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## Simplicity turns chaos into ca\$h

by Tim Sullivan, CIRAS

What is required to manage the portion of your business that manufactures and packages a finished consumer product for a seasonal market? Especially going into the peak season?

The answer is complex, right? You need detailed records of how many of each model sold in past years. The product is bulky and orders are erratic, so you also need lots of space to keep enough of the product in stock to fill orders quickly. And a crystal ball wouldn't hurt so you could predict the popularity of each model of the product.

Dale and Tana Brand, owners of Co-Line Welding, Inc., which is located in rural Mahaska County south of Sully, face the challenges of a seasonal consumer market. In January of 2005 they started working with CIRAS to develop a solution.

During the peak season, Co-Line couldn't keep up with orders for a bulky consumer product, so they built large inventories of it in the pre-season. To maximize efficiency, cells were operated at maximum capacity during the peak season, producing large batches of each part of the product. However, inventories occasionally ran short, often because while producing a large batch of one part, the supply of another part was depleted.

The situation was complicated by the fact that the cells that produce the parts for the consumer product also built parts for other customers, internal and external. During the peak season the consumer product had priority; overtime was often required to fill orders for other customers.

The common approach to process improvement in situations like this one is to do a better job of forecasting the need for the product and to



*Tana and Dale Brand, owners of Co-Line Welding, Inc., pose in front of nearly empty racks that used to be filled with finished-goods inventory.*

maximize the efficiency of every cell by running bigger batches of each part. After all, when you don't have enough capacity, setups are a waste so run as few setups as possible. In short, scrutinize every resource and make sure they are all producing to their maximum.

Was maximizing the efficiency of every resource effective? Not for Co-Line. Efforts to build inventory during the off season did little to minimize the chaos and stress of the peak season. In addition, the approach tied up significant capital, and they still ran out of stock at times.

Dale Brand attended a workshop in Des Moines that was also attended by Tim Sullivan of CIRAS. The two discussed Brand's situation. Sullivan ultimately visited Co-Line and was able to propose a different approach to their situation.

The approach recommended by Sullivan is based on the concept that even very complex systems have inherent simplicity. This approach is known as the Theory of Constraints or "TOC." Brand was familiar with the concepts. In fact, he was such a believer that he had been self-implementing TOC for years. So, after a tour, which included a trip through a warehouse

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### CIRAS Mission Statement

The mission of CIRAS is to enhance the performance of Iowa industry through education and technology-based services.

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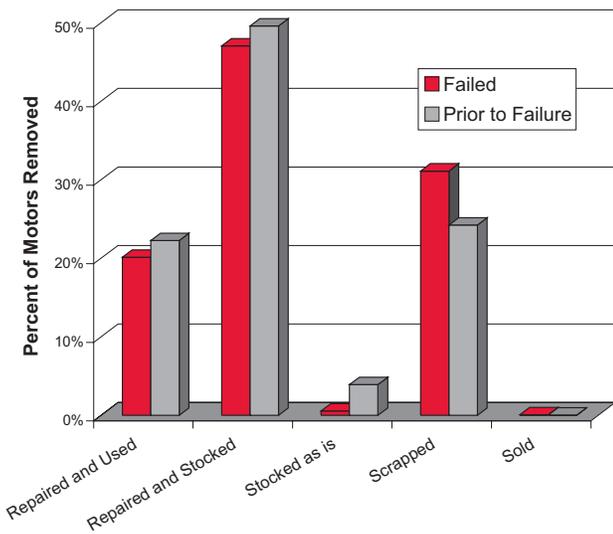
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# Premium efficiency motor use in Iowa

by Alexandre Kisslinger, Paul Gormley, and Ronald Cox, CIRAS

In 2001, the National Electrical Manufacturers Association defined a new energy efficiency class for motors. Premium efficiency motors, or PEMs, are typically 1% to 3% more efficient than EPCAct compliant motors (commonly known as high efficiency motors). This past year, CIRAS, with the assistance of the Iowa Energy Center, began a study for Alliant Energy-Interstate Power and Light to determine the potential acceptance and economic impact of a PEM energy efficiency program. The ultimate goal of the effort is to speed up the conversion from standard and EPCAct motors to premium efficiency motors to reduce manufacturers' costs and reduce energy consumption.

Existing empirical data was used to estimate the potential electrical energy savings that PEMs could provide for industrial manufacturing clients. This initial step relied on data from the *U.S. Industrial Electric Motor Systems Market Opportunities Assessment (MOA)*, a report published in 2002 by the U.S. Department of Energy. Results from this exploratory study suggested that considerable energy savings might be realized, so efforts were undertaken to acquire additional information.



## Destination of motors when they are removed from service.

In the next part of the study, 279 manufacturing clients and 52 motor distributor representatives were surveyed to validate the earlier estimates and to provide insight into clients' motor usage practices. The surveys developed for this study were based on The Motor Systems Practices Survey tool used in the MOA but were modified to fit current motor industry offerings and the particular goals of this study. Six topics were examined:

1. Facility Information—Basic information about the survey participant and the company he/she represented.

2. Replacement Patterns—Company practices regarding the selection, storage, and use of motors.
3. The Rewind/Replace Decision—The process and criteria used to purchase new motors or rewind existing ones.
4. Motor Purchasing Practices—The decision-making process used by the organization in purchasing a new motor.
5. Motor Maintenance Practices—The installation and maintenance practices for electric motors.
6. Pump, Fan, and Air Compressor Practices—Information about three large systematic users of electric energy in manufacturing facilities.

The surveys yielded five important findings as described below.

- Rewinding motors after change-out is a common practice. According to the survey results, approximately 70% of all motors that are replaced for any reason are rewound. This finding suggests a significant opportunity to improve the motor efficiencies of Iowa manufacturers. Since motors tend to lose 1–3% of their original efficiency when rewound, and most rewind motors are at EPCAct efficiency or below, replacing the unit with a PEM could net a 2–6% energy savings.
- Increasing the percentage of PEMs in operation may be adversely impacted by motor rewind rates. From the data collected, it can be concluded that respondents are replacing motors prior to failure at a rate of about 7% per year and after failure at a rate of 4% per year, for a combined rate of 11% per year. This indicates an average motor life expectancy of nine years. Since 70% of motors are rewound and companies report between one and two rewinds per motor as acceptable, it is possible for a motor to be in a manufacturing facility for up to three decades. This longevity could significantly limit progress toward increasing the percentage of PEMs and EPCAct-compliant motors in use in Iowa.
- Motor purchasing decisions are heavily influenced by capital costs and turn-around time. Both clients and distributors responded that capital cost and turn-around time are the factors that most influence decisions about motor replacement. Long-term operational costs, including life-cycle energy costs, typically ranked last. When coupled with the observed fact that few clients claim to have a clearly defined motor purchasing strategy, it appears that most manufacturers simply react to motor failure and thus need solutions that fit their

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# EDA assistance extends to companies and research project

by John Roberts and John Van Engelenhoven, CIRAS

In fiscal year 2004, 21 Iowa businesses received technical assistance from the Iowa Economic Development Administration (EDA) University Center in the areas of product design, product testing, productivity, and quality management. Many EDA projects are ongoing, but work that has been completed thus far has generated positive feedback. In surveys, average client satisfaction level was 8.9 on a 10-point scale. Below are examples of last year's EDA projects and their potential to reduce costs, increase sales, and create new opportunities for Iowa manufacturers.

**Iowa Lakeside Laboratory**, Milford, Iowa, provides educational courses through all three Iowa Regent universities and Drake, and short public programs on the geology, archaeology, plants, birds, fish, etc., of the Iowa Great Lakes region. Iowa State assisted Iowa Lakeside Laboratory in documenting approximate locations of all sewer, water, and communications lines on its 140-acre property. The utilities on the property have changed many times since the facility became a state-owned institution in 1936. The project was funded by the EDA University Center and Iowa State University Extension. The new utility drawing will assist Iowa Lakeside Laboratory as it grows to meet the future needs of Iowa.

**Mobility Concepts**, Charles City, Iowa, is a start-up company that developed a forearm crutch that is quickly reduced in length for easy storage when not in use. The company requested CIRAS assistance with testing the forearm crutch to determine its maximum load capacity. Following guidelines from an ISO standard and working with the Structural Engineering Research Laboratory, CIRAS specialists performed static load tests on the device. A written report was provided to the company describing the testing process and results. The company will use the information to assist them with developing user specifications. The company has been successfully gaining in sales and working to market the product through health care equipment providers.

**Plastic Professionals'** rotational molding and mold building operations are a division of Owner Revolution Inc., formerly known as Schafer Systems. When Plastic Professionals relocated from Adair to their current location in Atlantic, Iowa, Iowa State assisted them with a plant layout/simulation for their new facility. The project was partially funded by the EDA University Center. The company is investing \$2 million in a new plant and equipment and adding 25 new jobs. They expect \$2 million in increased sales at the new facility.

**Spillville Mill**, a division of Lynch Livestock, is a small feed mill in Spillville, Iowa, with approximately 17 employees.

Mill management requested Iowa State's assistance in ISO 9000 internal auditor training and management training. The Iowa EDA University Center and Northeast Iowa Community College provided funding for the project. Certified to ISO 9001:2000 in June 2005, the mill reports a 2 percent increase in net profits and an annual cost savings of \$5,000. The mill invested \$20,000 in scales and a new air filtration system.

In addition to providing technical assistance to Iowa businesses, the EDA University Center partnered with the Iowa State University Department of Economics to conduct regional economic studies on manufacturing. The information is to be used by economic developers of the region in their efforts to improve the regional economy. The initial study involved five southeast Iowa counties: Louisa, Muscatine, Des Moines, Henry, and Lee. The study has five objectives:

- 1) Overview of the regional economy and the forces affecting it
- 2) Assessment of the regional industrial structure examining strengths and weaknesses
- 3) Identification of regional key industries with an eye toward assisting industrial development, recruitment, and retention
- 4) Promote the use of research-based criteria for justifying public economic development spending
- 5) Link local organizational structures and needs with Iowa State University research, extension, and continuing education professionals

Three meetings have been conducted with regional economic developers to provide guidance and feedback. A report titled *Targeting Industrial Growth Opportunities in Southeast Iowa* has been completed. Copies of the report are being provided to the organizations of individuals who participated in the meetings.

The Iowa EDA University Center was established in 1989 to provide technical assistance to Iowa industry and assist with the transfer of university technology. The center also provides guidance, information, and design assistance to entrepreneurs in their efforts to develop new products.

*For more information on the Iowa EDA University Center and to see if your company is eligible for EDA assistance, contact John Roberts at [jrobert@iastate.edu](mailto:jrobert@iastate.edu); 515-294-0932; or John Van Engelenhoven at [jve@iastate.edu](mailto:jve@iastate.edu); 515-294-4475. ■*

## Bring down the noise

by Robert Mills, Communications Specialist, IPRT

For a company that specializes in keeping things quiet, Vibroacoustic Solutions, Inc., of Ames is making a lot of noise. Formed to commercialize applications of vibration and noise-control technologies, the start-up company has many irons in the fire as it works to create new products and get them into the market.

The company sprang from the minds of Ken Budke, a dentist from Cedar Falls, Iowa, and Atul Kelkar, a professor of mechanical engineering at Iowa State University and an expert in noise and vibration control. One of VSI's goals is to develop "smart" materials to control noise and vibrations in applications ranging from home appliances and office furniture to construction equipment and vehicle suspension systems.

Soon after forming in 2004, VSI received a \$100,000 grant from the National Science Foundation to develop a proof-of-concept for a natural fiber, polymer composite material embedded with active noise-control technology. The material can cover a wide spectrum of vibration frequencies and yet be molded like conventional plastics. The grant was made through the federal government's Small Business Innovative Research (SBIR) program. In August 2005, the company won a \$440,000 Phase II SBIR grant to develop a prototype.

### About IPRT Company Assistance

The Institute for Physical Research and Technology is a network of scientific research centers at Iowa State University. IPRT Company Assistance provides access to world-class expertise and equipment to help Iowa companies address technical problems and R&D needs.

IPRT helps Iowa start-up companies access university resources to commercialize new tech-based products. This is done by helping start-up companies on early-stage prototype development, market and customer research, and overall business model development. IPRT works with the Pappajohn Centers for Entrepreneurship, the ISU Research Park, and other statewide business development resources.

IPRT Company Assistance also helps Iowa companies set up contract research projects and solve nonroutine technical problems with its expertise in nondestructive evaluation and materials.



*Atul Kelkar holds a key component of a new pneumatic seat suspension system made for construction and agricultural equipment. Kelkar, chief technology officer for Vibroacoustic Solutions, Inc., and an Iowa State professor of mechanical engineering, says the system offers many advantages over those currently in use.*

The Company Assistance arm of Iowa State's Institute for Physical Research and Technology assisted VSI's commercialization and grant efforts. IPRT's Carey Novak, a technology transfer associate, used the resources of the Technology Commercialization Acceleration Program. Novak helped the company map out its initial product-development efforts. And, it was through Novak that VSI came to know another Iowa company, Creative Composites, a maker of natural-fiber-based materials. VSI has since become a majority shareholder in Creative Composites.

"Carey has been very instrumental in putting our two companies together," said Kelkar, who also serves as VSI's chief technology officer. He added that Novak also helped VSI establish contacts with potential customers and partners in Iowa industry.

As is often the case with start-up companies, VSI also has received assistance from other Iowa State University organizations, including CIRAS, Pappajohn Centers in Ames and Cedar Falls, and the ISU Research Park. CIRAS, for instance, helped the company evaluate the ride of the trucks of an Iowa utility company. Besides helping an Iowa company, "we got real-world data on actual trucks, which helps us to understand the market," Kelkar said. VSI is now working with an Iowa manufacturer to design a seat with an active pneumatic suspension system for use in construction and agricultural equipment.

*For more information, contact IPRT Company Assistance toll free at 877-251-6520, [iprtinfo@iastate.edu](mailto:iprtinfo@iastate.edu), or visit the Web at [www.iprt.iastate.edu/assistance](http://www.iprt.iastate.edu/assistance). ■*

# Energy-related sourcebook for food industry complete

by Tim Sullivan, CIRAS

Food processing is defined as converting edible raw materials into higher-value consumer food products. The conversion process utilizes significant amounts of labor, machinery, and energy. In addition, it relies increasingly on scientific knowledge to both improve food quality and safety and to reduce production costs.

Food processing is one of the largest and most important of all manufacturing sectors in the U.S. Within the manufacturing sector (NAICS Codes 31 through 33), food processing is second in sales, third in workforce size, fourth in number of individual businesses, and fifth in annual payroll. Based on a comparison of the 1997 and 2002 economic census, food processing is the only sector in manufacturing that reported growth in all four categories.

Food processing is a significant component of Iowa's employment activity, with all but five of the 99 counties engaged in some aspect of it. Fifty-five counties have over 100 workers employed by food processors. According to 2002 data from the Bureau of Economic Analysis, food processing in Iowa contributes \$4.3 billion to the gross state product (GSP). This is 21% of the manufacturing GSP, making it the largest sector in manufacturing both in sales volume and number of employees. Currently Iowa has 682 food industry employers with a combined workforce of 51,341 employees.

## Energy Intensive

Food processing is an energy-intensive activity. Nationally, in 1998, it consumed 7%—more than 213 trillion Btus—of the total electricity used by the manufacturing sector.

According to the American Council for an Energy Efficient Economy, less than 8% of the energy used by manufacturing is for non-process uses such as facility heating/cooling, lighting, ventilation, etc. Therefore the main focus of managers who want to reduce energy costs must be on process-related uses.

## Sourcebook

The mission of the Iowa Energy Center (IEC) includes striving to improve energy efficiency in all areas of Iowa's energy use. Since industry is a significant consumer of energy and since food processing is the largest manufacturing sector in Iowa, the IEC has funded the

publication of *Energy Related Best Practices: A Sourcebook for the Food Industry*. The sourcebook was produced by CIRAS with input from Iowa food processors and energy experts from outside the state. A copy is available for all of the state's food processors.

## Approach

Energy efficiency can be improved in at least two ways:

1) directly through means that reduce consumption and/or waste at the point of use, or 2) indirectly through means that reduce the required amount of energy per unit of product produced. An example of direct savings would be replacing an oven burner with a more efficient design, thus reducing the natural gas consumed by the oven. An example of indirect savings would be improving the mechanical efficiency of a mixing process by changing the shape of the mixing device, thereby reducing mixing time for a given volume of product. The energy requirement per unit of output for that process would be reduced.

Thus, the energy efficiency would

be improved because the ratio of product produced to energy consumed was improved.

This publication focuses primarily, but not exclusively, on the direct means of reducing energy consumption and/or waste at the point of use. It does, however, also present information on indirect savings through increased efficiencies.

## Energy Management

The heart of this publication is the chapter on energy management (EM). It describes a process based on commitment, training, continuous improvement, and communication. This process can be very detailed or streamlined for smaller companies. EM begins with an understanding of the company's current energy cost structure and current use trends, both of which are thoroughly discussed.

## Process Chapters

The remaining chapters are organized by process type, not by industry sector. Chapters for the following processes are included:

- Mixing
- Separation
- Drying
- Process Heating
- Refrigeration
- Industrial Air Handling

The publication includes several appendices with information on many existing resources that food processors can use in their efforts to improve energy

**Food processing is a significant component of Iowa's employment activity, with all but five of the 99 counties engaged in some aspect of it.**

efficiency. Appendices are:

- Steam
- Lighting
- Compressed Air
- Motors

### **Resource Guide**

Each chapter ends with a list of resources available to food processors, including printed materials, online tools, and professional organizations. These resources are compiled into a separate resource guide that is available on request from CIRAS.

### **Energy Management Assistance**

The goal of the Iowa Energy Center is not to produce sourcebooks, but to improve energy efficiency in Iowa. To be successful, then, *Energy Related Best Practices: A Sourcebook for the Food Industry* must be put to work. To facilitate this, CIRAS has a program coordinator with energy expertise and energy audit experience. Alex Kisslinger is available to visit your company to help you improve your energy efficiency.

*For more information on the sourcebook for the food industry, contact Alex Kisslinger, 515-294-1588; alexkr@iastate.edu. The complete sourcebook for the food industry is available at [www.ciras.iastate.edu/publications/EnergyBP-FoodIndustry/](http://www.ciras.iastate.edu/publications/EnergyBP-FoodIndustry/).*

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### **Chaos into cash**

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packed with product, aggressive goals were set: increase flow to accommodate additional sales of up to \$500,000 without additional people or equipment, while simultaneously decreasing inventory by \$100,000 (at retail value).

The project began with a detailed review of TOC terminology and definitions. Much time was spent coming to a thorough understanding of foundational concepts like “exploit,” “subordinate,” “protective capacity,” “rope,” and “capacity constraint resource.”

The drying oven in the paint line was identified as the capacity constraint resource, or CCR. It became the focal point of the production line, and Co-Line worked hard to exploit its capacity, that is, to get as much flow through the oven as is reasonable. Workers devised ways to increase the density of the pieces that were hung on the drag line as it was pulled through the oven. Output increased dramatically. In fact, it was quickly determined that the oven had more than enough capacity to handle all but the most extreme spikes in market demand.

Sullivan and Mike Willett, also of CIRAS, next introduced the concept of “replenishment.” The approach moved Co-Line from a push system based on guessing what the

market might buy to a pull system that produces only what customers are actually buying. This changed the focus of those who scheduled production. Instead of examining 12-month-old data, they looked at current orders.

The impact was dramatic and immediate. The non-CCR cells subordinated their priorities to that of the oven (which only needed enough parts to replace what was ordered yesterday). No longer were parts stockpiled in front of the paint line. Instead, small quantities of every part were run, every day. (In some cells, minimum quantities were set for a part family before that group was produced.)

Co-Line experienced a paradox common to companies that convert from “push” to “pull.” In the past, every resource was run at its maximum level, yet the system couldn’t keep up with demand. Now not only is the company able to meet an even higher market demand, they actually have some leftover capacity. System output increased significantly, and profits have never been higher!

“We were shooting ourselves in the foot,” says Dale Brand. “By running very large batches of every part, we were assured that when we finished the run on one part the stock level of other parts would be dangerously low. Now, by making small runs that replenish only what was shipped yesterday, other parts almost always have some buffer inventory still in place. As a result, we can build parts in the same, efficient sequence every cycle. We’ve eliminated the chaos.”

Looking back at his efforts to self-implement TOC, Brand says that his lack of an in-depth understanding of subordination combined with his tendency to quickly elevate when a bottleneck was encountered meant his company never fully exploited its capacity constraint resources. “We were so close to a successful TOC implementation, but we never would have made it on our own,” says Brand. “We probably had 95% of the necessary knowledge but only 20% of the benefits. That last 5% we got from CIRAS allowed us to get the 80% of the impact we were missing!”

What was the impact of the CIRAS project? Co-Line exceeded the project objectives. They report increased flow that can accommodate a \$700,000 increase in sales without adding people or equipment. In fact, the capacity they uncovered has allowed them to accept new customers as well as to deliver the increased market demand experienced in the past summer. “This year,” says Brand, “we had five happy customers instead of just one.” And this was done not by increasing inventory, but by cutting inventory by over \$200,000. Another financial benefit was a \$10,000 energy savings from better exploitation of the oven.

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# ISO 9001 process auditing focuses on improved performance

by Merle Pochop, CIRAS

ISO 9001 external auditors, known as Registrars, are using a procedure called process auditing to revise the methods they use to evaluate quality management systems. Companies that are ISO certified will need to change their audit planning and approach and increase their emphasis on continual improvement.

ISO 9000 has been in use by U.S. industry since the late 1980s. During this time, the standard has been altered twice. The first revision, in 1994, laid out 20 elements of compliance required of a certified company to demonstrate that a quality management system was in place and in use. These 20 elements fit manufacturers but were not as applicable to service-related activities.

In 2000, the standard was revised to the current ISO 9001:2000. In this revision, the original 20 elements were restructured to better apply quality principles to services and gain end results. The underlying purpose was to change focus from “quality” to “management” when the term “quality management system” is used. This change increased the commitment required of managers and the need to improve company performance through an emphasis on customer satisfaction, continual improvement, and involvement by all in the organization.

While methods for improving performance are more clearly identified in ISO 9001:2000, methods to help Registrars satisfy themselves that performance was indeed improving were not in place. An auditor could determine that individual activities were properly conducted, but the overall picture was not clear. In short, the “glue” to show that all parts of the organization were acting in concert to reach agreed-upon goals was not in place. To increase the value that Registrars provide to their client companies, changes are being made to the audit methods used. These can be categorized as follows:

1. Previously, audit practices varied by companies and auditors, and, in many cases, the method used by internal and external auditors to test for ISO compliance was based on a detailed review of a specific element of the standard. Thus, an audit might focus on the status of gauge control in one or more parts of a facility. Several more audits of this type would be required before a manufacturing process would have been entirely evaluated.

In order to audit companies for compliance with performance goals, it has been necessary to change the audit process. Beginning in the spring of 2005, registrar auditors have begun to advise client companies of new plans and methods for a practice known as “process auditing.”

The process audit approach views operations as a series of distinct activities or processes, thus presenting a clearer picture of the status or capability of a sector of the company's operations. Using this approach, a metal fabricating company would audit all activities at an operation that have to do with production. The audit would review the parts order, incoming material, work instruction, operator training, machine capability, gauge capability, and, of course, the end product.

Companies now using this approach relate that “on the floor” audit time is increased, but audit preparation time is reduced, making net time requirement about the same.

2. Planning for audits has changed as a part of this approach. Companies need to separate all direct and supporting activities into processes, each with inputs, activities, and specific outputs. A basic way to classify activities is to use three categories—product related, support related, and administrative actions. By auditing all of the activities under each of these categories, companies will generally audit all parts of the standard in a systematic manner.
3. Using the process audit approach provides a clearer picture of the status of an activity, but ISO Registrars are also concerned about the performance of the organization. To evaluate performance, auditors will focus on how audit results are treated, how a top management gathers customer input, and how continual improvement is managed.  
  
Customer input, either as a response to an existing product or as an expression of what's needed to improve performance, is an integral part of improvement. It is simply not enough to continue to focus on reporting customer complaints. Companies must become increasingly proactive in determining the status of customers' needs. This is a major role for top management and will always be audited, directly or indirectly, by Registrars.
4. Continual improvement is a basic requirement of ISO 9001:2000. Most improvement within a company occurs in an incremental manner, but not without consistent effort on the part of the organization to make this happen. For this reason, Registrars will ask all employees for knowledge of performance objectives within their individual areas and how these goals have improved. If this progress is shown in some visual manner, so much the better.

It is likely that failure to perform in these areas will be viewed by Registrars as non-compliance. Registrars have shown a marked reluctance to de-certify any client company. This may change as competitive pressures by large customers in the emerging supply chain business environment demand improved performance at all levels. Progress is key. As companies get better about what they do, the next step is to get better still!

**For more information on ISO, please contact Merle Pochop at 712-274-0048; [pochop@iastate.edu](mailto:pochop@iastate.edu), or Verlyn Anders at 515-231-4497; [vanders@iastate.edu](mailto:vanders@iastate.edu).**

# CIRAS 2005 ANNUAL REPORT

University Extension

IOWA STATE UNIVERSITY

College of Engineering

**CIRAS Mission Statement:** *The mission of CIRAS is to enhance the performance of Iowa industry through education and technology-based services.*

## From the Director

From 2000 to 2003, the U.S. experienced the largest drop in manufacturing employment since the end of World War II. In Iowa alone, 29,000 or 12 percent of manufacturing jobs were lost. The state has rebounded some since 2003: Iowa added 7,000 manufacturing positions at a time when the rest of the nation cut another 21,000 jobs in this sector.

Despite the loss of manufacturing jobs, U.S. consumption of manufactured goods continues to grow. This need is met by increases in both U.S. productivity and the trade imbalance. Nationally, manufacturing imports grew by 19% from 2000 to 2004 compared to manufacturing exports, which increased by 3%. Iowa fared better than the rest of the nation; state exports grew by 41% from 2000 to 2004.

Clearly, the world economy is in transition, and just as clearly CIRAS must make changes to provide timely services to its clients. For the past 20 years we have used the resources of the EDA University Center to provide one-on-one assistance to small rural manufacturers. This past year we expanded this program through a partnership with Iowa State economists to investigate regional clusters so that we can more effectively target the assistance that we provide.

We will soon be releasing a study on energy-related best practices for the food industry. Our industrial research work will continue to grow so that we can disseminate industry best practices to a much larger audience than we can with more individualized assistance.

CIRAS has also recently assumed responsibility for managing the NIST Manufacturing Extension Partnership (MEP) in Iowa. The integration of MEP with CIRAS will save administrative costs that can now be used to enhance services to Iowa manufacturers.

It appears that the slide in manufacturing employment in Iowa has ended, but we must remain vigilant in our efforts to assist manufacturers. Increasing the dissemination of best practices, developing stronger partnerships with key state and national groups, enhancing access to university resources, and continuing to lean our internal operations will be central themes as we move forward at this critical time.

*Ronald A. Cox*

## CIRAS Staff

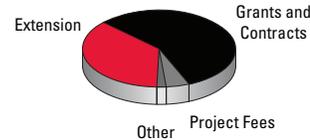
- Verl Anders
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- Dawn Hines
- Alex Kisslinger
- Jeffrey Mohr
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- John Roberts
- Carol Smith
- Timothy Sullivan
- Chris Thach
- John Van Engelenhoven
- Steven Vanderlinden
- Michael Willett
- Steve Winter

## Engineering Distance Education

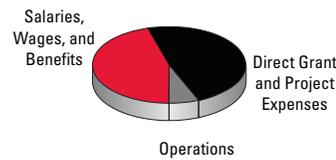
- Leah Barton
- Hiro Iino
- Paul Jewell
- Joe Monahan
- Pam Shill

And justice for all... Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, 3680 Beardshear Hall, 515 294-7612.

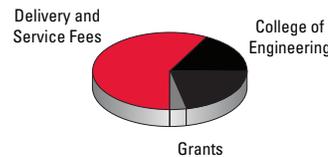
### CIRAS Income Total Income = \$3,549,805



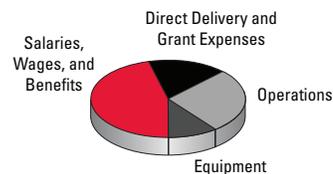
### CIRAS Expenses Total Expenses = \$3,479,340



### EDE Income Total Income = \$618,267



### EDE Expenses Total Expenses = \$537,163



## Iowa Manufacturing Profile

Iowa is home to 6,351 manufacturing establishments. The three areas below reflect how the manufacturing sector plays out as a portion of the state's total economic activity:

Labor Force .....	15%
Work Earnings .....	19%
Gross State Product .....	20%

# 2004–2005 Highlights

## Bioeconomy

- Experts from Iowa State University, CIRAS, USDA, and industry have hosted a series of workshops on the production of biodiesel fuel at Iowa Energy Center's biomass energy conversion facility in Nevada. Attendees hailed from 17 countries and 38 states, including staff from all of the biodiesel plants in Iowa. One attendee is spearheading the building of a biodiesel plant in Sac County, and another is moving forward with a new plant in north central Iowa.
- CIRAS is working with the USDA to develop and implement the Federal Biobased Products Preferred Procurement Program. Established by the 2002 Farm Bill, this program is designed to open potential federal markets for biobased products. Some of the products recently designated include a biodiesel fuel additive, penetrating oils, and mobile equipment hydraulic fluids. Each of these products is currently being produced by Iowa companies.

## Engineering

- The Iowa State Structural Laboratory, CIRAS, and IPRT assisted Mastercraft Furniture, Council Bluffs, in evaluating various couch frame designs and their relative load capacity. As a result of the project, Mastercraft Furniture saved \$150,000 and invested \$140,000 in new equipment.
- CIRAS engineers assisted Hoffman Precast Inc., an Ames manufacturer of concrete panels and foundations, with design modifications to their products. The improved designs saved the company \$12,500 annually and helped create two new jobs.

## Procurement

- CIRAS assisted a manufacturer in Central City through a severe downturn in sales to military customers. The company obtained new business through CIRAS marketing and bid preparation assistance that supported their focus on obtaining subcontracting opportunities with other military contract awardees. Their subcontract awards have surged to \$1.4 million in the past six months.
- Assistance with a bid response to the Department of Defense was provided to Brownells in Montezuma. The company was awarded a contract from the U.S. Army to produce hundreds of thousands of small arms ammunition magazines. The award will be nearly \$3 million.

## Productivity

- CIRAS engineers assisted Cummins Great Plains, Des Moines, in rearranging racks to free up floor space for an additional engine upfit line. The new rack arrangement allowed Cummins Great Plains to increase the number of engines processed per month. Changes made to the plant yielded \$100,000 in savings.
- Co-Line Welding, Inc., in Sully was approaching the busy season for a product they produce for another business. CIRAS worked with the company to improve the productivity of the work cells by using constraint management methods and revising the local and global measurements used. As a result, Co-Line reported a \$700,000 increase in sales with no additional operating expenses, a decrease in inventory of \$200,000, and \$270,000 in cost savings and investment avoidance.

- CIRAS conducted three Kaizen events and a Six Sigma project for Graham Manufacturing in Mason City. Three company employees were trained to facilitate future Kaizen projects for the company. Projects improved process flow and reduced quality problems, resulting in over \$500,000 in savings for the company.
- Gerdau Ameristeel's steel mill in Wilton received the Steel Manufacturers Association 2005 Recycler of the Year Award for manufacturing improvements that resulted in \$1.7 million savings for the company and significant contributions to the environment. CIRAS received assistance on the project from the Iowa Energy Center and the U.S. Department of Energy.

## Quality

- Spillville Mill decided to implement ISO 9001:2000 for continual improvement of business management and production practices. CIRAS was brought in to provide internal auditor and management training, assist with establishing an implementation plan and writing the quality manual, and conduct a pre-certification audit. The mill was certified to ISO 9001:2000 in 2005.

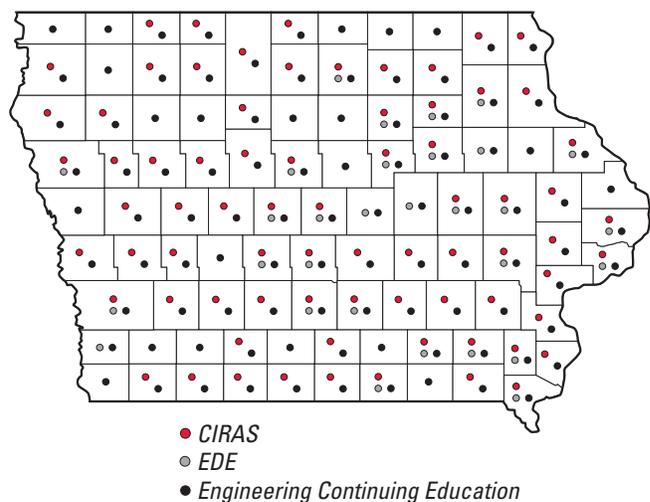
## Industrial Research

- CIRAS and the Iowa State University Department of Economics partnered with the Economic Development Administration to conduct a regional economic study on manufacturing in five southeast-Iowa counties: Louisa, Muscatine, Des Moines, Henry, and Lee. As a result, the Southeast Iowa Regional Economic Development Consortium intends to utilize the results to develop a marketing plan, create an entrepreneur program, and work to expand opportunities for existing companies.

## Continuing Education

- This past year Engineering Distance Education delivered 85 engineering courses to 783 students, 500 of whom were located in the state of Iowa. These courses allowed off-campus students to earn master's degrees in systems engineering, electrical and computer engineering, mechanical engineering, and information assurance.
- Extension staff from Iowa State's College of Engineering offered continuing education courses and workshops that were attended by 2,328 engineers.

## Project Activity



present cost and time constraints.

- Distributors and manufacturers disagree on the number of PEMs sold/purchased. In almost all survey categories, the distributor and client data supported one another. In one case, though, a significant difference was detected. Clients claimed to have purchased small PEMs at a higher rate than distributors reported selling them. Conversely, clients claimed to have purchased large PEMs at a lesser rate than distributors reported selling them. Further investigation is required to resolve this difference. It is clear, however, that a misunderstanding of the newest motor efficiency classification may hamper the actual usage of PEMs by manufacturers in the state.
- Clients may be ill informed about the advantages of replacing large motors with PEMs. The study found that manufacturers in Iowa, like their national counterparts, are less likely to replace large motors that fail with new motors. The largest motors are rewound at a significant rate, and when they are replaced with a new motor they are less likely to be replaced with a PEM. As indicated in the MOA, motors larger than 20 hp represent only 15% of the total distribution, but they account for 85% of the energy consumed by motors in manufacturing. Attention to this segment of the motor market is essential.

Using the observed static rewind rates as an indicator, it can be assumed that the overall distribution of motor type and size has changed little since 1997. If it is assumed that all Iowa manufacturers handle motor issues in a manner similar to what was found in this study, then energy savings of as much as 350GWh/yr might be achieved.

To make this happen in the near term, all motors with less than PEM efficiency, including functioning motors, would need to be replaced with new PEM models. Since full replacement is unlikely, the savings achieved through implementation of a statewide replacement program would be something less than 350GWh/yr.

Though the business case is hard to make for upgrading all motors in a facility at once, there is still great opportunity for improvement. The “lowest hanging fruit” in this case would be those motors that are replaced each year. Approximately 11% of the total motors in production are replaced annually, either due to failure or prior to failure for reasons such as preventive maintenance. A PEM energy efficiency program that focuses on these motors and on large horsepower motors might provide the best opportunity to reduce energy consumption in Iowa.

*For more information, please contact Alexandre Kisslinger at 515-294-1588; alexkr@iastate.edu, or Paul Gormley at 319-377-9839; gormley@iastate.edu. ■*



## Wilton steel plant receives distinguished recycler award

Gerdau Ameristeel's Wilton, Iowa, steel mill received the Steel Manufacturers Association (SMA) 2005 Recycler of the Year Award for manufacturing improvements that resulted in \$1.7 million savings for the company and significant contributions to the environment.

In 2002, the team completed a Total Assessment Audit and Plant-Wide Assessment (TAA/PWA) designed to examine potential process changes and technologies that could improve energy efficiency, decrease waste, and improve productivity at the Wilton location. The implementation of recommendations from the assessment was started in 2003.

Working with Gerdau Ameristeel to identify potential areas for efficiency and environmental improvement was Rudy Pruszko from the Center for Industrial Research and Service (CIRAS) at Iowa State University, the Iowa Energy Center and the U.S. Department of Energy Industrial Technologies Program. The award-winning team was recognized at the SMA Annual Members conference in Washington, D.C. on Wednesday, May 18, 2005.

“The TAA/PWA was of great benefit to the Wilton steel mill,” Jack Skelley, Wilton Environmental Manager said. “The ability of other steel manufacturers to use our findings to improve their operations was an unexpected but exciting side-effect. This award has tremendous meaning because it was given to us by our steel industry peers.”

SMA member companies are the nation's largest recyclers, recycling more than 50 million tons of steel scrap in 2004. The recycling of steel scrap plays an important role in conserving energy because producing steel from melted scrap requires much less energy than producing steel products with iron ore and blast furnaces.

*2005 Recycler of the Year Award recipients (from left to right): Phillip Casey, President and CEO, Gerdau Ameristeel; Carl Czarnik, Vice President and Plant Manager, Gerdau Ameristeel Wilton; William Haman, Iowa Energy Center; Rudy Pruszko, Center for Industrial Research and Service; John Skelley, Environmental Manager, Gerdau Ameristeel Wilton; and David Rodgers, U.S. Department of Energy.*

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## New account territories

Account managers provide initial manufacturing needs assessments and also explore and match resources to client needs. The state of Iowa has been divided into five account managers' territories. Currently CIRAS has three account managers covering the five territories. Their contact information follows.

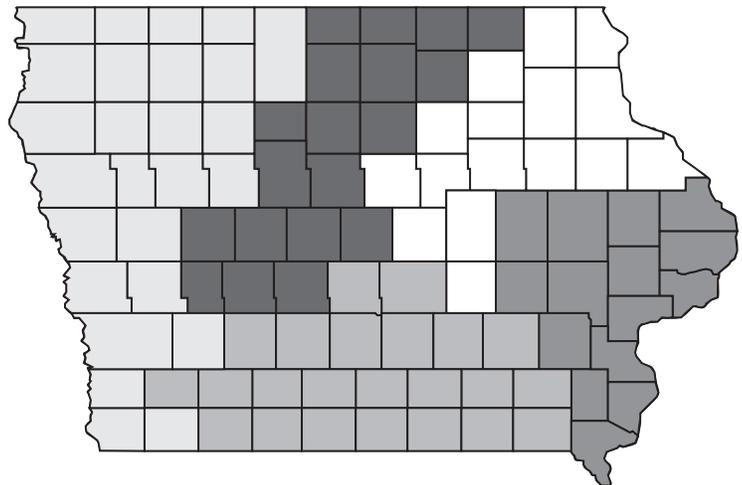
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*CIRAS News* is published quarterly by the Center for Industrial Research and Service and edited by the CIRAS publications team. Design and production is by Engineering Communications and Marketing, Iowa State University. Contact John Van Engelenhoven at 515-294-4475 or [jve@iastate.edu](mailto:jve@iastate.edu) with questions and comments regarding the newsletter.

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