Industrial Energy Productivity: Manufacturing Sector in the Midwest

2012

MGA
50th Anniversary
Midwestern Governors Association

Table of Contents

Introduction 1

What is Industrial Energy Productivity? 2

Why is IEP Important? 3

What Technologies are Utilized in IEP Projects? 5

What is the Scope of the IEP Manufacturing Sector in the Midwest? 6

Profiles of Midwestern Companies in the IEP Manufacturing Sector 11

Introduction

The Midwest accounts for nearly one-fourth of the industrial energy usage in the U.S., including nearly half of all industrial coal consumption[1]. Yet, only 10 percent of Midwestern industrial facilities are upgrading their equipment to improve energy productivity[2].

With this in mind, in 2011 the Midwestern Governors Association (MGA) launched an industrial energy productivity (IEP) initiative aimed at improving the competitiveness of Midwestern industry by highlighting the region's IEP assets and opportunities—namely the region's energy, manufacturing, financial, natural and human resources.

As a region, we have a unique opportunity to work cooperatively to:

- *promote the benefits of improved IEP;*
- *remove policy and regulatory barriers to IEP; and*
- *identify new strategies for increasing the adoption rate of IEP practices and improvements.*

Many government agencies, utilities, universities and nonprofit organizations are beginning to focus on untapped opportunities to make Midwestern manufacturing more competitive through improved energy productivity.

The attention, visibility and cache that a collaboration by Midwestern Governors, legislators and agency heads brings, can increase the rate of IEP adoption and prevent the expense and inefficiency of each state traveling the IEP learning curve alone.

Numerous reports have been published on the efforts of large, energy-intensive industries to make their operations more energy productive.

This briefing focuses on manufacturing companies that make and supply the innovative technologies and components that are purchased and installed by large energy users to make their operations more efficient. It aims to:

- *give state and local policy makers and economic developers a snapshot of the manufacturing sector for IEP in the region;*
- *explain what IEP is and what the IEP manufacturing sector is;*
- *highlight why IEP and the IEP manufacturing sector is important to the Midwest and outline some of the major IEP technologies and components; and*
- *highlight a small handful of Midwest manufacturing companies that are thriving in the IEP marketplace.*

[1] Midwest Energy Efficiency Alliance (MEEA), US DOE Webinar, "Regional Energy Efficiency Programs", Dec.13, 2011.
[2] 2006 Manufacturing Energy Consumption Survey (MECS Survey), U.S. Census.

What is Industrial Energy Productivity?

There are numerous definitions of industrial energy productivity (IEP). Some definitions, such as those used by the U.S. Energy Information Administration (EIA) and the Federal Reserve Board's Index of Industrial Production, are geared toward measuring the aggregate and average efficiency of industrial enterprises. The EIA also uses a more broadly applicable definition of energy efficiency as "energy reductions without sacrifice of service[3]."

In this report, we use the following definition of IEP, which takes EIA's broader definition and applies it to the most energy-intensive industrial sectors in the U.S. and in the states that comprise the MGA:

*IEP is the combined set of **practices** (production processes, material sourcing) and **improvements** (equipment, machinery, facilities/buildings) that enable the largest, most energy-intensive industrial enterprises to:*

- *significantly reduce energy usage and emissions (carbon and particulate),*
- *significantly reduce energy costs, and*
- *maintain or increase production and productivity levels (i.e., no sacrifice of service).*

In the Midwest, the most energy-intensive industries include petroleum, coal, steel, aluminum, paper and the manufacturing of chemicals, machinery, food and transportation equipment[4].

[3] EIA, Total Energy, glossary: http://www.eia.gov/tools/glossary/index.cfm?id=E.

[4] Composite list taken from multiple sources including Michigan Manufacturing Technology Center, World Resources Institute, Minnesota Technical Assistance Program, Center on Globalization & Competitiveness (Duke University), Midwest Energy Efficiency Alliance, and the National Commission on Energy Policy (Yudken).

Why is IEP Important?

Industry in the U.S. has made considerable gains in reducing energy usage (see Figure 1). However, with more widespread awareness of the impact of rising energy costs on industry's bottom line, and the impact of some traditional energy practices on the health of our environment and communities, there are still more gains to be made.

Figure 1: Historical and Forecast Values (1970-2035)

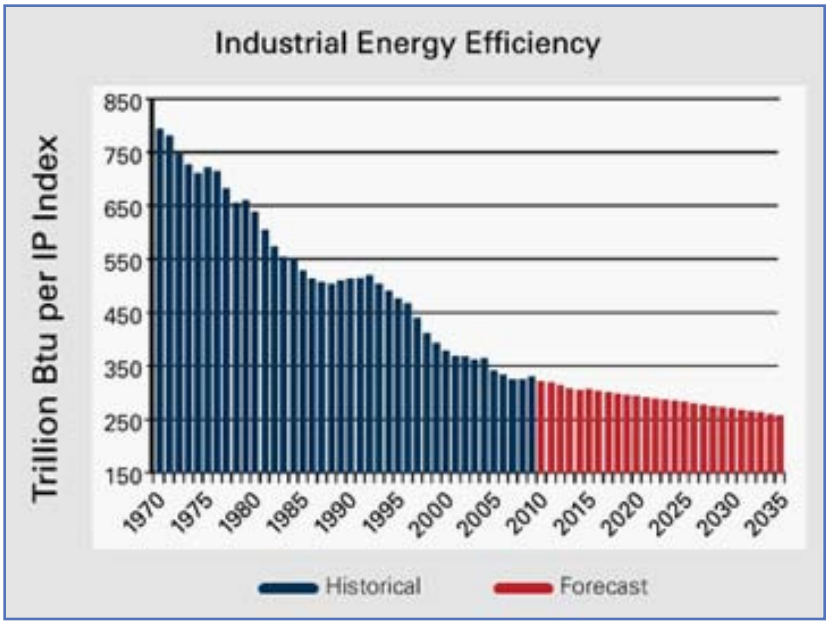


Figure 2: EIA data published in "Metric of the Month", Institute for 21st Century Energy, U.S. Chamber of Commerce, Dec. 2011.

Data from the U.S. Environmental Protection Agency (EPA) suggests that a 10 percent improvement in the energy productivity of industrial facilities could result in $20 billion in savings to companies, and annual reductions in greenhouse gas emissions equivalent to the emissions from 22 million homes[5].

What's more, the continued adoption of IEP represents a large and growing market opportunity for businesses in the Midwest.

A recent McKinsey & Co. report estimates that between 2009 and 2020, there will be $113 billion in investments in IEP made in the U.S.[6] The EIA predicts growth in total domestic expenditures for energy services from $1.2 trillion in 2010 to over $1.7 trillion in 2030[7].

Globally, IEP is an even larger opportunity. The new ISO 50001 Energy Management Standard is creating additional incentives for industry to actively pursue energy efficiency. ISO 50001 was developed by the International Standards Organization (ISO), the pre-eminent industry standards body, whose standards (including ISO 9001 and ISO 14001) have become widespread benchmarks of quality and performance in nearly every industry. ISO 50001 is designed to "enable organizations to establish the systems and processes necessary to improve energy performance, including energy efficiency, use, consumption and intensity."[8]

[5] EPA, 2010, as published in "The Multiple Pathways to Industrial Energy Efficiency", Center on Globalization, Governance & Competitiveness, Duke University, Feb. 15, 2011.

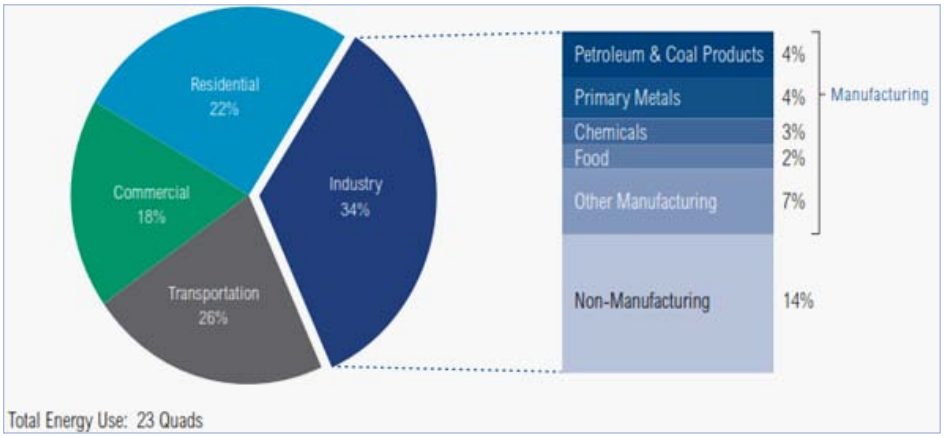
[6] U.S. Department of Commerce, http://selectusa.commerce.gov/industry-snapshots/energy-industry-united-states, April, 14, 2012.

[7] Ibid.

[8] Draft International Standard ISO/DIS 50001, Energy management systems — Requirements with guidance for use, 2010.

In the Midwest, industry is the largest energy-using sector, accounting for 34 percent of all energy use; heavy industrial manufacturing (petroleum and coal, primary metals, chemicals, food and other manufacturing) accounts for 20 percent of the total (see Figure 2).

Figure 2: Energy-using Sectors



Source: Bradbury and Aden, World Resources Institute, "Midwest Manufacturing Snapshot: Energy Use and Efficiency Policies", Feb. 2012.

Midwest utilities are already helping to develop the market. There were $1 billion in energy productivity projects funded in partnership with industry customers in 2010. Current predictions of annual growth are between 3 and 17 percent per year, with an estimated $1.7 billion of funding in 2015 (see Table 1).

However, the bulk of IEP projects will be accomplished through private industrial companies purchasing and installing more efficient technologies, and making strategic decisions about how to operate on a day-to-day basis with reduced energy usage.

While it is not an exact comparison, the market size for Midwestern IEP over the next decade could be estimated at 34 percent of $113 billion, or approximately $38 billion. The bottom line is that, in addition to environmental reasons, IEP is an enormous economic opportunity for the Midwest.

Table 1: Current and Predicted Funding for Energy Efficiency Projects

State	2010	2015
IA	$ 151,864,307	$ 193,097,488
IL	$ 175,105,135	$ 309,888,951
IN	$ 31,000,000	$ 85,733,283
KS	$ 5,400,000	$ 6,997,727
KY	$ 29,000,000	$ 34,482,657
MI	$ 95,750,832	$ 250,275,342
MN	$ 152,912,628	$ 167,138,000
MO	$ 40,500,000	$ 38,245,504
ND	$ 200,000	$ 200,000
NE	$ 12,987,000	$ 9,345,853
OH	$ 163,800,000	$ 239,028,467
SD	$ 1,460,046	$ 1,673,570
WI	$ 199,368,218	$ 381,100,000

Source: Midwest Energy Efficiency Alliance, US DOE Webinar, “Regional Energy Efficiency Programs”, Dec.13, 2011.

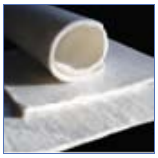
What Technologies are Utilized in IEP Projects?

The Energy Resources Center at the University of Illinois at Chicago, College of Engineering, organizes IEP technologies into one of four basic categories:

1. **General Manufacturing Equipment** are a set of commonly used technologies, such as compressors, motors (fans and pumps), steam generators and process heating equipment. All of these require thermal or electric energy either generated on-site or purchased from utilities or independent contractors.

2. **Specialized Manufacturing Processes** include manufacturing process technologies and equipment which are unique to each manufacturing sector and often highly energy and capital intensive. Examples include blast furnaces for steelmaking, clinker kilns for cement making, crackers for petrochemical refining and black liquor recovery boilers for pulp and paper manufacturing.

3. **Combined Heat and Power (CHP)** is a set of cross-cutting technologies that facilities with substantial on-site demand for electricity and heating have the potential to apply productively. Rather than generating steam and electricity through separate, inefficient processes, CHP involves co-generation of both, resulting in significant overall efficiency gains.



4. **Buildings** share a common set of energy-consuming technologies that cut across all sectors of the economy. Examples include lighting, heating and cooling (HVAC), automated system-control technologies and insulation of the building envelope.

A recent study by the Minnesota Technical Assistance Program (MnTAP) at the University of Minnesota identified two categories of IEP technologies that can be deployed across all sectors – those that have an impact on a facilities' thermal (heating) efficiency and those that have an impact on electrical efficiency (Table 2)[9].

Table 2: Cross-sector Energy-efficient Technologies

Thermal Efficiency Technology Cross-Sector Opportunities	Electrical Efficiency Technology Cross-Sector Opportunities
Burners and burner controls	Compressed air
Thermal oxidizer upgrades	Motors
Turbulators	Process controls
Direct fired water heating	Pumps
Boiler heat recovery	Fans
Process heat recovery	Lighting
Combined heat and power (CHP)	Refrigeration
HVAC	HVAC

Source: MnTAP

For both technology categories, instituting best practices and upgrading equipment significantly reduces the amount of heat or electricity required to run core processes – without any loss in service or productivity, and in many cases driving productivity increases.

[9] "Energy Conservation Market Analysis: A study to identify energy conservation opportunities for Minnesota's manufacturers." MnTAP, University of Minnesota, Nov. 19, 2010.

What is the Scope of the IEP Manufacturing Sector in the Midwest?

The Midwest is the heart of our country's manufacturing sector. Despite economic contraction and job losses, and only 22 percent of the U.S. population, the region accounted for 30 percent of total U.S. manufacturing value-added activity between 2000 and 2010[10]. IEP is an enormous opportunity for Midwestern manufacturers to continue being the nation's – and the world's – go-to resource for quality, innovative technologies and components. This will translate into greater prosperity and good jobs for Midwest states and communities.

We define the IEP manufacturing sector as follows:

> *Companies in the IEP manufacturing sector are firms that manufacture the equipment and technology – either complete products and systems, or components of products and systems – which are used by large energy-intensive industries to implement IEP practices and improvements.*

Many firms are already manufacuturing and supplying key products for IEP projects. Others are looking to get into the market. To date, there have been no studies specifically quantifying the scope of the IEP manufacturing sector in the Midwest. However, a 2010 report by The Climate Group and the University of Michigan might help to shed some light on the subject. The Climate Group analyzed 250 technologies that had been identified by McKinsey & Company as "low-carbon," to determine in which technologies the Midwest has a competitive manufacturing advantage. Although not all low-carbon technologies are energy-efficient technologies, there is significant overlap. The Climate Group's analysis was based on a review of state-level production data within each of the technologies' NAICS codes, as well as data on annual revenues, payroll and workforce. They identified 15 technologies in four sectors where the Midwest has an advantage. As shown in Table 3, below, four of these technologies (highlighted in green) are clearly IEP technologies and similar to those listed in the previous section.

Table 3: Technologies Where the Midwest has an Advantage

Primary Metals	**Chemicals**
Energy-efficient appliances Energy-efficient HVAC and building systems Public transportation systems Wind turbine components	Amines for carbon capture and storage (CCS) Electrolytes for advanced batteries Energy-efficient building insulation Enzymes for increasing the energy efficiency of industrial processes Photovoltaic (PV) solar cells
Machinery Production	**Automotive**
Biomass boilers Combined heat and power (CHP) systems	Advanced batteries Hybrid powertrains Diesel particulate filters Lightweight vehicles

Source: Adapted from The Climate Group.[11]

10 U.S. Census Bureau

11 "American Innovation: Manufacturing Low-Carbon Technologies in the Midwest," The Climate Group, January 2010.

With all of this information in mind, 16 areas of manufacturing were identified that are related to supporting IEP (see Figure 3).

Figure 3: Industrial Energy Productivity Manufacturing Sector by NAICS Code

NAICS Code	Industry Description	Relation to IEP
332410	Power Boiler and Heat Exchanger Manufacturing	Thermal – CHP and Boiler heat recovery
333411	Air Purification Equipment Manufacturing	Thermal/Electrical – HVAC
333412	Industrial and Commercial Fan and Blower Manufacturing	Electrical – Fans
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	Thermal/Electrical – HVAC
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	Thermal/Electrical – HVAC and Refrigeration
333611	Turbine and Turbine Generator Set Units Manufacturing	Thermal – Turbulators
333612	Speed Changer, Industrial High-Speed Drive and Gear Manufacturing	Electrical – Process controls
333911	Pump and Pumping Equipment Manufacturing	Electrical – Pumps
333912	Air and Gas Compressor Manufacturing	Electrical – Compressed air
333994	Industrial Process Furnace and Oven Manufacturing	Thermal – Process heat recovery
333995	Fluid Power Cylinder and Actuator Manufacturing	Electrical – Motors
333996	Fluid Power Pump and Motor Manufacturing	Electrical – Pumps and Motors
335110	Electric Lamp Bulb and Part Manufacturing	Electrical – Lighting
335122	Commercial, Industrial and Institutional Electric Lighting Fixture Manufacturing	Electrical – Lighting
335312	Motor and Generator Manufacturing	Electrical – Motors
335314	Relay and Industrial Control Manufacturing	Electrical – Process controls

Source: EMSI Complete Employment – 2012.1

The Midwest employs 131,000 people in this industry—one-third of its workforce (see Figure 4)—within 2,200 establishments, representing 30 percent of the total IEP manufacturing sector firms in the nation.[12] The average IEP manufacturing employee earns $76,500 annually.

Figure 4: IEP Manufacturing Sector Comparison

Area	2012 Jobs	2011 Average Earnings	2011 Establishments
Midwest Total	131,889	$76,578	2,297
National Total	397,331	$77,847	7,598

Source: EMSI Complete Employment – 2012.1

Another way to consider the scope of the IEP manufacturing sector is to look at measures that compare industry activity levels among different areas of the country. These measures, "location quotients," are ratios comparing the concentration of the industrial energy efficiency manufacturing sector (or one of its sub-sectors, such as motor and generator manufacturing) in the region to that of the nation.[13] These ratios reveal the degree of state specialization in the sector (or in particular

[12] EMSI Complete Employment – 2012.1.
[13] U.S. Bureau of Labor Statistics.

sub-sectors). If the location quotient for the sector (or particular sub-sector) is between zero and one, the state is less specialized than the national average, while location quotients greater than one reveal greater specialization of the sector (or particular sub-sector) in the state compared to the rest of the country.[14]

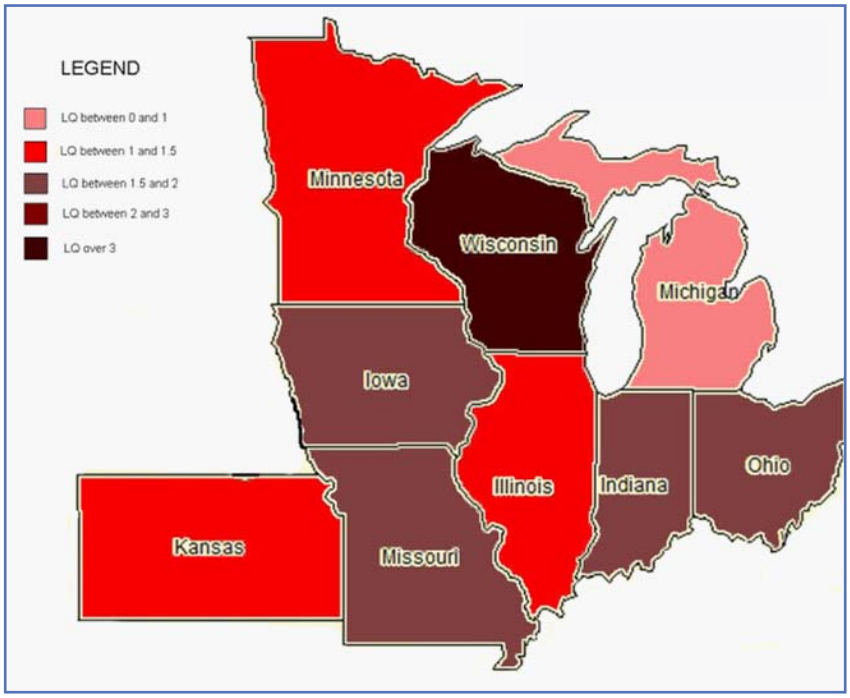
Figure 5: IEP Manufacturing Sector Location Quotients for the Midwest, 2012

State	Location Quotient
Wisconsin	3.25
Iowa	1.88
Ohio	1.77
Missouri	1.62
Indiana	1.59
Minnesota	1.40
Illinois	1.32
Kansas	1.11
Michigan	0.96

Source: EMSI Complete Employment – 2012.1

The Midwest is more specialized than the rest of the nation in the IEP manufacturing sector, with a location quotient of 1.61. Within the region, Wisconsin is the most specialized of the states (see Figure 5 and Map 1) and all of the states are more specialized in this sector than the national average, with the exception of Michigan.

Map 1: IEP Manufacturing Sector Location Quotients (LQ) for MGA Region, 2012



As noted in Figure 6, the region is most specialized in speed changer, industrial high-speed drive and gear manufacturing (2.79) and least specialized in turbine and turbine generator set units manufacturing (0.78).

The air-conditioning, warm air heating and refrigeration equipment manufacturing sector employs more people than any of the other 16 sub-sectors (27,955), while the electric lamp bulb and part manufacturing sector employs the least number of

[14] One D Scorecard.

people (2,627). The relay and industrial control manufacturing sector had the most establishments in the region in 2011 (353), while the electric lamp bulb and part manufacturing sector had the least (50). The relay and industrial control manufacturing sector had the highest average employee earnings in 2011 ($102,215), while air purification equipment manufacturing sector employees earned the least ($54,754).

Figure 6: IEP Manufacturing Employment, Earnings, Establishments and Location Quotient Within the Midwest

Industry	2012 Jobs	2011 Average Earnings	2011 Firms	2012 Location Quotient
Power Boiler and Heat Exchanger Manufacturing	4,462	$85,023	69	0.93
Air Purification Equipment Manufacturing	5,416	$54,754	117	1.54
Industrial and Commercial Fan and Blower Manufacturing	5,491	$63,146	87	2.49
Heating Equipment (except Warm Air Furnaces) Manufacturing	5,097	$61,585	126	1.42
Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	27,955	$64,720	301	1.61
Turbine and Turbine Generator Set Units Manufacturing	4,646	$81,406	62	0.78
Speed Changer, Industrial High-Speed Drive and Gear Manufacturing	7,235	$76,309	144	2.79
Pump and Pumping Equipment Manufacturing	9,968	$86,024	163	1.78
Air and Gas Compressor Manufacturing	5,730	$82,883	110	1.39
Industrial Process Furnace and Oven Manufacturing	4,522	$73,170	154	2.24
Fluid Power Cylinder and Actuator Manufacturing	7,677	$68,591	147	2.27
Fluid Power Pump and Motor Manufacturing	6,293	$90,875	84	1.77
Electric Lamp Bulb and Part Manufacturing	2,627	$83,970	50	1.59
Commercial, Industrial and Institutional Electric Lighting Fixture Manufacturing	4,535	$65,774	109	1.10
Motor and Generator Manufacturing	14,062	$76,788	225	1.84
Relay and Industrial Control Manufacturing	16,174	$102,215	353	1.67
Total	**131,889**	**$76,578**	**2,297**	**1.61**

Source: EMSI Complete Employment – 2012.1

From the sub-sectors noted above, we identified seven core industries in the IEP manufacturing sector to more closely examine specialization within the Midwest states. The seven core industries are: pump manufacturing; motor manufacturing; lighting manufacturing; industrial control manufacturing; HVAC manufacturing; compressor manufacturing; and heat recovery manufacturing.

In pump manufacturing, Illinois (3.39) is most specialized compared to other states in the Midwest (see Figure 6 and Map 2), and seven states are more specialized than the national average. In motor manufacturing, Iowa (4.27) is more specialized, while five other states are more specialized than the national average. In lighting manufacturing, Indiana (2.94) is most specialized, but only four states are more specialized than the national average. Wisconsin (6.99) is more specialized in

industrial control manufacturing than the other states in the Midwest and six other states are more specialized in this industry than the national average.

Figure 7: Location Quotient of Seven Core IEP Manufacturing Sectors, by State

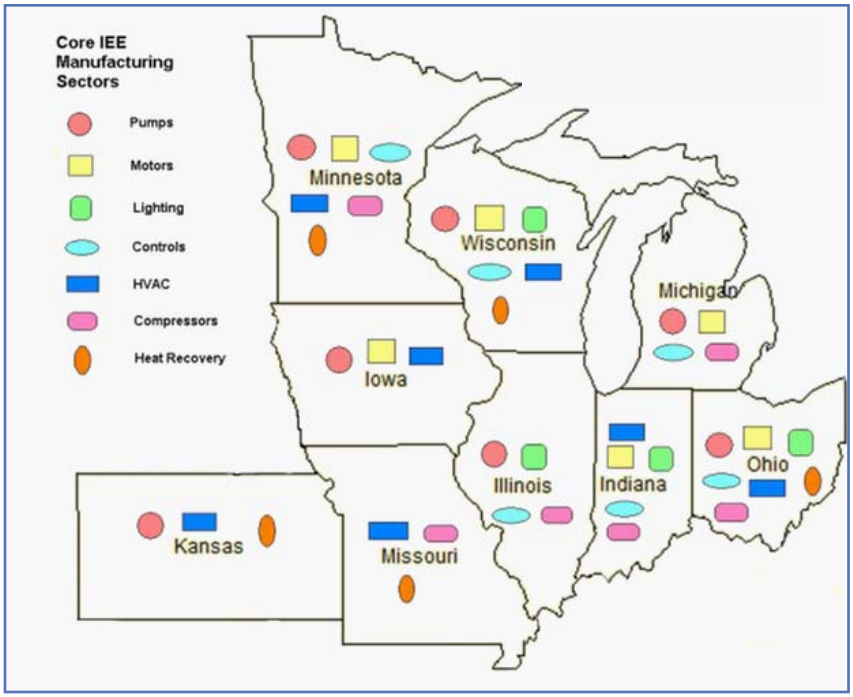
	Illinois	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Ohio	Wisconsin
Pumps	3.39	0.62	1.57	1.60	1.22	2.14	0.17	1.34	2.61
Motors	0.88	1.68	4.27	0.60	1.08	2.05	0.88	1.60	2.63
Lighting	1.28	2.94	0.28	0.56	0.52	0.52	0.63	1.88	1.54
Controls	2.02	1.46	0.53	0.29	1.03	1.09	0.44	2.10	6.99
HVAC	0.81	1.88	2.05	1.77	0.83	1.14	3.55	1.50	2.99
Compressors	1.16	1.81	0.01	0.89	1.08	1.07	1.13	2.75	1.00
Heat Recovery	0.53	0.54	0.61	1.25	0.95	1.24	1.13	2.55	2.78

Source: EMSI Complete Employment – 2012.1

In HVAC manufacturing, Missouri (3.55) is most specialized within the Midwest and seven other states are more specialized than the national average. In compressor manufacturing, Ohio (2.75) is most specialized, while seven states are more specialized than the national average. Wisconsin (2.78) is most specialized in heat recovery manufacturing and five states are more specialized than the national average.

This data illustrates that the Midwest region has a good base of companies within the IEP manufacturing sector, with each state uniquely positioned in different sub-sectors.

Map 2: Specialization of Core IEP Manufacturing Sectors, by State



Profiles of Midwestern Companies in the IEP Manufacturing Sector

ENERCON ENGINEERING: BI-FUEL ENGINE SYSTEMS AND SWITCHGEARS

Headquartered in East Peoria, Illinois, Enercon Engineering is a leader in the design, engineering and manufacturing of custom bi-fuel engine systems and controls and switchgears. Their technology is deployed around the world in both prime power and back-up power applications in mining, landfill, agricultural, health care and military applications. In 2011, Enercon had more than $50 million in sales.

Above and right: Examples of Enercon's bi-fuel technology.

The key to Enercon's success, according to vice president of sales, Cecil Stapley, is the engineering side of the business. "Where other companies make standard off-the-shelf systems, everything we do is custom for very large engine systems with unique operational parameters." For example, 24 percent of the landfill industry uses Enercon's products to control methane gas generators because each system is so uniquely configured that off-the-shelf systems won't get the job done. Retrofitting older switchgear systems is another area of expertise for Enercon. Updated switchgear systems allow large energy users, such as hospitals or research facilities, to both increase the productivity of their energy systems and have reliable, uninterrupted stand-by power for emergency situations.

Above: Testing Enercon switchgear technology.

Enercon also excels in bi-fuel systems for diesel generators running between 1200 rpm and 1800 rpm and which generate one MW or more in power. With over 200 units in operation worldwide, Enercon's bi-fuel systems allow industrial diesel engines to operate on 50 to 75 percent natural gas, propane, bio-fuel or landfill gas. No internal modification to the engines is required, and the bi-fuel system facilitates smooth, automated transition between diesel and bi-fuel, with gas modulation over the entire power range, with no loss of power. By modulating injection of the gaseous fuel into the inlet combustion stream, Enercon's customers typically see substantial fuel

savings, a return-on-investment (ROI) of one to two years and lowered NOx emissions. “A $75,000investment can turn into $2 million in savings in short-order,” Stapley says. When natural gas substitution through a bi-fuel system is used for electricity peak shaving, ROI can be achieved in a month.

Enercon’s future prospects continue to look bright, especially in the retrofit of distributed generation systems based on diesel power. In the U.S. alone, there are two TW (terra-watts) of diesel power currently installed – the majority of which is utilized an average of six hours per month for emergency stand-by power. Enercon believes it has an attractive value proposition – getting industrial customers to convert these systems to bi-fuel, and use them as prime, not back-up, power systems, significantly reducing coal-based energy usage and their overall fuel costs.

The company is privately owned and was founded in 1975 in Chillicothe, Illinois. The company originally moved to East Peoria to be close to Caterpillar, a major customer at the time. Since then, its customer base has diversified to include hundreds of customers around the world – but the company has chosen to keep its headquarters, and 200 of its 300 employees, in central Illinois.

Why have they made this decision? “Two reasons,” says Eric Kells, director of marketing, “geography and workforce. Logistically, we can easily get to anywhere in the country or the world from here. People-wise, we are able to access the region’s strong work ethic, top-notch universities and multi-generational talent-base.” Enercon has had success in hiring multiple members of the same family. At the same time, as competition increases from original equipment manufacturers (OEMs) like Caterpillar and Komatsu, as well as Chinese companies, Enercon sees the critical challenge not in terms of business advantage, but in terms of talent. Kells says they are confident that their custom approach to developing systems will continue to grow in the marketplace. “Where we face hurdles,” Kells says, “is in competing against firms like Caterpillar for top-tier talent, especially from the universities.”

The East Peoria headquarters location has design, engineering, fabrication, manufacturing, testing, sales and marketing capabilities. The company also has facilities in Georgia, Arizona, Singapore and Pakistan.

For more information, visit: www.enercon-eng.com.

GROB SYSTEMS: HIGH EFFICIENCY AUTOMOTIVE PRODUCTION MACHINERY

GROB Systems is a private, German-owned company with U.S. operations in Bluffton, Ohio. GROB manufactures high-volume production equipment such as CNC machines, assembly lines and transfer lines, with a special expertise in machining and assembly of engine components and engines.

"Some European automakers have been constantly developing new engine generations for their vehicles and constantly upgrading their production equipment for decades," according to Ralf Bronnenmeier, chief executive officer. "Other automakers are still using engine designs and production equipment from the early 1990s. The old production systems are mainly using hydraulic motions require enormous amounts of energy to run and are also very limited with regards to flexibility. Our production lines are heavily automated using electronic controls which make them extremely flexible."

Above: GROB automated flexible metal cutting production equipment.

As a result of increased demand for more fuel-efficient vehicles, many OEMs, such as Ford, GM, Harley Davidson and Caterpillar are now using flexible production equipment to produce more fuel-efficient engines and cylinders, and which itself runs more efficiently due to GROB's modern engineering. Bronnenmeier says that GROB's metal cutting machines not only use less electricity to run, many also incorporate dry machining, which removes the need for coolants in metal cutting operations.

"This saves our OEM customers the costs of both the coolant and the disposal of the coolant in their metal cutting operations," Bronnenmeier says. "Beyond cost, removing the coolant from the plant is a positive with regard to environmental, health and safety issues."

In 2011, GROB had $120 million in revenues in the U.S. There are 280 employees at the Bluffton, Ohio facility. The parent company has 2,650 employees in Germany, 550 employees in Brazil and 120 in a newly established facility in China. A new eco-boost engine line at the Ford Lima Engine Plant, in Lima, Ohio is just one example of a recent project deploying GROB's technology.

Bronnenmeier sees a shift in the marketplace for automotive production lines. In the past, car makers wanted dedicated production lines for each engine type. Now, production cycles are shortening and OEMs want production equipment that is flexible and can produce multiple types of engines. "30 years ago, the U.S. was the machine tool capital of the world," Bronnenmeier says. "That industry has been gutted and we are now the only competitor in our segment in the U.S. capable of doing everything in-house." GROB provides integrated engineering, fabrication, manufacturing, assembly, start-up and installation at customers' sites all from its Bluffton location. GROB's competitors manufacture overseas, ship to U.S.-based assembly facilities, then ship to the customer so that the OEM is paying double for shipping of very large assemblies – and expending double the fuel and energy to get them there.

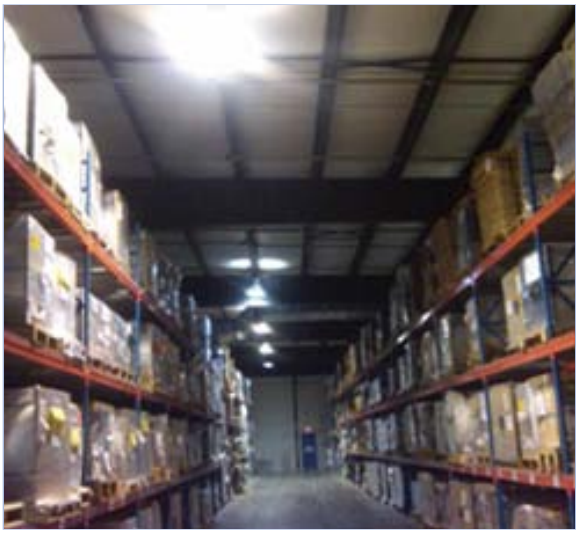
When asked about the competitive advantage of being in the Midwest, Bronnenmeier was unequivocal: "It's the people, the workforce." GROB was founded in 1962 in Munich, Germany.

However, the company soon discovered the restrictions of being in a big city. Therefore, it moved operations to a rural farming community in Bavaria and found that the work ethic of the workforce was a good match with the company's requirements. In 1992, when it was scouting a location for its U.S. operation, it repeated the parent company's workforce strategy by locating in Bluffton, a small rural town about two hour's drive from Detroit and two hours from Cleveland. It recruits directly from high schools in the area, and provides a three-year electrical or mechanical training program that ends with an associate degree that can be used toward a four-year bachelor degree which can be earned with evening classes. According to Bronnenmeier, 80 percent of its managers are graduates of the early generations of the training program.

For more information, visit www.grobgroup.com.

INNOVATIVE LIGHTING, INC. – HIGH EFFICIENCY INDUSTRIAL LEDS AND A SIMPLIFIED LIGHTING INFRASTRUCTURE

Before



After

Despite major competition from multi-national companies like GE, Phillips and Sylvania, as well as a host of Chinese firms, Innovative Lighting, Inc. is holding its own in the increasingly crowded space of high-efficiency lighting. Headquartered forty miles north of Des Moines in Roland, Iowa, Innovative Lighting has been manufacturing high-brightness, high-efficiency LEDs for commercial and industrial applications for almost 20 years with product lines that are particularly suited for warehouse and refrigeration applications. The company also makes LEDs for boats, RVs and trucks.

To founder and CEO Jerry Handsaker, being located in the Midwest has distinct challenges and opportunities. "Our main challenge," he says, "is sourcing some of the parts we use in our end products. Many companies have moved to low-cost, low-quality parts, often from overseas suppliers. We've maintained our focus on quality engineering and there aren't as many sources for what we need in this region." To overcome this, Innovative Lighting invested in two plastic injection molding facilities with a combined 39 standard presses ranging from 22 to 1750 tons. This gives Innovative Lighting the capabilities to produce parts for its LED lines to the specifications it requires, as well as to sell

these capabilities to other companies with injection molding requirements.

However, Handsaker says that the opportunities far outweigh the challenges and that Innovative Lighting is uniquely positioned to capitalize on them. “The opportunity is that there are thousands of warehousing and manufacturing facilities in the Midwest that need to reduce energy consumption and lighting is often the first place they turn,” he says.

Innovative Lighting differentiates itself with its low-voltage Eco-Brite™ LED lighting line and an innovative remote power supply. Industrial customers using Eco-Brite™ have reduced energy usage by an average of 70 to 90 percent by replacing old metal-halide lamps, and they are seeing an average return-on-investment time of one to three years. Eco-Brite™ comes in 12 to 72 inch fixtures and can operate continuously 24 hours a day, seven days a week for up to 90,000 hours. Innovative Lighting’s remote power supply provides added cost savings through reduced materials and labor, and it increases building flexibility by simplifying a facility’s lighting infrastructure. The power supply enables numerous lights to be positioned, moved and operated remotely off a single trunk-line of conduit, versus traditional lighting, which requires a complex and costly grid of conduit in the ceilings and walls. As building use requirements change, facilities can quickly and easily re-configure lighting without the need for a complete re-wire of the building.

In 2011, Innovative Lighting had just under 100 employees and $18 million in revenues selling to both U.S. and international customers. Handsaker expects revenues in 2012 to increase 15 to 20 percent, driven largely by the Eco-Brite™ product line. He also believes that LEDs combining high efficiency and high brightness are still in their infancy, since they have only been available on the market for the past four years. He sees ample opportunity for LED technology to improve and for Innovative Lighting to lead the way.

For more information, visit www.innovativelight.com.

QRDC: EFFICIENT VIBRATING TECHNOLOGY FOR MINING OPERATIONS

QRDC, based in Chaska, Minnesota, has developed machinery that uses miniaturized lead zirconate titanate (PZT) and electromagnetic motors with a closed-loop power management system to vibrate the “live” screening deck at system and/or panel resonance frequencies. This approach is replacing conventional screens that use the brute force of a large electric motor and eccentric-shaft to mechanically shake the entire machine. The Ultra Efficient Vibrating Machine provides fine mineral separations for the mining industry and has applications for the construction, pharmaceutical, agriculture and petroleum industries. Benefits include increased capacity and efficiency; reduced energy consumption of 50 to 70 percent; lowered maintenance costs through elimination of moving parts and the need for lubrication; and improved worker safety.

For more information, visit: www.qrdc.com.*

* [NOTE: The entries on this page and the pages that follow are adapted from “Energy Technology Solutions: Public/Private Partnerships Transforming Industry,” U.S. Department of Energy, December 2010, and from company websites.]

ZBB ENERGY CORPORATION: LOAD LEVELING BATTERIES FOR LARGE ENERGY SYSTEMS

ZBB Energy Corporation, of Menomonee Falls, Wisconsin, produces a zinc-bromine battery (ZBB), which increases load-leveling efficiency and offers longer cycle life with less weight. The system architecture can scale from 25 kW to two MW of grid-connected or grid-independent inverter capacity coupled with solar, wind, fuel cells, or diesel gen-sets, along with 50 kWH to eight MWH of energy storage on a single platform. The system features the unique capability of discharging down to zero voltage without degrading battery life. These features provide continuous and uninterrupted energy delivery for energy utilities and industrial users during peak-power cycles and energy shortages. The battery systems reduce capital expenditure requirements for equipment, installation design and materials, and they lower the total cost of ownership compared with Li-ion and lead-acid batteries due to replacement of individual cell stacks versus whole battery systems.

For more information, visit: www.zbbenergy.com.*

THE TIMKEN COMPANY: MAKING TUBE AND PIPE MANUFACTURING EASIER AND MORE EFFICIENT*

The Timken Company, based in Canton, Ohio, has an enhanced spheroidized annealing process, which makes through-hardened steel tubes and pipes easier to machine and form. The steel is heated to temperatures at which the carbides have the tendency to form spherical shapes. Changing hard, elongated carbide particles to a spherical shape makes the steels easier to form. This process maintains key steel parameters while reducing the annealing cycle times by 20 percent, which also reduces the amount of fuel required in the process. Other benefits include increased productivity due to the reduced cycle time.

For more information, visit: www.timken.com.*

DETROIT STOKER COMPANY: TURNING 500,000 TONS OF INDUSTRIAL WASTE INTO ENERGY EVERY DAY

Detroit Stoker Company, located in Monroe, Michigan, is a leading supplier of stokers and related combustion equipment for the production of steam used in heating, industrial processing and electric power generation around the world. Every day, more than 500,000 tons of biomass and refuse are burned on Detroit stokers, the largest of which produces more than 100 MWe. Many types of biomass and combustible solid waste can be profitably used as fuel. These include bark, wood waste, shavings, sawdust and agricultural wastes such as sugar cane residue (bagasse), coffee refuse, sunflower shells and even poultry litter. These wastes produce insignificant levels of

acid gas when compared to the fossil fuels they replace and are considered carbon dioxide neutral since the carbon dioxide produced is used in the growth cycle of renewable fuel sources. Furthermore, reduction in volume of these wastes minimizes landfill requirements and related disposal costs.

For more information, visit: www.detroitstoker.com.*

Midwestern Governors Association

2025 M Street, NW, Suite 800

Washington, DC 20036

Phone: 202-367-1112

Fax: 202-367-2112

www.midwesterngovernors.org