its productivity. Misty Harbor last year credited training in disciplines such as Lean manufacturing and the Theory of Constraints, among others, with boosting the company's bottom line by an estimated \$2 million in new and retained sales.

But the transformation is still in progress.

Jacobs, describing a growing wave of what she calls “Misty Harbor

Pride,” said she only needed to hire five people in November for one of the boat manufacturer's 60-person departments—and four of those were new hires to aid with an expanded production line. Meanwhile, in a different department one-third the size, workers have been slower to adopt the company's new culture. Jacobs hired eight people during the same month to replace workers who had left.

“You can have that mentality of ‘Why am I doing so much?’ or you can have that mentality of ‘Sure, I can do that.

Why don't I help you?’ It's all about how you present it,” Jacobs said. In general, with the focus on employee-driven productivity, “we have more of an ownership attitude. People are happy to come to work.”

Companies across Iowa report similar benefits from following Lean manufacturing and other productivity practices. Businesses that incorporate Lean tend to have less worker turnover and to be more attractive to available job applicants, experts say. Both are valuable traits in a state where

AT A GLANCE

Misty Harbor

LOCATION: Fort Dodge, Iowa

BUSINESS: Maker of pontoon boats with worldwide sales and distribution network

EMPLOYEES: 70

LEAN: The company cut costs and experienced a \$2 million sales increase after working to make itself more lean.

Pella Corporation

LOCATION: Pella, Iowa

BUSINESS: Manufacturer of wooden windows and doors

EMPLOYEES: 3,700

LEAN: After 23 years of Lean manufacturing, the company eliminated waste and used excess capacity to move more distribution work to Pella and to expand the finishing work on its windows.

Kreg Tool Company

LOCATION: Huxley, Iowa

BUSINESS: Maker of a wide variety of tools, including Kreg Jigs and other innovative tools for clamping, joining, routing, cutting, and measuring wood

EMPLOYEES: 180

LEAN: Kreg has spent the last few years growing with fewer people by building a workplace environment that encourages employees to be more productive.

HNI Corporation

LOCATION: Muscatine, Iowa

BUSINESS: Manufacturer of office furniture

EMPLOYEES: 3500

LEAN: HNI has seen higher productivity and lower employee turnover, at least some of which is due to Lean.



manufacturers have long reported difficulties in finding skilled people willing to work at what the companies consider a practical wage.

The trick, according to the experts, is that you can't simply look to Lean to solve your hiring problems. Long-term benefits come only for companies that embrace the entire philosophy—a philosophy popularized by Toyota Motor Corporation, which rose to dominate its industry by encouraging employees to continually search for ways to boost quality and bleed waste out of the production process.

"Toyota used to say, 'First we build people, and then we build cars,'" said CIRAS program manager Jeff Mohr. "If your reason for using Lean, your sole reason, is to cut costs, then it may be counterproductive.

"That's not what Lean is about," Mohr said. "Lean is about doing more with what you have and building an army of problem solvers rather than relying on a small team of problem solvers."

Pella Corporation in Pella, Iowa, has been embracing Lean production methods since 1993, to better utilize the materials, time, and resources it uses to manufacture its

windows, doors, blinds, and shades. "Our products were some of the most expensive available on the market," said Gina Singer, continuous improvement manager for the company. "We needed to rework our pricing, while maintaining our product standards and driving profit."

Over the course of several years, the company streamlined its production process, continued to reduce waste, and reorganized team members and their duties. The company used its extra capacity to "shift processes from our distribution organization to Pella, freeing our distributors to focus on sales and service," added Singer. For example, Pella started using its own labor to add

prefinish stain and colors to its windows, thereby creating more value for the consumer.

Teresa McMahon, executive director of the nonprofit Iowa Lean Consortium, stresses that "Lean isn't a silver bullet" and that simply "trying to cut (costs) is not going to lead you to prosperity." Rather, it's building a culture where employees are actively involved in making their work run more smoothly—and

where they're able to do so without fear of talking themselves out of jobs.

"If your reason for using Lean, your sole reason, is to cut costs, then it may be counterproductive. That's not what Lean is about. Lean is about doing more with what you have and building an army of problem solvers rather than relying on a small team of problem solvers."
— Jeff Mohr

Tony Hogan, president and chief executive at Kreg Tool Company in Huxley, said his still-growing company has been following Lean practices for more than three years. But Hogan believes Kreg has felt less pain in hiring from the so-called worker shortage than it would have if the company had not built a workplace environment that encourages employees to be more productive.

“Culturally, Lean only works as a long-term philosophy,” Hogan said. “It doesn’t work if you’re focused on the short-term investment. . . . It’s all about employee engagement and involvement. As soon as that engagement results in ‘I don’t have a job,’ then the whole thing falls apart.”

“We have been successful, in our minds, because of the culture that we have here,” Hogan said. “Once they see what we’re about, they want to join our team. Without that cultural impact, it would be a lot more challenging.”

Gary Carlson, vice president of community relations for HNI Corporation, the Muscatine-based maker of office furniture, said it’s difficult to quantify how much of his company’s lower turnover and higher productivity came as a result of Lean. “Because we do a lot more (in terms of production) as a Lean company, we haven’t needed as many people,” Carlson said. “But because we’re having growth, we still need more people.”

The bottom line is that Lean will certainly help, but it won’t eliminate workforce issues in a growing company.

“If you’re only going into it as a reason to reduce your headcount to produce the same output, then try something else,” Carlson said. “You’re not genuinely into it. I think Lean really has to become part of your culture.

“There are a lot of great things that can come from Lean,” he said. “But you really have to become invested.”



A Few Examples of How CIRAS Can Help

If your company is trying to grow but having trouble finding the people you need to do it, then one solution may lie in increasing productivity.

CIRAS offers a number of services aimed at improving Iowa businesses—even if you can’t count on adding anything to available resources. Consider the following:

■ **Lean.** CIRAS experts can help you develop all of your employees into problem solvers focused on improving safety, quality, cost, delivery, and morale. This helps reduce or eliminate waste, improves your processes, and increases employee satisfaction (thereby reducing turnover).

CIRAS also has a board member on the **Iowa Lean Consortium**, a nonprofit organization formed to promote Lean and bring its practitioners together.

■ **Training Within Industry.** TWI provides a standardized framework for teaching employees. Essentially, it’s a way to get workers trained the same way and have them work to the same standard every time. It creates a systematic process for improving and helps workers build trust so they can cooperate and deal with each other’s problems.

■ **Constraint Management.** The Theory of Constraints helps businesses focus on, and gain control of, those few key things in any firm that restrict growth. CIRAS uses this theory to identify what really generates money for a company and to design systems where the right numbers of people are in the right places to maximize profits.

■ **Safety.** The average cost for one loss-of-time accident is roughly \$37,000. CIRAS helps companies meet regulatory requirements and develop a healthy safety culture. This improves worker confidence and reduces overall operating costs.

■ **Simulation.** CIRAS helps companies experiment with different plant layout options to find the most efficient way to produce more and handle material the least. This is a way to obtain objective data before making costly changes.

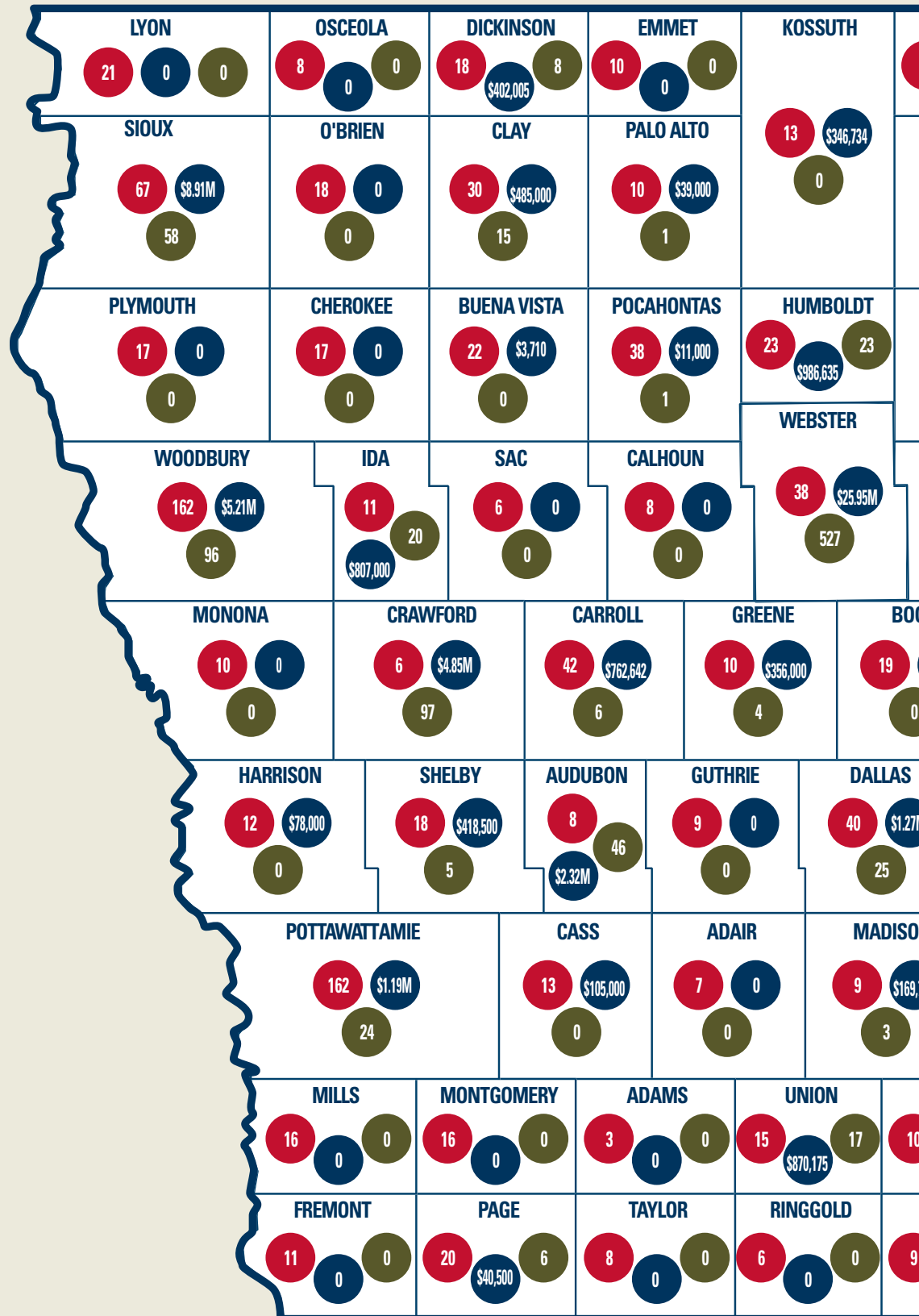
■ **Technology.** CIRAS’ Technology Assistance Program provides expertise to help businesses lower the risks of deploying technologies within their operations. CIRAS experts can help in a variety of areas, including materials, nondestructive evaluation, and engineering support.

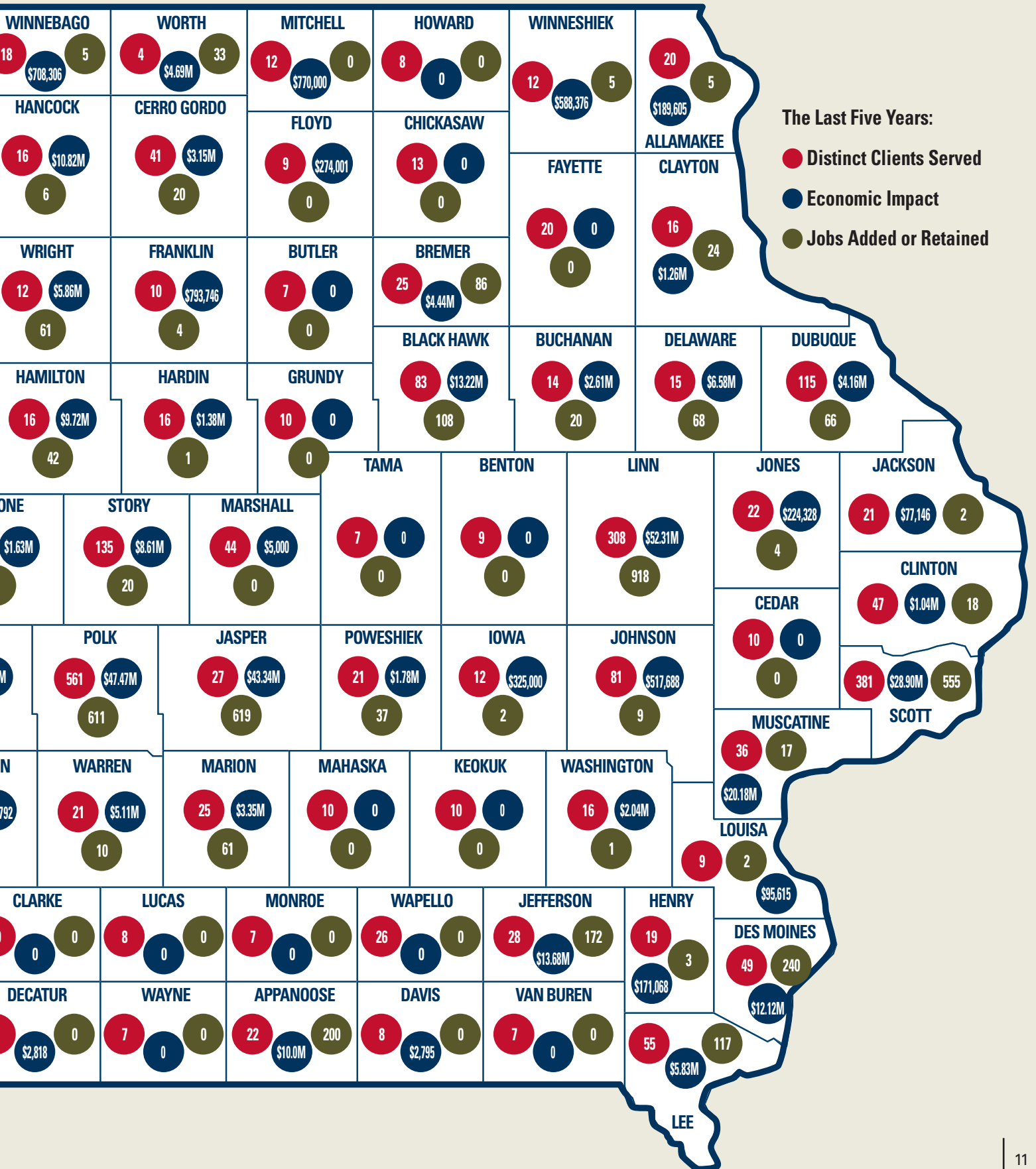
➤ **For more information on any of these services, contact Mike O’Donnell at modonnll@iastate.edu or 515-294-1588.**

Engaging, Educating, and Embedding— Everywhere

CIRAS and its partners provided assistance to 3,577 distinct Iowa businesses in fiscal years 2011 through 2015. Clients reported an economic impact of more than \$2 billion during that period and estimated that 29,290 jobs either were created or retained because of CIRAS' involvement.

In 2014 alone, CIRAS and its partners helped 1,548 Iowa businesses in 97 counties. According to company surveys, an estimated 5,154 jobs were added or retained because of work that had an estimated economic impact of \$386 million. The numbers include \$45 million in new investments, \$329 million in new or retained sales, and \$12 million in savings or avoided costs.







Flexible Staffing Arrangements by Liesl Eathington

Many firms consider flexible staffing arrangements, sometimes referred to as “just-in-time staffing,” to accommodate variable or seasonal workloads or to meet specialized skill needs. These nontraditional staffing arrangements may use on-call workers, direct-hire temporaries, temporary-help agency workers, leased or contract company workers, or independent contractors.

Anecdotal evidence suggests that alternative work arrangements are widespread in the United States, especially since the 2007–2009 recession. Traditionally more prevalent among blue collar and clerical jobs, these arrangements are drawing increased scrutiny in service industries because of blurring of lines between traditional employees and independent contractors.

The size and characteristics of the flexible workforce in the United States are not well understood because of a surprising scarcity of data. Congress has denied funding requests from the U.S. Bureau of Labor Statistics (BLS) to increase the frequency of its Contingent Work survey, which was last issued as a supplement to the Current Population Survey in 2005.

Analysis by the BLS suggests that use of temporary-help services, which represent only a portion of the flexible workforce, has diversified notably across industry sectors since the 1990s. The manufacturing sector in particular has intensified its use of temporary-help services even as overall manufacturing employment has declined.

A U.S. Department of Labor report in 1999 discussed several reasons why firms pursue alternative work arrangements. In addition to flexibility in staffing levels, such arrangements may offer savings in wage and benefit costs, better opportunity to screen workers before hiring them on a permanent basis, ad hoc access to workers with specialized skills, and the ability to circumvent some statutory protections afforded to traditional employees.

The advantages to workers are less clear. A 2014 report from the General Accounting Office (GAO) reiterated concerns raised by the Department of Labor about lower pay, less job security, and fewer protections for workers in these jobs. The GAO analysis found that contingent workers often receive lower pay than traditional employees, especially in many service jobs. On average, contingent workers are less likely to have benefits coverage and more likely to be living in poverty and receiving public assistance than workers in traditional jobs.

Wage and job security issues associated with flexible staffing arrangements are

especially relevant in Iowa, where some areas already struggle to attract and retain workers. Real or perceived erosions in job quality could exacerbate population losses in labor-challenged rural areas. Workers who desire traditional employment arrangements will eventually seek them elsewhere if opportunities ebb in their home communities.

Many questions remain about the national and regional economic consequences of a shift toward a contingent workforce. Until we have more data, we’ll know very little about how firms are using these arrangements in the post-recession economy.

Sources:

- U.S. Government Accountability Office. 2015. Contingent Workforce: Size, Characteristics, Earnings, and Benefits. Report to the U.S. Senate, <http://www.gao.gov/assets/670/669766.pdf> (27 November 2015)
- Houseman, S. N. 1999. Flexible Staffing Arrangements: A Report on Temporary Help, On-Call, Direct-Hire Temporary, Leased, Contract Company, and Independent Contractor Employment in the United States. U.S. Department of Labor, http://www.dol.gov/oasam/programs/history/herman/reports/futurework/conference/staffing/exec_s.htm (27 November 2015)
- Luo, T., A. Mann, and R. Holden. 2010. The expanding role of temporary help services from 1990 to 2008. U.S. Bureau of Labor Statistics, *Monthly Labor Review*, <http://www.bls.gov/opub/mlr/2010/08/mlr201008.pdf> (27 November 2015)

AT A GLANCE

SIMPLY SOOTHING

FOUNDED: 2003

LOCATION: Columbus Junction, Iowa

EMPLOYEES: 12 full-time, 15 part-time

IMPACT: Nearly \$2.5 million in increased and retained sales, plus eight new jobs and \$100,000 invested in new plant equipment.

MORE: www.simplysoothing.net



Simply Soothing Plots a Smoother Future with Help from CIRAS

Freda Sojka's first effort at using plants to battle pests involved crushed corn cobs soaked in a peppermint infusion.

It was 2007, and Sojka, CEO of Simply Soothing, was running a Columbus Junction shop that added scents to lotions and candles. One day, the insurance salesman next door to her complained that he was tired of battling mice. Did Sojka have anything that would help?

She did. It worked well. And a new product called Mice Be Gone was born.

A year later, major flooding came to southeast Iowa. Sojka mixed up a spray using plant-based extractions and offered it to her sister, who lived near a river, for help keeping mosquitos and gnats away. Sojka called it Bug Soother, and it quickly became popular with the government crews who checked water levels near her sister's home—so much so that their bosses ultimately bought out Sojka's entire stock.

All-natural Bug Soother bug spray is now a key offering at Simply Soothing, which has seen its annual sales jump from \$850,000 in 2013 to \$2.5 million in 2014.

"People are so passionate about it," she said. "People send it to relatives. They are excited that it's Iowa made. They are excited about the story."

A partnership with CIRAS over the past year has helped improve that story, as Simply Soothing worked to streamline its

business practices and explore new markets. The company recently credited CIRAS with helping boost sales by more than \$1.6 million.

"This is a family business," CIRAS project manager Glenn Volkman said. "They have a great product and just needed some help concentrating on the right things."

Simply Soothing started in 2003 after Sojka retired from Monsanto. An initial shop failed in Muscatine. The Columbus Junction store fared better, and Sojka and her husband, Jim, added a line of air fresheners. But they struggled with production and distribution.

"There's so much coming at a small-business owner," Sojka said. "It's such an overwhelming task, to drive to the next step instead of just getting overwhelmed. You're wearing a thousand hats every day."

Production occurs in Columbus Junction, where 12 full-time and 15 part-time employees



mix batches in 50-gallon tanks and store products in 100-gallon drums. The process reflects an upgrade from the 5-gallon buckets where ingredients originally were mixed via paddles attached to electric drills.

With CIRAS' help, Simply Soothing has been exploring a wider market for its products. Government contracting specialist Beth White has been helping the Sojkas understand the government procurement process so they can sell beyond the few months each year when pests are prominent in the Midwest.

"It's really grown into more of a strategic view with them," White said. "We've helped them identify some potential customers."

"Now we work smarter, not harder. Working with CIRAS is one of the best things that's ever happened to us."

— Freda Sojka

"Now we work smarter, not harder" and make fewer mistakes, Sojka said. "Working with CIRAS is one of the best things that's ever happened to us."

IADG Receives USDA Award for Its Economic Development Work

United States Department of Agriculture (USDA) officials honored a CIRAS partner last fall with an award for expanding rural economic development opportunities in Iowa and across the nation.

The Iowa Area Development Group (IADG) was presented with the USDA Abraham Lincoln Honor Award at a Washington, D.C., ceremony in November. The recognition came for, among other things, being a national advocate of the USDA's Rural Economic Development Loan and Grant (REDL&G) program.

The IADG works on behalf of nearly 250 rural utilities that support economic development. Together, the IADG and its utility partners have been involved with more than 200 economic development projects in Iowa that have received \$82 million in REDL&G funding. These projects also have leveraged \$635 million in capital investment, led to the creation of 15,000 rural Iowa jobs, and established nearly 50 revolving loan funds for rural businesses and organizations to access across the state.

"The IADG's active participation and exemplary success with the USDA REDL&G program stems from a strong desire from our member utilities to support business and community growth in rural Iowa," IADG president Rand Fisher said in a November news release. "The USDA REDL&G program has provided invaluable funding and support for growth in rural areas across the nation. The IADG is very pleased to play an important role in the transformational projects and rural revitalization that have taken place as a result of this program and our member-supported economic development work."

The IADG serves as the marketing and business development office for nearly 250 of Iowa's member-owned rural electric cooperatives, select municipal electric utilities, and independent telecommunication companies. It has assisted with more than 2,000 successful business expansions and start-up projects—projects that total more than \$10 billion in investment and 50,000 Iowa jobs.

CIRAS congratulates the IADG.



Making the Most of Your Tradeshow Experience

by Pamela Russenberger

Tradeshows should be a key part of your government contracting marketing strategy. Here are CIRAS' tips for how to navigate the experience.

First, do your homework:

- Determine a budget. How many events will you attend? Will you be an exhibitor or attendee?
- Identify the tradeshows your current customers, government and commercial, are attending. Any associations that involve a lot of government contracts can be a good place to start.
- Review events that CIRAS is sponsoring or attending.

Prepare:

- Use a list of exhibitors to target specific agencies/companies. Time will be limited. You'll want a plan of who to meet.
- Research the exhibitors. Do they require supplier registration prior to doing business? Do they currently buy what you sell?
- Prepare a capabilities statement and, if possible, individualized copies for targeted companies/agencies. Show them how you'd fit.
- Confirm that registrations are up to date, including SAM, specific state vendor registrations, and any company portal. Assume others are researching you, and try to give the impression that you are procurement ready.
- Pack plenty of business cards.
- Prepare and practice your elevator speech.

Execute:

- Maximize your networking. Talk to the person eating breakfast next to you. Talk to your neighbor in the breakout sessions. Talk.
- Seek out the attendees/exhibitors you researched. Introduce your company. Give bits of differentiating information, leave your materials, and ask how to follow up.
- Engage during the event. Ask questions or offer comments to get yourself noticed. Use hashtags to comment on social media.

Follow up:

- Send a personal e-mail to the contacts you made, thanking them for their time and asking if you can include them on your distribution list. Connect with them via Twitter, LinkedIn, etc.
- Respond timely to any requests you receive.

Remember: It's in the planning. A good tradeshow strategy will position you to have a fruitful experience.

New Tri-State Summit Offers Knowledge for Businesses in Southeast Iowa and Beyond

Small businesses don't have to go it alone.

That's part of the message to be conveyed at a first-of-its-kind forum slated for March 23 in Keokuk. The Tri-State Procurement and Economic Development Summit, sponsored by CIRAS and economic development officials from three states, has been organized to educate companies about the incentives and programs that are available to help them grow their businesses.

"I've witnessed it before—industrial leaders come together and one company's need fills another," said Shelley Oltmans, executive director of the Keokuk Area Chamber of Commerce and a community development specialist for Iowa State University. "This will provide an environment for those connections to be made."

The summit will share information about services offered through local economic development organizations in southeast Iowa, northeast Missouri, and northwest Illinois, Oltmans said, as well as services available from university-based programs such as CIRAS. Experts will share tips on how to find financial assistance, expand a client list, and navigate the government's byzantine procurement process.

Beth White, a government contracting specialist for CIRAS' Procurement Technical

Assistance Program (PTAP), said plans sprang out of discussion among economic officials from around the tri-state region. In Iowa alone, there are more than 300 resource programs available for businesses, including initiatives to make improvements and find capital, she said. Company owners often try to research such programs on their own and end up frustrated.

They needn't be, White said. "We really have it all right here."

The March event is part of ongoing efforts to support area businesses, said Steve Bisenius, executive director of Lee County Economic Development. Many efforts remain centered around workforce, and that's a topic that's expected to come up at the summit.

"The most critical need for all our industries is helping find workers with the skills needed for the particular jobs available here," Bisenius said.

Find out more

The Tri-State Procurement and Economic Development Summit will be 8 a.m. to noon March 23 in Keokuk. Registration is free. For more information, contact Beth White at whiteb@iastate.edu or 563-370-2166.

- **Bad Links and How They Hurt Search Rankings**
February 17, 2016
1:00 p.m. to 2:00 p.m.
Webinar
 - **Duplicate Content and Your Disappearance from Search Results**
March 8, 2016
10:00 a.m. to 11:00 a.m.
Webinar
 - **Metals Fabrication Industry Innovation Summit**
March 22, 2016
Ames, IA
 - **Tri-State Procurement and Economic Development Summit**
March 23, 2016
1:00 p.m. to 5:00 p.m.
Keokuk, IA
 - **Spring CIRAS Internet Marketing Strategy Boot Camp**
April 5–7, 2016
10:00 a.m. to 4:00 p.m.
Stoney Creek Inn, Johnston, IA
 - **Spring CIRAS Video Marketing Boot Camp**
April 11–12, 2016
9:00 a.m. to 4:00 p.m.
Stoney Creek Inn, Johnston, IA
- For more information on these and other similar events, please visit www.ciras.iastate.edu/events.asp.**

STAFF NEWS



Tina Colburn—Event Coordinator

Ames native Tina Colburn joined CIRAS last fall as its new event coordinator.

Colburn graduated from Iowa State University with a bachelor's degree in exercise science and a minor in community health education. Her career has been spent in the service industry, working previously as a care provider for people with brain injuries and later in the Kansas City area with a retirement community, where part of her duties involved organizing and facilitating activities in a long-term care center. Upon returning to Iowa, Colburn and her husband owned and operated Ge-Angelo's Italian Restaurant in Ames for nine years. She later worked for Monsanto in Huxley at The Huxley Learning Center, where she promoted precision agriculture and organized events, caterers, and meetings.

Colburn, who is passionate about promoting both Iowa State and its community, has served on the boards of the Ames Convention and Visitors Bureau and the Octagon Center for the Arts. She and her husband, Ryan, have two children.



Manufacturing Day Makes Iowa a Model for the Nation

Thousands of Iowans across the state celebrated national Manufacturing Day this fall with 132 events spread through all 99 counties—a participation level that’s expected to turn Iowa into a national model for similar celebrations next year.

Manufacturing Day was first launched in 2011 as an organized, national party to promote manufacturing as a superb career for young job seekers. Each year, Americans are encouraged to take one day (in 2015, it was October 2) to explore their local manufacturing facilities and learn about the technology and innovation that’s taking place there.

This year, CIRAS decided to take a new approach. On the suggestion of CIRAS account managers Paul Dunnwald and Glenn Volkman, we decided to expand Manufacturing Day to the entire month

of October and to push for an event in every Iowa county.

How’d it go? Nationwide, there were 2,627 Manufacturing Day events in 2015. An average outcome, based on Iowa’s 1 percent of the U.S. population, would have been roughly 26 events in Iowa—instead of our 132.

The events—organized through the coordinated efforts of CIRAS, Elevate Iowa, Iowa State University Extension and Outreach, and community colleges around the state—drew more than 7,000 attendees. Iowa ranked fifth in the nation

in terms of the number of events scheduled (46 events behind first-place Ohio).

Iowa also won special attention from the U.S. Department of Commerce. Federal officials have told CIRAS that they intend to recommend the county-by-county strategy when the time comes to schedule events for 2016.

So thanks for your participation, and know that we’ll be doing it all again this fall. Watch *CIRAS News* and mfgday.com for more information when the events are scheduled later this year.

Above: CIRAS visits Glenwood High School. **Below Left:** FFA students tour a Coveris plant in Sibley. **Below Right:** Pella Corp. workers tour Eaton Corp. in Urbandale.



Fabricated Metals to Be the Subject of CIRAS' Next Innovation Summit

Iowa has 624 businesses involved in making something through the cutting, bending, or assembling of metal. Together, they make up 5 percent of the Iowa manufacturing economy, contributing nearly 21,000 jobs and \$1.7 billion to the state's gross domestic product (GDP).

Individually, most aren't large—roughly 70 percent have fewer than 20 employees. But they're working hard to get better.

On March 22, CIRAS will be working to help.

This spring, CIRAS' annual Innovation Summit will focus on the fabricated metals sector. It's the third installment in a five-year project funded by the United States Economic Development Administration's University Center Program. (A fourth summit, focused on Iowa's food manufacturing, is expected to be held in November 2016.)

CIRAS spent much of this past fall questioning Iowa's fabricated metals companies about their businesses and use of technology. The plan is to analyze all that information, develop a strategy and path going forward, then present it all to the businesses on March 22 at the Gateway Hotel and Conference Center in Ames.

"Fabricated metals workers are the foundation of a lot of Iowa's manufacturing economy," said CIRAS program director Pete Nadolny. "Many of these companies are small, which allows them to adjust and make changes faster than larger competitors. They have enormous potential. But to realize it, they must be comfortable adopting new technologies. If they don't, they won't be able to keep up with customer demands and aggressive competitors."

"Fabricated metals workers are the foundation of a lot of Iowa's manufacturing economy."

— Pete Nadolny

An early look at survey results shows most fabricated metals businesses recognize the need for continued improvement.

Seventy-six percent of respondents to a CIRAS questionnaire said they were planning to develop a new product, service, process, or business model within the next year as part of a move to grow sales. According to the results, 72 percent of companies already are planning to modify an existing product, service, process, or business model within the next year as a bid to reduce costs.

Fabricated metals workers have to innovate to compete, according to a study of the sector by Iowa State University economists. Statistics show that Iowa's sector, which for decades has lain below the U.S. national average in terms of GDP per job in fabricated metals, has been losing ground more sharply since 2009.

According to the research, most of the sector's current jobs lie in machine shops and working with architectural and structural metals. Most businesses sell to manufacturers of construction and agricultural machinery, equipment manufacturers, and ammunition makers.

➤ For more information, contact Pete Nadolny at pnadolny@iastate.edu or 515-227-2471.

New CIRAS Advisory Council Member

Karen M. Richards joined the CIRAS Advisory Council in January. Richards works for Valent BioSciences Corporation as the plant manager of the greenfield fermentation plant in Osage, which is dedicated to the manufacturing of bio-rational products. Richards led the plant through successful start-up of fermentation-based microbial products and chemical entities, overseeing activities such as staffing, developing management systems, commissioning and start-up of equipment, process improvement, and culture development and sustainment.



Karen M. Richards

Richards, who has a bachelor's degree in chemical engineering from Purdue University, is experienced in manufacturing fine chemicals, small molecule active pharmaceutical ingredients, viral and bacterial antigens, aseptic vaccines, and human health drug products, as well as bio-rational pesticides/plant growth regulators.

Richards said she is passionate about process improvement, culture development, safety, and leadership development and mentoring. She is excited to join the CIRAS Advisory Council for its networking opportunities and for the ability to provide input on manufacturing needs and interests. She hopes to build contacts with other manufacturers and share best practices with her business team members and those in other companies.

Iowa State Career Fairs—A Chance for Students, Companies to Put Their Best Feet Forward

Job postings are everywhere online, but the Internet is no match for meeting a would-be employer face to face.

That's why career fairs continue to be a tremendous benefit for companies seeking new workers, according to Brian Larson, Director of Engineering Career Services at Iowa State University. Career fairs help recruiters take full measure of a prospective hire.

"An employer can tell a fair amount about a job candidate from their resume, but they often need to talk to them to see if they are a good fit for a position," Larson said. Face-to-face discussion brings out a candidate's communication skills and personality, "all the things you can't really get a good sense of from a resume."

Campus recruiting gives businesses the chance to meet a wide pool of potential applicants, Larson said. Career fairs are especially important for companies that don't have strong name recognition among students—and therefore risk having their job openings ignored on a website, he added.

From the other perspective, career fairs expose students to businesses they may not otherwise have considered. Students can learn more about a company's corporate culture, mission, benefits, and other details that aren't part of an online job posting.

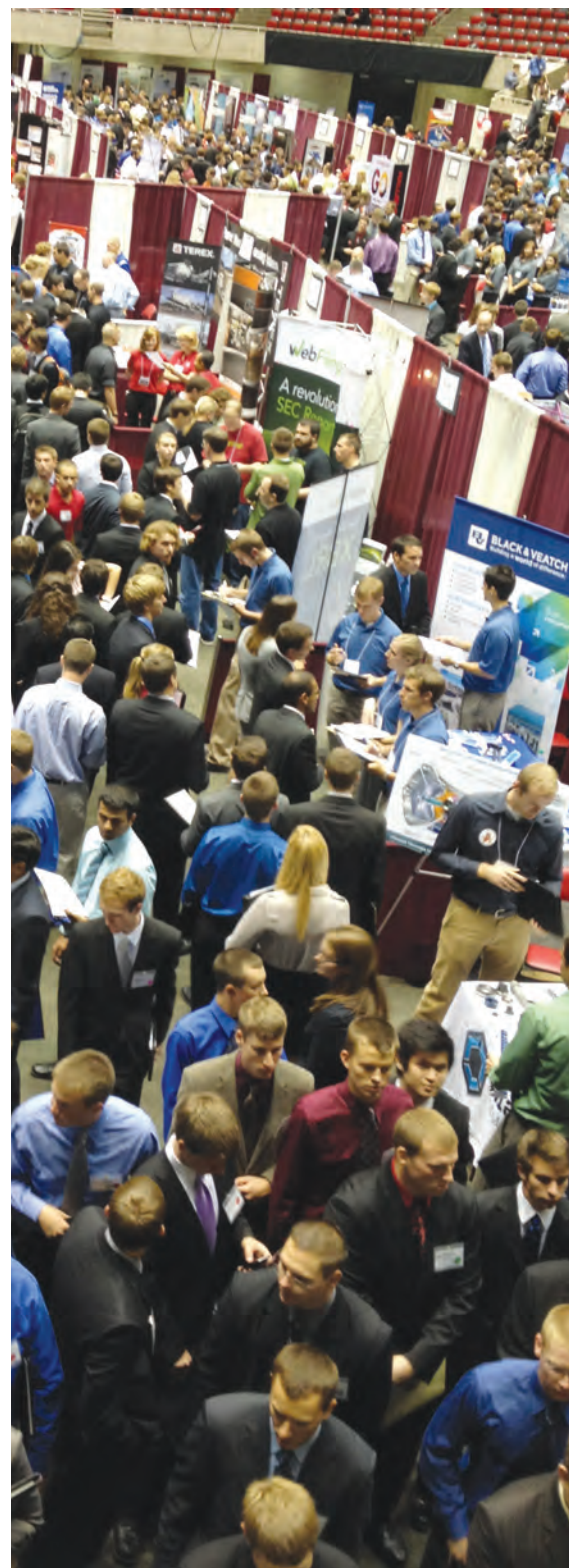
"It gives the students an opportunity to present themselves and their qualifications, and to make an impression on the employer," Larson said. Despite all the digital job-hunting tools available, "face-to-face networking continues to be the most effective job search method."

Career Fairs are not the only way to recruit ISU students and graduates. Employers are encouraged to promote employment opportunities on CyHire (ISU's online job board) and conduct on-campus interviews. Both can be arranged through Career Services and there is no charge for these services.

Spring Career Fairs

Here are the Iowa State University spring career fair dates and locations, along with contact information for employers interested in participating.

- **Agriculture and Life Sciences Ag Career Day:** 10 a.m. to 2 p.m. Wednesday, February 3; Memorial Union.
CONTACT: mikegaul@iastate.edu.
- **Engineering Career Fair:** Noon to 6 p.m. Tuesday, February 9; Hilton Coliseum and Scheman Building.
CONTACT: ecs@iastate.edu.
- **Business, Industry and Technology Career Fair:** Noon to 6 p.m. Wednesday, February 10; Hilton Coliseum. Focuses on business, liberal arts and sciences, and human sciences.
CONTACT: buscs@iastate.edu.
- **People to People Career Fair:** 1 p.m. to 5 p.m. Wednesday, February 10; Scheman Building. Focuses on human/social services, education, health/wellness, government, and hospitality. Hosted by the Colleges of Human Sciences and Liberal Arts and Sciences.
CONTACT: hscareers@iastate.edu.
- **Design Career Expo:** 1 p.m. to 5 p.m. Thursday, February 18; Memorial Union.
CONTACT: designcareers@iastate.edu.
- **Teacher Education Career Fair:** 1 p.m. to 5 p.m. Friday, March 4; Iowa State Alumni Center.
CONTACT: tecareerfair@iastate.edu.



CONTACT INFORMATION



Since 1963, we have delivered proven services to enhance the performance of industry. Our approach—Engage. Educate. Embed.—creates specific solutions that allow each business and its community to prosper and grow. Coupled with a satisfaction guarantee, our typical client has achieved a 200% ROI. Clients have reported an economic impact of more than \$2 billion over the past five years.

				Account Manager	Economic Development	Engineering	Government Contracting	Innovation	Management Practices	Productivity	Quality Management	Safety	Supply Chain Management	Sustainability	CIRAS Operations
Cox, Ronald • Director	515-294-0099	rcox@iastate.edu	Campus		●	●									●
Alexander, Andy	402-547-0333	andyalex@iastate.edu	Council Bluffs				●								●
Bangalore, Savitha	515-294-5240	savitha@iastate.edu	Campus												●
Barton, Leah	515-291-0733	bartonl@iastate.edu	Waterloo												●
Berge, Paul	515-294-5972	pmerce@iastate.edu	Campus			●		●							
Boesenberg, Adam	515-294-5903	aboesenb@iastate.edu	Campus			●		●							
Burant, Melissa	563-726-9958	mmburant@iastate.edu	Bettendorf				●								
Clark, Susan	319-329-9267	skclark@iastate.edu	Iowa City						●	●					
Donald, Joy	319-359-0206	jdonald@iastate.edu	Iowa City						●						
Dunnwald, Paul	515-509-1377	dunnwald@iastate.edu	West Des Moines	●											
Eckhoff, Jeff	515-231-7826	eckhoffj@iastate.edu	Campus												●
Essex, Jodi	515-509-0769	jodir@iastate.edu	West Des Moines				●								
Fagle, Julie	319-310-8612	jafagle@iastate.edu	Marion				●								
Galleger, Sean	515-290-0181	galleger@iastate.edu	Waterloo	●											
Gilbert, Seth	563-213-8823	sgilbert@iastate.edu	Dubuque	●											
Gormley, Paul	319-721-5357	gormley@iastate.edu	Marion					●						●	
Hill, Chris	515-294-5416	chhill@iastate.edu	Campus			●		●							
Kelch, Laurel	515-294-5472	lmkelch@iastate.edu	Campus												●
Li, Haiyan	515-294-1316	hli@iastate.edu	Campus												●
Martin, Brenda	515-570-5282	bkmartin@iastate.edu	Fort Dodge	●							●				
Mohr, Jeff	515-294-8534	jeffmohr@iastate.edu	Campus			●				●					
Muff, Brian	515-520-1033	bmuff@iastate.edu	Denison					●							
Nadolny, Pete	515-227-2471	pnadolny@iastate.edu	Campus			●		●							
Novak, Carey	515-408-4257	cenovak@iastate.edu	Campus			●									
O'Donnell, Michael	515-294-1588	modonnll@iastate.edu	Campus		●	●			●				●	●	
Poe, Jim	515-294-1507	jrpo@iastate.edu	Campus			●		●	●	●		●			
Pruszko, Rudy	563-599-0645	rpruszko@iastate.edu	Dubuque								●			●	
Reinig, Mark	515-231-4150	mreinig@iastate.edu	Elkader		●										
Roberts, John	515-294-0932	jarobert@iastate.edu	Campus			●		●							
Russenberger, Pam	515-509-7814	plrussen@iastate.edu	West Des Moines				●								
Schneider, Marc	563-221-1596	maschn@iastate.edu	DeWitt						●	●			●		
Srinivasan, Shankar	515-290-6702	srigshan@iastate.edu	Campus		●	●									
Thach, Chris	515-294-7731	cthach@iastate.edu	Campus												●
Thompson, Derek	515-419-2163	thompson@iastate.edu	Boone	●											
Volkman, Glenn	515-205-3786	gvolkman@iastate.edu	Grinnell	●											
White, Beth	563-370-2166	whiteb@iastate.edu	Bettendorf				●								
Willett, Michael	319-234-6811	mwillett@iastate.edu	Waterloo							●					
Zimmerman, Mary	515-450-1278	maryz@iastate.edu	Campus				●								

CIRAS PARTNERS

Iowa State University

Center for Crops Utilization Research
Center for Nondestructive Evaluation
College of Engineering
Community and Economic Development

Department of Environmental Health and Safety
Engineering Career Services
Engineering-LAS Online Learning
Extension and Outreach
Industrial Assessment Center
Meat Science Extension

Des Moines Area Community College

Iowa Area Development Group
Iowa Association of Business and Industry
Iowa Business Council
Iowa Central Community College
Iowa Farm Bureau

Iowa Innovation Corporation

Iowa Lean Consortium
Iowa Sustainable Business Forum
North Iowa Area Community College
Northeast Iowa Community College
Quad Cities Manufacturing Innovation Hub



THE INNOVATION CYCLE

Materials Detectives: Tales from the Search for What Goes Wrong with Parts and Products *by Paul Berge*

I sometimes think of myself as part of "CSI: Metallurgy."

I am a metallurgical engineer, and investigating how a product or component failed is one of the most interesting and challenging aspects of my work. Much like a forensic investigator, I follow the evidence to arrive at a likely cause of the problem. In my 26-year career, I've learned that the evidence can lead anywhere. Products can fail by being under-designed or over-stressed. They can be misused or neglected. Sometimes, there are defects such as inclusions within the materials themselves. Other times, defects are introduced by the manufacturing process.

Here are a few of the more common scenarios I have encountered.

Material selection may be a problem area. Design engineers and technologists understand metals and materials. They use data to make choices regarding which materials to use in manufacturing a product. However, many small- to medium-sized companies don't have the metallurgical or materials expertise on staff to recognize material shortcomings.

For example, consider a company manufacturing shafts that go into a gearbox. Designers may select a

material based on how strong it is, how accessible, and how machinable. What often gets overlooked is fatigue performance. Shafts made from free machining steels generally do not perform well where longitudinal shear is induced by a bending or twisting stress. When that happens, shafts break. A higher quality, heat-treated alloy might be a better choice.

Another common problem area involves the design of welded joints. Company drawings may specify a weld size and location, but trained metallurgical engineers can help develop a welding procedure specification (WPS). The WPS then becomes a design document that tells your welder how to make a joint that will meet your expectations.

Finally, there's stress concentration. When parts are placed under stress, certain contours and changes in cross section can have a multiplying effect on the stress experience at those locations. For example, the placement of a weld may be in an area of high stress. Or a reduced section of a shaft is located where maximum bending stresses are experienced. By being aware of stress concentration in the design process, you can reduce the chances of failure.

➤ **For more information, contact Paul Berge at pmerce@iastate.edu or 515-294-5972.**