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Energy Matters

U.S. Department of Energy, Industrial Technologies Program

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by Dean Hutchins, Defense Logistics Agency, and Thornton White, Advanced Technology Institute

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Several years ago, Congress called upon the U.S. Department of Energy (DOE) to help lead the nation toward a clean-energy future by promoting greater strides toward industrial energy efficiency. The trick, however, was to design an approach that would emphasize both the need for and the value of better energy management while still encouraging increased productivity. The solution put forward under section 106 of the *Energy Policy Act of 2005* (Pub. L. No. 109-58, 42 U.S.C. §15811) was to give the Secretary of Energy the directive to reduce industrial energy intensity (energy consumed per unit of production) by 2.5 percent between 2007 and 2016 through voluntary agreements. DOE's Industrial Technologies Program (ITP) embraced this charge and ran with it, setting a goal to reduce industrial energy intensity 25 percent over the next 10 years (*25 in 10*).

Recognizing that the most effective way to achieve that goal would be through the establishment and enhancement of strategic partnerships, ITP is now partnering with industry, utilities, states, universities, and other stakeholders in the newly launched *Save Energy Now* LEADER initiative—a new component of the existing and successful *Save Energy Now* program. Through the basic *Save Energy Now* program, companies nationwide have partnered with DOE to participate in no-cost energy assessments and use ITP tools and training to reduce their energy use and lower their operating costs. Over 2,000 plants received energy assessments under the *Save Energy Now* program from 2006 to 2009.[1] Those assessments yielded $1.3 billion in identified cost savings,[2] 119 trillion Btu (natural gas) in identified energy savings,[3] and 11.2 million metric tons of identified CO_2 savings.[4]

Russ Wanke (Vice President and General Manager, Thilmany Papers) pledges to be a Save Energy Now *LEADER.*

Moving ahead, the *Save Energy Now* LEADER initiative provides an opportunity for forward-thinking companies to make a voluntary commitment to achieve an aggressive 25-percent reduction in energy intensity over 10 years in exchange for priority access to a range of DOE services, including technical assistance, identification of financial incentives, and the provision of high-level public recognition. Participating companies are asked to sign a *Save Energy Now* LEADER Pledge to mark the voluntary commitment.

Midwest Industrial Energy Efficiency Exchange

On September 9–10, Midwest industrial manufacturers with energy efficiency projects joined companies with the resources needed to implement those projects in Detroit, Michigan, to participate in the Midwest Industrial Energy Efficiency Exchange. The Midwest Exchange demonstrated the importance of partnerships on lowering industrial energy intensity in the region.

On September 9, participants heard welcoming remarks from Michigan Governor Jennifer M. Granholm, who discussed the importance of industry in the region. Next, 35 companies received awards for reducing their energy consumption by more than 15 percent (Energy Champions) and 7.5 percent (Energy Savers) after participating in an Energy Savings Assessment. Participants also took part in technology demonstrations from Apogee Technology Inc., Argonne National Laboratory, Caterpillar, Cummins, Energy Industries of Ohio, Gas Technology Institute, Oak Ridge National Laboratory, OG Technologies, Swagelok, and Waukesha.

The next day, industry participants learned of the technical and financial assistance available at local, regional, and national levels, including DOE's Loan Guarantee Program. They also heard from industrial participants who have achieved cost- and energy-savings, as well as industry executives who have made energy efficiency a priority. The crux of the morning sessions was the *Save Energy Now* LEADER Pledge signing event, which included 11 industrial manufacturers from the Midwest. The afternoon brought about a session where panelists discussed how partnering with other companies, such as ITP or Focus on Energy, has helped them make energy-efficiency improvements in their plants and achieve actual energy- and cost-savings. At the same time, industrial manufacturers met with resource providers to gauge how they could work together to improve the energy efficiency of their facilities. Results will be tracked to calculate how many Btus were saved as a direct result of the Midwest Exchange. Data will be released in a later report.

The *Save Energy Now* LEADER program is now up and running with 11 companies[5] having already committed by signing the Pledge at the Midwest Industrial Energy Efficiency Exchange in Detroit, Michigan (see box on previous page), with more companies continuing to sign on as the program moves forward. Demonstrating the positive potential impact of the program, a 25-percent reduction in energy for the 11 businesses that signed up at the Midwest Exchange alone could lead to approximately $3.58 billion in cost savings[6] and the retention of over 46,000 jobs.[7]

The commitments made by *Save Energy Now* LEADER Companies will also help to advance progress toward goals established in the *American Recovery and Reinvestment Act of 2009* by stimulating manufacturing facilities to undertake energy-management projects that reduce energy expenses and free up capital for reinvestment to help create jobs. These same commitments also establish a corporate culture of energy efficiency, yielding cost savings through energy-use reductions, as well as corresponding reductions in carbon emissions. The cost savings translate into job retention, job creation, and increased financial stability for the industrial manufacturing sector—a sector of the economy that has been a mainstay employer for many middle-income Americans.

Interested companies can find more information at the *Save Energy Now* LEADER Web site, http://www.eere.energy.gov/industry/saveenergynow/leader.html, or can e-mail the program at SaveEnergyNow@ee.doe.gov.

Endnotes

[1]U.S. Department of Energy, Energy Efficiency & Renewable Energy, *Save Energy Now* results page, September 16, 2009 update, Source: http://apps1.eere.energy.gov/industry/saveenergynow/partners/results.cfm

[2]U.S. Department of Energy, Energy Efficiency & Renewable Energy, *Save Energy Now* results page, September 16, 2009 update, Source: http://apps1.eere.energy.gov/industry/saveenergynow/partners/results.cfm

[3]U.S. Department of Energy, Energy Efficiency & Renewable Energy, *Save Energy Now* results page, September 16, 2009 update, Source: http://apps1.eere.energy.gov/industry/saveenergynow/partners/results.cfm

[4]U.S. Department of Energy, Energy Efficiency & Renewable Energy, *Save Energy Now* results page, September 16, 2009 update, Source: http://apps1.eere.energy.gov/industry/saveenergynow/partners/results.cfm

[5]Companies that signed the *Save Energy Now* LEADER Pledge at the Midwest Industrial Energy Efficiency Exchange on September 10, 2009 in Detroit, Michigan are 3M (St. Paul, MN), Briggs & Stratton (Wauwatosa, WI), Didion Milling (Johnson Creek, WI), The Dow Chemical Company (Midland, MI), Flambeau River Papers (Park Falls, WI), Manitowoc Grey Iron Foundry (Manitowoc, WI), Owens Corning (Toledo, OH), Quad/Graphics, Incorporated (Sussex, WI), Thilmany Papers (Kaukana, WI), Neenah Foundry (Neenah, WI), and ThyssenKrupp Waupaca (Waupaca, WI).

[6]Energy cost data is gathered directly from the businesses in question when possible. When not possible, that data is calculated by determining annual energy consumption and then extrapolating this energy consumption into an energy cost figure using data from the Energy Information Administration (EIA). Energy cost savings are then calculated by multiplying total annual energy consumption by 25 percent.

[7]Estimating job retention is done by dividing the value of energy savings by the cost to employ one employee within that industry. This is represented by the following: [Jobs Created or Retained = Energy Cost Reduction / Annual Cost of One Employee] The cost of implementing the energy conservation measures is not included because it is not always clear as to who will provide the funding and what other businesses received the benefits of the energy conservation.

Industry leaders from across the Midwest region attended the Midwest Industrial Energy Efficiency Exchange.

Answering the Call

ARRA Spurs Job Creation across Industry

The Industrial Technologies Program (ITP) of the U.S. Department of Energy (DOE) not only leads the national effort to transform U.S. industrial energy use, but also stands poised to answer the call to action set forth by the *American Recovery and Reinvestment Act of 2009* (ARRA). ITP focuses on job creation, the advancement and training of our current workforce, and the development of America's future industrial workforce.

ITP releases approximately $156B in ARRA funds, providing growth and enhancement potential to industry's workforce

In support of ARRA, ITP is not only assisting industry to overcome many of the barriers it often faces when considering energy-efficient improvements, such as capital costs and payback period, but is also encouraging industry to create green-collar jobs. ITP has released approximately $156 billion in ARRA funds; because of this, industry has been able to apply for projects that seek to deploy energy-efficient technologies in areas of combined heat and power (or cogeneration), district energy, waste-energy recovery, and efficient industrial equipment.

Chosen applicants were required to identify the number of new jobs that were created (both directly and indirectly) in relation to Year One of the project, as well as the number of long-term jobs that would result from the project. The net effect of these projects will increase U.S. national energy security, provide near-term job opportunities in the manufacturing and construction industries, and provide long-term job opportunities for those responsible for the operation and maintenance of the new technologies.

Training Infrastructure

ITP already has the necessary training and professional development infrastructure in place to address the widely heralded creation of green-collar jobs. This infrastructure positively impacts the education of the country's current and future workforce. One example is demonstrated through the program's Industrial Assessment Centers (IACs).

As part of the program's *Save Energy Now* Initiative, IACs utilize engineering faculty and university students to provide free-of-cost energy, waste, and productivity assessments for small- to medium-sized manufacturers across the country. This program has the added benefit of exposing and training graduate and undergraduate students in industrial assessment and energy system management techniques and often results in IAC graduates pursuing careers related to energy efficiency. Table 3 details the number of IAC students who participated in and departed the program from fiscal year 2004 through 2008. Figure 1 illustrates the various fields that graduates entered after departing the program.

These assessments serve as an example of how investments made in energy efficiency are creating a new class of green jobs, in addition to reducing industrial energy intensity and lowering carbon emissions.

How to Get Involved

ITP offers system-wide and component-specific training and education programs on corporate energy management, plant management, and technical activities to help enable U.S. industry to run its facilities more efficiently. ITP-sponsored training is offered throughout the year and around the country.

Sources

"Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste Energy Recovery Systems, and Efficient Industrial Equipment." This document describes DOE funding announcement " Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste Energy Recovery Systems, and Efficient Industrial Equipment DE-FOA-0000044." http://www1.eere.energy.gov/industry/pdfs/de-foa-00000044_chp.pdf.

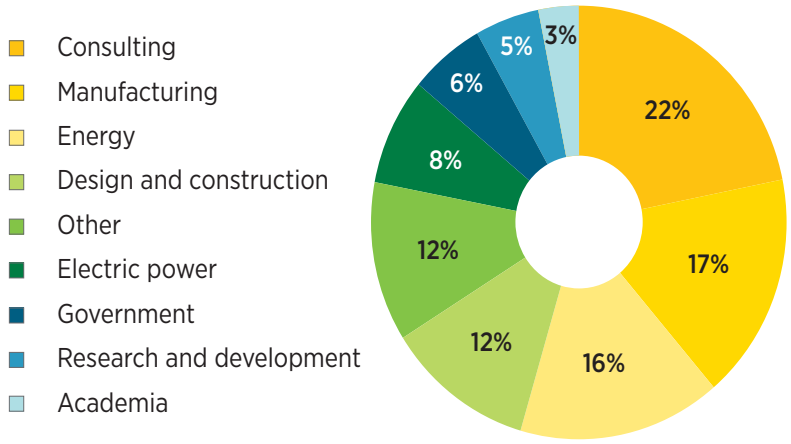
IAC Forum. http://www.iacforum.org/iac/metrics.jsp.

Table 1. Assessments Completed and Program Participation by Fiscal Year

	Number of Assessments Completed	Participating Students
FY 2004	76	423
FY 2005	60	403
FY 2006	75	339
FY 2007	60	296
FY 2008	64	255
FY 2009 (to date)	59	224

Source: IAC Forum. http://www.iacforum.org/iac/metrics.jsp.

Figure 1. Professional Affiliation of Students with Jobs or Job Offers upon Departure



Metalcasting Solutions for Warfighter Readiness

Contributed by Dean Hutchins, Program Manager, Defense Logistics Agency, and Thornton White, American Metalcasting Consortium Program Manager, Advanced Technology Institute

Metalcastings are integral to the readiness and performance of every Department of Defense (DOD) weapon system. Because many of the weapons systems currently in place were introduced into service many years ago, the Defense Logistics Agency (DLA) and its supply centers have been facing numerous challenges in procuring castings to support the aging—yet capable and widely-used—military systems. Contributing factors such as old technical data, broken supply chains, the inability to know whether an assembly contained a casting, diminishing sources, procurement in small lots, and lost tooling have resulted in long production lead times, high costs, and poor quality, affecting the Defense Supply Centers' ability to effectively procure cast repair parts for fielded weapon systems.

The American Metalcasting Consortium (AMC) proposed solutions to DLA that included developing and applying innovative technologies and new processes for the procurement, manufacture, and design of castings. Implementing these proposed solutions would enable DLA to provide rapid support of cast spare parts to the armed forces. AMC's strategic direction is to ensure a reliable casting supply chain that will rapidly provide high-quality, cost-effective cast parts to DLA for aging weapon systems.

AMC and its participating industry, government, and academic partners represent every facet of the casting procurement supply chain. AMC combines the best and brightest minds from the metalcasting industry, its technical associations, and leading metalcasting research universities to support DLA's objectives of procuring cost-effective spare parts on time and with increased reliability.

Government

DLA supplies America's military services with the critical resources needed to accomplish their mission. They manage the AMC partnership effort among the supply centers, selected DOD sites, industry, and research universities to ensure best-value solutions in cast replacement parts for America's warfighter.

Industry

The four leading metalcasting industry associations—the American Foundry Society, North American Die Casting Association, Non-Ferrous Founders' Society, and Steel Founders' Society of America—and their member foundries strengthen the casting supply chain by ensuring that AMC research is relevant and that the resulting technology breakthroughs are quickly implemented industrywide. A team of casting engineers is providing direct technical and procurement support to DLA's supply centers. The Advanced Technology Institute, a recognized leader in applied research and commercialization, provides program management of AMC.

Universities

America's premier metalcasting research universities are developing new technologies that will produce high-quality, cost-effective metalcastings while reducing the overall administrative and procurement lead times for replacement parts in older weapons, as well as new parts for developing weapon systems.

AMC's Castings for Improved Readiness Program *is sponsored by the Defense Logistics Agency, Ft. Belvoir, Virginia.*

AMC's Castings for Improved Defense Readiness Program *is sponsored by the Armaments Research and Development Engineering Center, Picatinny, New Jersey, and by Benet Laboratories, Watervliet, New York.*

For more information*, contact Thornton White, AMC Program Manager, at whitet@aticorp.org.*

Highlights of AMC's Research Efforts

- **Improved Casting-Procurement Processes**: Implemented at DLA's Defense Supply Centers, these improved casting-procurement processes eliminate the need for unnecessary engineering support requests
- **Linking Solicitations to Existing Tooling and Capable Foundries**: Reduces costs by an average of 13% and lead times by an average of 12 weeks from the previous procurement
- **Digital Reference Image Standards for Aluminum and Steel Castings**: Reduces inspection costs and times by up to 50%
- **Rapid Tooling Technology**: Reduces tooling manufacturing time by up to 75%, in addition to outperforming traditional tooling by 500%
- **Modeling and Simulation**: Improves performance and reduces weight time (up to 30%) and design time (up to 75%)
- **Casting Conversions**: Designed for performance and production improvements
- **High-Performance Cast Steels**: Cost-effective replacement of titanium
- **New Heat-Treatment Processes and Materials for Steel Welds**: Improves corrosion resistance by more than 80%
- **Continuous One-Step Process for Metal Matrix Composites**: Reduces weight and improves wear resistance and ballistic performance.

Waxman-Markey Calls for Innovative Industry Solutions

On June 26, 2009, the U.S. House of Representatives passed H.R. 2454, otherwise known as the *American Clean Energy and Security Act of 2009* or the Waxman-Markey bill. Although significant changes could be made to H.R. 2454 before it clears the Senate and becomes law, the current version of the bill will significantly impact industrial sectors across the United States. Title III of the bill, designated "Reducing Global Warming Pollution," will likely have the greatest influence in shifting the industrial sector's behavior away from "business as usual."

Emissions Regulations and Targets

Title III will compel heavy emitters of greenhouse gasses (GHGs) to reduce their emissions. The list of regulated GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). The bill will directly regulate electricity generators, natural gas distribution companies, petroleum producers and importers, large industrial businesses (defined as those that qualify for an ITP Energy-Saving Assessment by consuming more than 300 billion Btu annually; e.g., chemical manufacturers, aluminum smelters, carpet and flooring manufacturers, small engine manufacturers, and paper mills) with high emissions (more than 25,000 metric tons per year—equivalent to the annual emissions from the energy consumed in 12,000 homes), and other specific GHG emitters.

Emissions regulations will be facilitated through a cap-and-trade system. The cap-and-trade model provides the total pool of GHG emitters with a set number of credits that corresponds to a certain level of emissions. These credits will be divided among the GHG emitters and are to be used to cover any GHG emissions.

GHG emitters who are able to cost-effectively reduce their emissions, leaving them with extra credits remaining after

covering all of their own emissions, will be permitted to sell those extra credits to emitters who were not able to cost-effectively reduce their own GHG emissions and do not have enough credits. There will be a regulated market for these credits that will set the price. GHG emitters who do not have enough credits to cover their emissions will be fined for emissions over the credits possessed. H.R. 2454 seeks to cut national GHG emissions through cap-and-trade to 3 percent below 2005 levels in 2012 and 83 percent below 2005 levels in 2050.

Industrial Sector Allowances

Of the listed GHGs, CO_2, an emissions byproduct of burning fossil fuels, will be the most costly to the industrial sector due to the high levels of energy consumption by many industrial businesses. The vast majority of industrial businesses, however, will not be directly regulated. They will instead feel the impact of the bill as CO_2-emissions-regulated energy suppliers pass the cost of regulation through to their industrial customers.

Due to the large impact of H.R. 2454 on industrial businesses, Congress built in a relief valve to help the businesses that would be disproportionately hampered by this bill. Crucial energy-intensive and trade-exposed businesses will be given emissions allowances that will help them stay in business during the near-term and provide them with the time needed to update their processes and technologies in order to better cope with GHG regulation. Allowances will be given to businesses within eligible industries based on the amount of goods they produce. These allowances can be sold on the GHG emissions market to cover the cost of higher-priced energy and energy-efficiency upgrades.

One of the most important goals of providing the allowances is to prevent carbon leakage, thus protecting U.S. businesses and jobs from being taken by foreign countries. Carbon leakage occurs when carbon regulations in one region force energy-intensive businesses to move to other regions where there are fewer or no carbon regulations. In addition to forcing businesses from the region, carbon leakage does not reduce global carbon emissions because the same level of emissions is resulting from the businesses' new locations. Although protecting U.S. businesses and jobs from being forced out of the country is an important goal of providing allowances to energy- and trade-intensive industries, other aims of providing allowances include helping businesses innovate to reduce energy consumption and invest in energy-efficient technologies.

Determining Allowance Eligibility

For an industrial sector to be eligible for emissions allowances it must pass either the standard energy-intensity or GHG-intensity test, as well as the trade-intensity test.

Standard Energy-Intensity Test:
Energy Expenditures / Value of Product Shipments ≥ 5%

Standard GHG-Intensity Test:
20 x Tons of CO2-equalivent GHG / Value of Product Shipments ≥ 5%

Trade-Intensity Test:
(Value of Imports + Value of Exports) / (Value of Imports + Value of Product Shipments) ≥ 15%

For highly energy- or GHG-intensive industries, industrial sectors can also qualify for eligibility if either their energy- or GHG-intensity is greater than 20 percent, regardless of their trade intensity.

Providing Allowances

Allowances will be provided to businesses within industrial sectors, given the sector in which they belong meets certain eligibility criteria regarding energy intensity, GHG intensity, and trade intensity. An industry is eligible for allowances if it is proven to be energy- or GHG-intensive and trade intensive. The standard energy- and GHG-intensity threshold for allowances is 5 percent, while the threshold for trade intensity is 15 percent. Additionally, an industry can also qualify for allowances if it has either an energy- or GHG-intensity over 20 percent. See box (left) for information on calculating energy, GHG, and trade intensities.

Table 1 displays information on various industries—specifically, their energy intensity, trade intensity, and whether or not they were eligible for rebate—based upon data from 2007. GHG intensities are not included in this table because of insufficient data.

A list of all eligible industries will be provided to industry no later than June 30, 2011. Additionally, subindustries within ineligible industries will have a chance to prove that they are eligible for allowances. Updates to the list will first occur by February 2013 and then once every four years thereafter. As industries become more or less energy-, GHG-, and trade-intensive, they will be added or removed from the list.

To ensure that industries do not simply maintain their status quo operations in order to remain eligible, the benefits of being on the list begin to decline in 2026. For instance, in 2026, industries will be allocated 90 percent of previous allowances. Each subsequent year, the allocation drops by 10 percent until it bottoms out in

2035. This structure allows businesses the time to improve their energy efficiency and trade vulnerability and to reduce their GHG emissions before fully feeling the impact of legislation.

Moving Ahead

The next step in the process is for the Senate to hold a hearing for H.R. 2454. On July 7, 2009, the bill was placed on the Senate General Orders calendar as Order Number 97. The final impact on the industrial sector depends on whether or not the Senate passes the bill, and what changes are made to H.R. 2454 if it passes. At this point, the outcome is only up to speculation.

If the bill does pass and looks similar to what was approved by the House of Representatives, there will certainly be significant changes ahead for all U.S. citizens in regard to how energy is produced and consumed. The U.S. industrial sector will also be required to change its operations practices and move toward more efficient uses of energy to stay competitive both domestically and globally. In the near-term, allowances will be made for energy-intensive industries; in the long-term, however, all industries will have to innovate and develop novel solutions to energy-consumption challenges.

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U.S. Senate, Calendar of Business, September 9, 2009. www.gpoaccess.gov/calendars/senate/index.html.

Table 1. Allowance Eligibility, by Industry

Industry	Energy Intensity	Trade Intensity	Eligible for Rebate
Breakfast Cereal Manufacturing	2%	12%	No
Sawmills	3%	32%	No
Plastic Bottle Manufacturing	4%	10%	No
Glass Container Manufacturing	14%	20%	Yes
Iron and Steel Mills	6%	32%	Yes
Primary Aluminum Production	20%	62%	Yes
Iron Foundries	6%	15%	Yes
Electronic Computer Manufacturing	0%	57%	No
Automobile Manufacturing	0%	78%	No
Aircraft Manufacturing	0%	67%	No

Sources: U.S. Census Bureau, 2007 Economic Census (July 2009), www.census.gov/econ/census07/*; U.S. International Trade Commission, DataWeb, (April 2009),* http://dataweb.usitc.gov/*; and Library of Congress, H.R. 2454:* American Clean Energy and Security Act of 2009 *(Engrossed as Agreed to or Passed by House; June 2009),* www.thomas.gov.

Success in Industry

Frito-Lay Goes off the Grid Thanks to New Energy-Efficient Technology

The Frito-Lay manufacturing facility in Killingly, Connecticut, has officially unplugged itself from the Northeast power grid, thanks to the installation of a state-of-the-art combined heat and power (CHP) co-generation system. This new system allows the plant to generate its own electric power, providing almost 100 percent of the plant's electricity requirements. To make the most out of the new system, the facility will also convert the waste heat generated on site into steam, helping Frito-Lay manufacture its snack products onsite. The implementation of this new system not only provides relief to the Northeast by reducing the significant load on the heavily congested regional power grid, but also helps the site lessen its environmental footprint by reducing its carbon dioxide and nitrous oxide emissions, which contribute to greenhouse gases.

The proven benefits resulting from the launch of the new CHP co-generation system at the Frito-Lay facility are an important step toward investing in sustainable business practices and transforming the way in which U.S. industry uses energy. This new system has the potential to help U.S. industry achieve a sustainable future by enabling other plants to become more energy-efficient and minimize their environmental impact.

The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy cofunded the in-field demonstration programs of the CHP applications through the Industrial Technologies Program. The official ribbon-cutting ceremony for the CHP project took place on August 12, 2009, while the 12-month data-evaluation period began on May 1, 2009. Full operation of the CHP system was achieved during the week of March 23, 2009. Gains from this project will be reported in a future issue.

New Energy-Efficient Process Helps Revitalize Small Minnesota Town

Hoyt Lakes, Minnesota, is a small, quiet community where everyone knows one another. That close-knit feel made it particularly difficult when the nearby LTV Steel Mining Company shut down in 2001, putting over 1,400 people from the region out of work. The town's fortune changed for the better, however, when the new, innovative, and highly energy-efficient Ironmaking Technology Mark Three (or ITmk3®) process was developed by Kobe Steel, Ltd. The development of this new process paved the way for a series of investments and projects that are now providing hope for the small town.

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A pilot-scale operation of the new process, supported by the U.S. Department of Energy's Industrial Technologies Program, proved its technical and commercial viability, resulting in a decision by Steel Dynamics, Inc. to build its new Mesabi Nugget ironmaking plant in Hoyt Lakes. Construction of the new plant began in January 2007 and is expected to be completed in the fall of 2009. The project has created work for approximately 500 construction workers and will also provide permanent jobs to about 65 workers when the plant is completed.

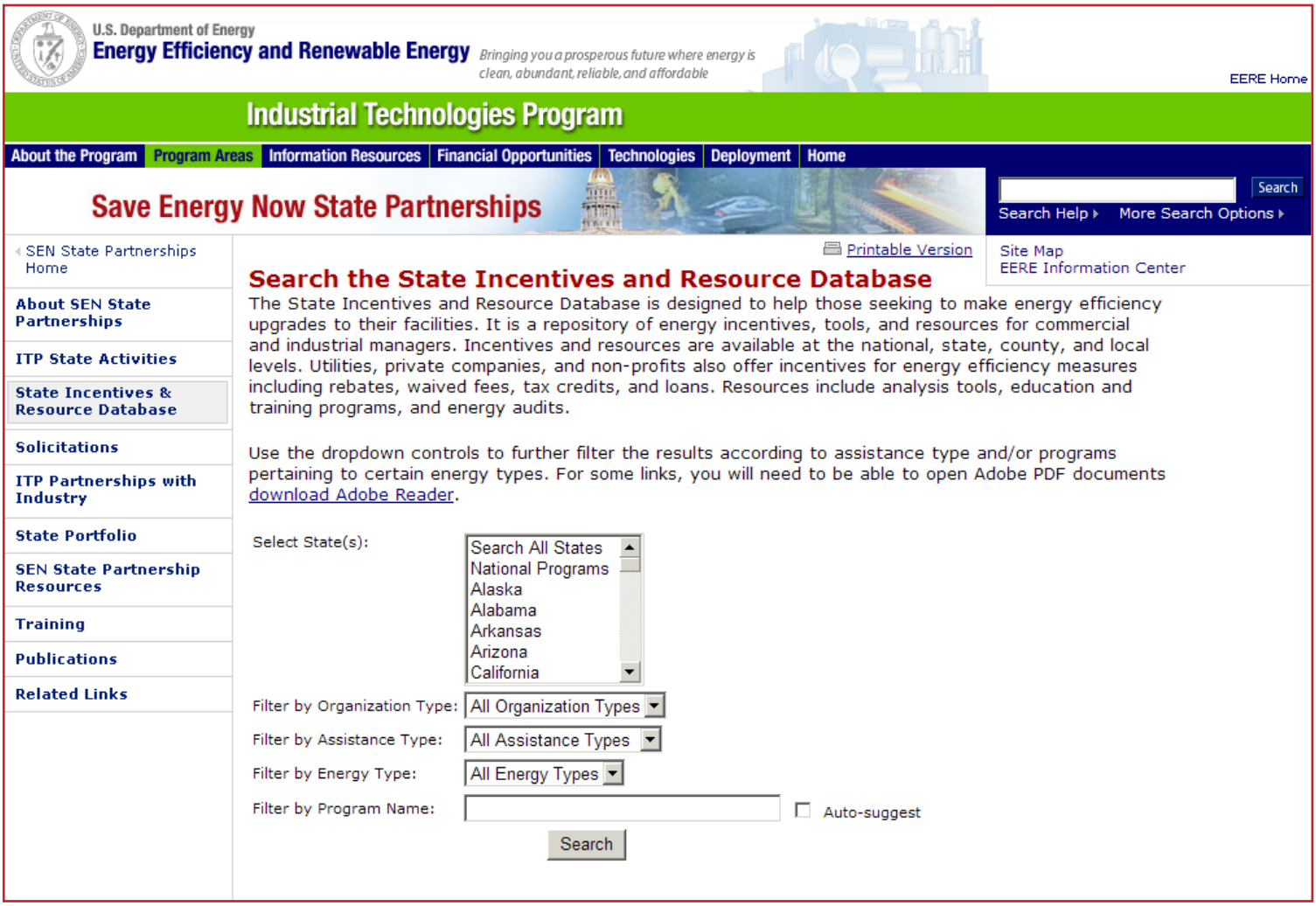
The new approach of the ITmk3® process has the potential to revolutionize ironmaking by utilizing methods that consume 30 percent less energy than those of blast furnaces. A remarkable benefit of this new energy-efficient process can be seen with the large amount of time saved in the critical iron-making stages of reduction, melting, and slag removal, which now occur in only 10 minutes, as opposed to hours when using the traditional blast-furnace process. Additionally, this method significantly reduces the amount of process-associated pollutants and greenhouse gas emissions, helping to tackle the problem of climate change.

States & Utilities Corner

Access to Financial and Technical Energy-Efficiency Assistance *In Your State*

In 2008, the Industrial Technologies Program (ITP) developed the State Incentives and Resource Database (depicted below)—a comprehensive state-by-state database that contains links to information on the financial and technical incentive programs offered to help improve the energy efficiency of commercial and industrial operations. The database is searchable by state, assistance type, energy type, organization type, and program name, and is updated biannually to ensure that new programs are added, old information is deleted, and Web site links are updated.

As of August 2009, the database holds 2,759 resource entries offered by local utilities, states, and nonprofit groups that can be utilized by commercial and industrial sectors. To learn more about the database and to find technical and financial resources for reducing your energy use, visit http://www1.eere.energy.gov/industry/states/state_activities/incentive_search.asp.



Industrial Activities *In Your State*

The Industrial Technologies Program (ITP) Partnership Development & Deployment Team is engaged in outreach, support, and collaboration on industrial energy efficiency with each of the 50 states.

State Activities Web pages were developed by ITP to offer the public easy access to the industrial profile of each state, including information on relevant industrial, economic, and energy indicators. For ease of use, the site includes interactive maps that illustrate where ITP assessments, trainings, and technology projects have taken place across each state. Clicking on the informational links provides details about each project and its results. The site also provides contact points within each state for local energy-efficiency resource and assessment centers, as well as experts.

This information and data is valuable to ITP, its partners, and the general public for identifying potential project allies, learning about new technology deployment in your state, or contacting a local assessment center to learn more about getting a trained professional to conduct an assessment in your plant. The site also ranks the states based on population, gross domestic product, and energy consumption.

Visit the State Activities site to see a snapshot of your state's industrial profile.

Tools of the Trade

INDEED

Industry Expresses Need for Resources; ITP Delivers

The Industrial Energy Efficiency Directory (INDEED) Web site is designed as a publicly accessible resource that delivers energy-efficient technology and process options to industry. The INDEED concept stems from needs expressed by industry to create a repository of commercially available equipment and systems that best achieves energy efficiency within industrial facilities and that accelerates the deployment of these technologies and systems. INDEED provides key information that plant managers need for deciding which technologies meet the energy efficiency goals obtained from the installation and use of new equipment.

The INDEED Concept

The objective of the INDEED Web site is to provide plant managers with useful resources information for assessing their energy efficiency needs and offer valuable solutions. INDEED comprises four interactive areas—an equipment directory, case study directory, software tools page, and blog forum—as well as a helpful list of resources and a collection of useful links.

To maximize the success of INDEED, ITP has designed the site to appeal primarily to companies/plant managers. Companies/plant managers will access INDEED in search of energy-savings options and will discover information on new technologies and

BestPractice options while there. Moreover, they will be able to share their opinions on a case study or experience with a specific technology via the blog forum, allowing others to learn and benefit from such discussions.

Provided below are brief descriptions of INDEED's interactive areas:

- **Equipment Directory**: The equipment directory provides users with access to a market directory of energy-efficient technologies, their projected energy savings and carbon dioxide emissions reduction, and manufacturing and installation information.
- **Case Study Directory**: The case study directory provides industry with access to success stories of efficiency-improvement projects and energy savings that have been implemented by companies across various industries.
- **Software Tools**: The software tools page provides users with access to tools that can help identify energy- and emission-reduction opportunities at their industrial facilities. Links for obtaining these free software tools are provided as well.
- **Blog Forum**: The blog forum enables users to discuss industry-related energy efficiency topics, learn about and share tips on managing energy at industrial facilities, and share guidelines on energy-efficient implementation. Users have the ability to suggest energy efficiency topics and contribute to the forum discussions.

In addition to these features, INDEED offers a **Resources** page, which directs users toward financial and technical resources and education and training programs, and a **Links** repository, which provides users with a collection of useful Web sites from which they can obtain additional information on various federal agencies, energy organizations, and industrial organizations.

The following groups will reap the benefits of INDEED's many features:

- Companies/plant managers/energy managers
- Users seeking data on the commercially available equipment and systems that can best achieve energy efficiency, reduce energy intensity, and maximize return on investment
- Facilities that could benefit from equipment location and installation information, as well as from the blog forum for discussions on project financing and energy efficiency implementation
- Individuals, various consortia, and associations interested in ITP programs and initiatives, energy-efficient-technology options, technology-deployment information and models, and industry case studies.

The INDEED Web site performs the following functions:

- Encourages discussion on industrial topics and preeminent equipment and systems that are commercially available
- Facilitates access to energy-efficient technology implementation, technical and financing opportunities, and a directory of equipment
- Results in the deployment of the best energy-efficient options available to industry.

See what's new with INDEED at http://www.indeed.govtools.us/.

Research & Development

Paving the Way for Nanotechnology

Nanotechnology can be described as the identification and/or development of materials with specific properties on the nanoscale (less than 100 nanometers). These materials are then produced as scaled-up bulk materials or are integrated into existing or new products such that the sought properties remain on the macroscale. Nanotechnology has been and remains a basic science problem, identifying useful and new nanoscale properties. However, in the last two decades, the basic concepts and research have been developed into industrial and other commercial applications. With these developments come new requirements to refine more properties to greater extents, integrate them into more existing and new products, and to identify further areas for development and exploitation.

Examples of Industrial Uses for Nanotechnology

- Coatings and binders for improving the strength- and wear-resistance in engine parts or breaks in automotive applications
- Conductors (liquids or solids) and insulators for low-weight high-energy-density batteries or hydrogen fuel cell applications
- Conductors for heat dissipation in electronics, or heat capture and conversion for industrial energy-efficiency improvement
- Selective, adaptive bonding materials for use in packaging
- Inks and display technology for electronics
- Structural materials (high-strength low-weight) for wind power components.

With their commercial applications come related health, environmental, and regulatory concerns. Due to their extremely small size, nanomaterials have a propensity to migrate from their original application. Thus, there are concerns about

ingesting or absorbing these materials, as well as what effect they will have on plant and animal life. With such a wide variety of products and applications, the health and environmental issues cannot be universally and finally resolved. Problems, however, can be identified and combated before they grow large enough to threaten the industry and present investment with careful planning that includes continued study of the potential problems, flexibility in products and business decisions, and risk management. As in any area of new development and regulation, a stable, predictable landscape is generally preferred to encourage continued investment.

The following regulatory and accreditation schemes are being developed in response to questions that remain over unknown, undiscovered, adverse impacts of nanotechnology:

- The U.S. Environmental Protection Agency has issued recommendations (though no requirements) for reducing the risks associated with nanotechnology
- The United States will develop regulations, which are likely more than five years away
- Businesses and associations are proactively developing accreditation schemes to avoid and prevent any bad actions
- The European Union is developing regulations applicable to nanomaterials, such as the *Registration, Evaluation, Authorisation and Restriction of Chemicals* regulation (2006).

In the last couple of years, nanotechnology was predicted to see large increases in domestic and international investment, many-fold increases in market size, and uncounted new business opportunities. The economic downturn has affected the industry, reducing its predicted growth to simply sizeable amounts. Due to the large number of applications spanning multiple industries and the large upside to nanotechnology developments, the area's potential is just as strong as any other emerging, developing technology. Currently, the crucial business decisions include the questions of where and how much to invest limited research and development resources across a growing list of promising applications and discoveries. In June 2007, the U.S. Department of Energy's (DOE's) Industrial Technologies Program (ITP) hosted a workshop where industry experts, scientists, and engineers gathered to review research and development and business developments in nanotechnology to decide which would provide the greatest energy efficiency and productivity improvements in the next 5 to 10 years.

The following areas were considered to be worth the most investment and focus:

- **Catalysis**: Catalysis is key to the chemicals, petroleum, and refining industries. Its benefits include lower-temperature reactions and reduction of byproducts, which saves energy and reduces emissions and other wastes
- **Coatings**: Coatings are low-friction, low-drag, and self-lubricating surfaces that have potential in many industries, including construction, mining, manufacturing, and automobiles
- **Lightweight Materials**: The addition of nanomaterials can maintain or reduce weight, while maintaining key properties like strength and durability
- **Material Modification**: These developments enhance a variety of properties, including ultrahardness and wear-resistance
- **Separations**: Applicable to a wide variety of industries, separations will provide an alternative to water- and energy-intense distillation and evaporative processes
- **Thermal Management**: Thermal management has the potential to provide superior heat-transfer fluids, substrates and coatings, or a flip-side of low-conductivity materials as barriers or in other applications
- **Thin Films**: Thin films provide a variety of flexible, low-weight heat-recovery (e.g., thermoelectric) or energy-storage applications.

In addition to the performance improvements, the development of new products and markets, and the related competitive advantages from these, the workshop generated a calculation of annual energy savings estimated at more than 1.0 quadrillion Btus from the application of nanotechnology in the chemicals, refining, and forest products industries.

ITP—through its Nanomanufacturing platform—and DOE's Office of Science—through its Materials Science platform—offer solicitations and other joint funding opportunities.

Additional Readings on Nanotechnology

Nanomanufacturing for Energy Efficiency, Workshop Report (ITP, December 2007)

Estimated Energy Savings and Financial Impacts of Nanomaterials by Design on Selected Applications in the Chemical Industry (Los Alamos National Laboratory, 2006)

The Nanotech Report (Lux Research, 2006)

International Nanotechnology Development in 2003: Country, Institution, and Technology Field Analysis Based on USPTO Patent Database (National Science Foundation, 2004)

Chemical Industry R&D Roadmap for Nanomaterials by Design (Chemical Industry Vision2020 Technology Partnership / Energetics, 2003)

Markets & Trends

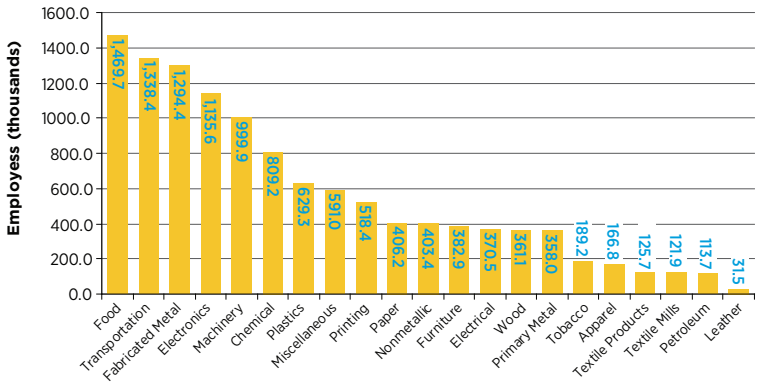
Industry Trends

The following sections detail current trends in the industrial sector with regard to workforce, energy intensity, and carbon pricing.

Workforce

Examining the workforce data provided by the Bureau of Labor Statistics, Figure 1 shows the manufacturing industries (in decreasing order) by total number of employees, as of the third quarter of 2009.

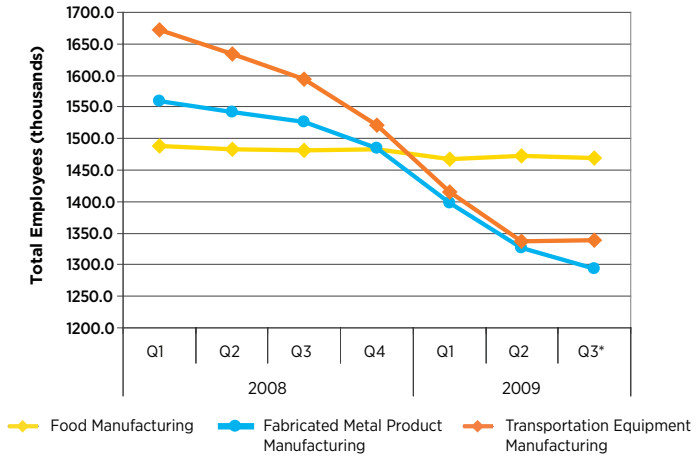
Figure 1. Manufacturing Industries by Total Employees (Q3* 2009)



*Q3 2009 data based on July numbers only.

Since the fourth quarter of 2008, the Transportation Equipment Manufacturing and Fabricated Metal Product Manufacturing sectors have lost enough employees to be surpassed by the Food Manufacturing sector (see Figure 2).

Figure 2. Total Employees, Selected Industries



*Q3 2009 data based on July numbers only.

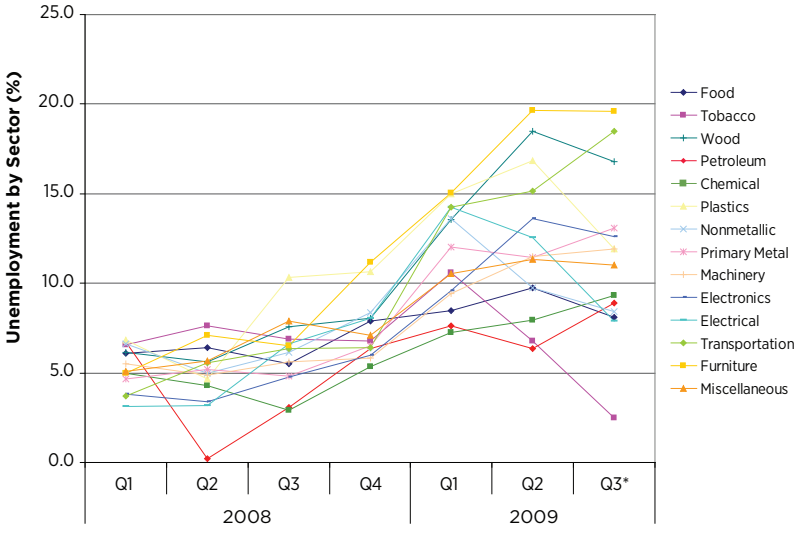
Examining the unemployment rate over the same period, the average industry wide increased from 5.4 percent to 11.5 percent. The Furniture and Related Product Manufacturing, Transportation Equipment Manufacturing, and Wood Product Manufacturing sectors have seen double digit increases in unemployment, while the Beverage and Tobacco Product Manufacturing has seen a decrease in unemployment of more than four percent (see Table 1 and Figure 3).

Table 1. Change in Unemployment (Q1 2008–Q3 2009*)

Transportation	14.8%	Plastics	5.1%
Furniture	14.6%	Electrical	4.8%
Wood	10.7%	Chemical	4.3%
Electronics	8.8%	Petroleum	2.2%
Primary Metal	8.4%	Food	2.0%
Machinery	6.4%	Nonmetallic	1.8%
Miscellaneous	5.9%	Tobacco	-4.1%

*Q3 2009 data based on July numbers only.

Figure 3. Manufacturing Industries Unemployment



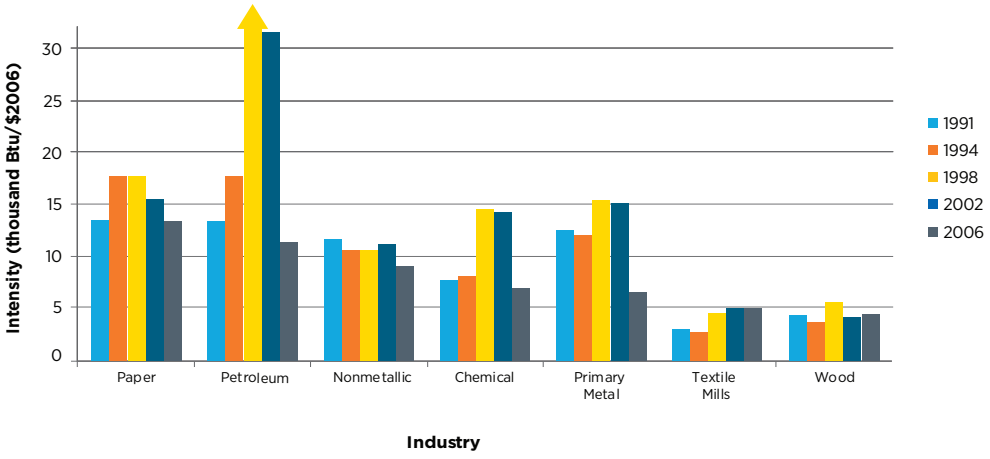
*Q3 2009 data based on July numbers only.

Energy Intensity

Energy intensity for a given industry, as reported by the Energy Information Administration, is calculated based on the total consumption of energy in Btus divided by the total value of shipments (in 2006 U.S. dollars). The *Manufacturing Energy Consumption Survey* (MECS) provides the basis for these calculations. Prior to 1994, the MECS was carried out every three years and the industry categories were based on the Standard Industrial Classification System. Beginning in 1998, the MECS was carried out every four years and has been based on the North American Industry Classification System. While the crosswalk of sectors between the two classification systems is not 1:1, the trends presented here are roughly approximate. The value-of-shipments data is still being compiled for the 2006 MECS and resulting energy-intensity data will be presented when it becomes available.

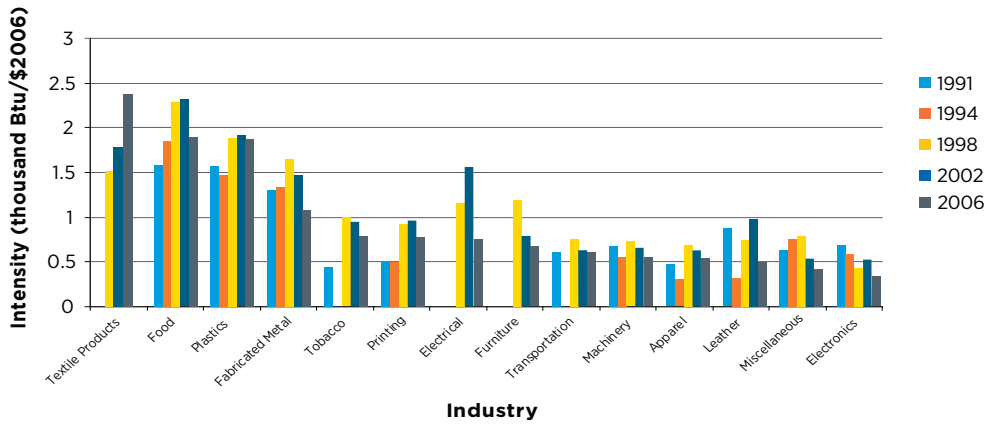
Most industries showed an increase in energy intensity from the 1991 and 1994 surveys to the 1998 survey. The majority of the highest-intensity industries (petroleum, paper, primary metal, chemical, and wood products) decreased their energy intensity between the 1998 and 2002 surveys, as did half of the lowest-intensity industries (fabricated metal, tobacco, furniture, machinery, transportation, apparel, and miscellaneous). Textile mills, food, plastics, textile products, electrical, leather, printing, and electronics all showed an increase between the 1998 and 2002 surveys.

Figure 4. Most Energy-Intense Industries



*2006 data is based off of value of shipments from 2007 Economic Census, the remaining data is from MECS.

Figure 5. Least Energy-Intense Industries



*2006 data is based off of value of shipments from 2007 Economic Census, the remaining data is from MECS.

Price of Carbon

The price of carbon, or carbon emissions, is often given as the price per metric ton of carbon dioxide. The data presented here is provided by the Chicago Climate Exchange, which reported an initial value of $0.98 per metric ton on December 13, 2003.

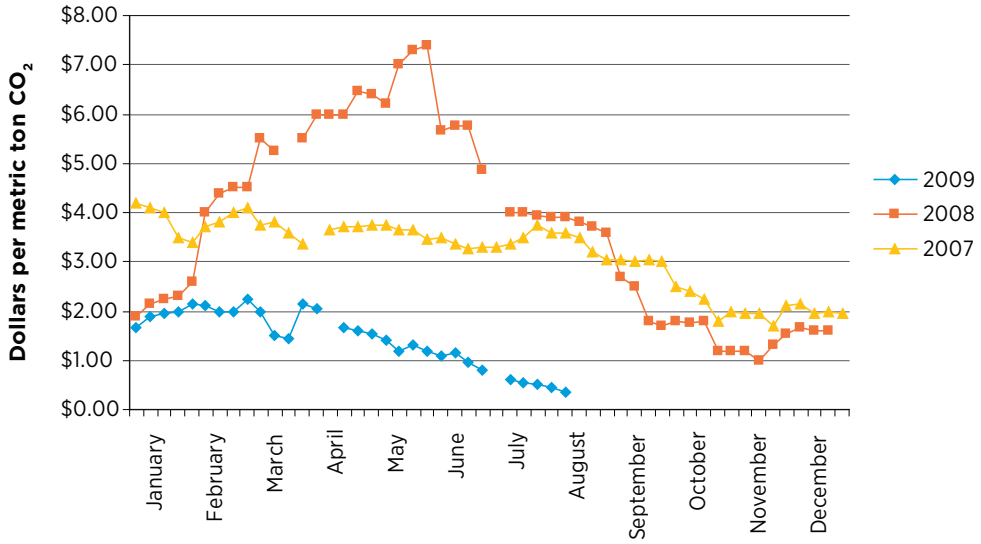
By the start of 2007, the price was almost up to $4.00, and by 2008, the price jumped up to almost $8.00 ($7.40 on May 30, 2008). The large and continued decrease in carbon prices since that peak has caused speculation and worry about the prospects for investment in carbon sequestration and capture and alternatives to high-carbon-emission technologies and industries.

Table 2. Price of Carbon

Date	Price
Jan 2, 2004	$0.98
Jan 3, 2005	$1.75
Jan 3, 2006	$1.70
Jan 2, 2007	$3.75
Jan 2, 2008	$1.90
Jan 2, 2009	$1.65

Source: The Chicago Climate Exchange, www.chicagoclimatex.com/market/data/daily.jsf.

Figure 6. Price of Carbon



Source: The Chicago Climate Exchange, www.chicagoclimatex.com/market/data/daily.jsf.

Ask the Energy Expert

Boiler Combustion Control

Dear Energy Expert:
My plant is looking for recommendations for achieving boiler combustion control more efficiently. Do you have any suggestions?

When investigating steam systems, the boiler is one of the primary targets for energy-efficiency improvement. There are many tools used in the evaluation and management of boiler performance. One of the most useful tools is boiler efficiency. Boiler efficiency describes the fraction of fuel energy that is converted into useful steam energy. Of course, the fuel input energy that is not converted into useful steam energy represents the losses of the boiler operation. Boiler investigations generally examine the losses by identifying the avenues of loss, measuring the individual loss, and developing a strategy for loss reduction.

There are many avenues of loss encountered in boiler operations. Typically, the dominant loss is associated with energy leaving the boiler with combustion gases. The temperature of exhaust gases is an indication of their energy content. Ensuring that the heat-transfer surfaces of the boiler are clean is a major point of focus for managing the thermal energy in exhaust gases. Energy can be recovered from exhaust gases by transferring thermal energy from the high-temperature gases to boiler feedwater, or to the combustion air entering the boiler.

Another aspect of exhaust-gas energy management, which is the focus here, is combustion management. It should be noted that the temperature- and combustion-related attributes of exhaust gases are interrelated—they combine to represent the stack loss of the boiler. Again, this is typically the dominant loss for the boiler. Stack loss is dependent on the operating characteristics of the boiler, the equipment installed, and the type of fuel burned in the boiler. Stack loss generally ranges from as much as 30 percent for a green-wood-fired boiler, to 18 percent for a typical natural-gas-fired boiler, to 12 percent for an oil-fired boiler, to as low as 9 percent for a coal-fired boiler. It must be pointed out that the stack-loss range is wide for any given fuel.

To address your question, we will examine the combustion of a simple fuel—methane (CH_4). The chemical equation for the reaction of methane with oxygen (O_2) is presented below:

$$CH_4 + 2O_2 \underset{\text{Energy Release}}{\rightleftharpoons} CO_2 + 2H_2O$$

In a perfect world, methane will react with oxygen to release energy and form carbon dioxide and water. In this perfect arrangement, each molecule of fuel would find the exact amount of oxygen needed to cause complete combustion. In the case of methane, one molecule of methane must find two molecules of oxygen in order to produce a complete reaction.

In the real world, however, the combustion process does not proceed in a perfect manner. A fuel molecule may encounter less oxygen than is required for complete combustion. The result will be partial combustion; the exhaust gases will then contain some unreacted fuel and some partially reacted fuel. Generally, these unburned fuel components are in the form of carbon monoxide (CO), hydrogen (H_2), and other fuel components that may include the fully unreacted fuel source, which in this case is methane.

When unburned fuel is found to be part of the combustion products, a portion of the fuel that was purchased is consequently discharged from the system, unused. It is also important to note that unburned fuel can accumulate to a point where a safety hazard could result. Unburned fuel can burn in a part of the boiler not designed for combustion—under certain conditions, the materials can even explode. Additionally, these chemicals are typically toxic in nature, presenting health and environmental hazards.

$$CH_4 + 2O_2 \underset{\text{Energy Release}}{\rightleftharpoons} \alpha CO_2 + \beta H_2O + \gamma CO + \delta H_2 + \varepsilon CH_4 + \zeta O_2$$

Unburned fuel presents negative safety, health, environmental, and economic impacts to the boiler operations. As a result, it is imperative to manage the combustion process in order to maintain these components at minimum levels. Fortunately, the complex interrelations of the combustion process can be managed with two fairly simple principles. The first principle of combustion management is based in the fact that unreacted fuel components are undesirable in the exhaust gases of the boiler, but the presence of unreacted oxygen presents minimal safety, health, and environmental concerns. Furthermore, as long as the burner is appropriately mixing the oxygen and fuel, the presence of extra oxygen in the combustion zone essentially ensures that all of the fuel will react completely. The fan energy required to move ambient air into the combustion zone is generally minimal when compared to the cost of fuel.

Combustion management principle number one, stated simply, is ***provide more oxygen than you theoretically need to ensure that all of the fuel burns up***. As a result, when combustion management principle number one is applied to the example chemical reaction, rather than two molecules of oxygen being supplied for every one molecule of methane, each molecule of methane may be provided three or four molecules of oxygen. This will ensure that all of the fuel is burned. The extra oxygen that is added to the combustion zone, however, enters at ambient temperature, and it exits the boiler at flue-gas temperature. The flue-gas temperature of a typical boiler could be anywhere in the 300°F to 500°F range. As a result, the extra oxygen could have entered the boiler at 70°F and exit at 400°F. The extra oxygen reached this temperature by receiving fuel energy—in other words, fuel was purchased to heat the extra oxygen. Additionally, ambient air contains almost four molecules of nitrogen (3.76 to be exact) for every one molecule of oxygen. As a result, every amount of excess air brings with it a huge amount of nitrogen. This nitrogen enters at ambient temperature and receives fuel energy to exit the boiler at flue-gas temperature.

This brings us to combustion management principle number two—***do not use too much oxygen***. In other words, combustion management requires that extra oxygen be provided to the combustion zone in order to ensure that all of the fuel is reacted; however, the amount of extra oxygen must be minimized to reduce energy loss. The critical measurements required to manage the combustion loss are the flue-gas oxygen content and the flue-gas combustibles concentration. The flue-gas oxygen content is measured to allow the combustion air flow to be modified to meet a set point. Combustibles concentrations are measured to identify the minimum practical oxygen concentration. It should be noted that combustibles concentrations can be elevated even though excess oxygen is provided to the combustion zone. This situation is typically indicative of a burner failure. A primary function of a burner is to mix the air and fuel thoroughly to ensure complete combustion. If a burner component has failed or is improperly adjusted, the mixing process can be ineffective. This can result in unburned fuel and excess oxygen. Combustibles concentration values vary based on fuel type, operating conditions, and burners. A typical natural-gas-fired boiler will operate with combustibles concentrations less than 50 parts per million (ppm), while a coal-fired boiler may operate with combustibles concentrations greater than 200 ppm. Generally, combustibles concentrations less than 100 ppm are considered negligible in terms of efficiency impact. Baseline combustibles concentrations should be established for each boiler.

The principles and measurements used in combustion management outlined above indicate that combustion control should incorporate flue-gas oxygen measurement, combustibles measurement, and active control of combustion airflow. Many boilers, however, do not incorporate these factors into the control process. Common boiler-control strategies are based primarily on steam-pressure control. As the process steam demand increases, the steam pressure at the boiler deceases. The boiler steam-production controller will measure this decrease in pressure and will increase fuel flow to the boiler. In the case of a natural-gas-fired boiler, the controller will proportionally open the fuel control valve. As the fuel flow is increased, the combustion air flow must also increase in order to maintain safe and efficient combustion.

A very common and simple method of accomplishing the control of combustion air flow is to mechanically link the air-flow control device to the fuel-flow control device. This is commonly called *positioning control* because the air-flow-control device will have a position that is based solely on the position of the fuel-flow-control device. It should be noted that this control does not incorporate any active oxygen or combustibles measurements. Oxygen and combustibles

measurements are only taken to establish the position relationship between the fuel controller and the air controller. After the position relationship is established, oxygen and combustibles measurements cease.

Tuning the boiler is the act of reestablishing the position relationship between the air and fuel. This tuning activity is completed in the same manner the original air-fuel control point positions were established. The boiler is operated steadily at discrete fuel input positions and the airflow control device position is redefined. The boiler will be operated at discrete loads throughout the operating range of the unit. While the fuel-flow controller is 100-percent open, for example, the position of the air-flow controller is adjusted until an appropriate flue-gas oxygen content is attained. Combustibles concentrations should also be measured to ensure proper burner operation. The position relationship exercise is repeated over the operating range of the boiler (95-percent load, 90-percent load, down to minimum load). This retuning activity should be completed frequently to ensure safe and efficient boiler operation.

It should be noted that when positioning control is used, the oxygen content cannot be minimized because of many factors. One factor influencing the airflow controller position is ambient temperature. Ambient temperature is a concern because the combustion air fan is basically a constant volume-flow device (for a given controller set point). If the position relationship is established for a relatively cool inlet-air temperature, the mass flow of air into the combustion zone could be dangerously low as the inlet air temperature increases. As a result, positioning control can only attain moderate efficiency.

Combustion control can be improved through the use of an *automatic oxygen trim system*. This type of system continuously measures flue-gas oxygen content and adjusts the combustion air flow to maintain a set point. This type of control can be more precise and efficient than positioning control because it continually tunes the air-fuel relationship. Combustibles measurement and control can be added to allow the oxygen set point to be minimized.

These control strategies take many forms, and there are many variations of each; this description only outlines the primary composition of the control. Table 1 depicts the expected flue-gas oxygen content for common fuels. It should be noted that most boilers require higher flue-gas oxygen content at lower loads. This generally results from the fact that mixing is compromised in the burner at low loads. Additionally, flue-gas oxygen content targets will be influenced by additional environmental controls, such as nitrogen oxide control. When a boiler is equipped with nitrogen oxide control, the minimum oxygen concentrations are somewhat higher than in boilers without the nitrogen oxide control.

Ask the Energy Expert is an ongoing column designed to provide information and solutions for industry's most pressing questions. This issue's Energy Expert is **Dr. Greg Harrell, PhD, PE, of Energy Management Services in Jefferson City, Tennessee.**

Table 1. Typical Flue-Gas Oxygen Content Control Parameters

Fuel	Automatic Control Flue-Gas O_2 Content		Positioning Control Flue-Gas O_2 Content	
	Min. [%]	Max. [%]	Min. [%]	Max. [%]
Natural Gas	1.50	3.00	3.00	7.00
Number 2 Fuel Oil	2.00	3.00	3.00	7.00
Number 6 Fuel Oil	2.50	3.50	3.50	8.00
Pulverized Coal	2.50	4.00	4.00	7.00
Stoker Coal	3.50	5.00	5.00	8.00

Data based upon field observations.

International

Energy Management Standard Development Proceding
The third meeting of ISO PC 242 to develop ISO 50001: Energy management requirements and guidance for use, will be held this November in London, England. The last meeting was held in Rio de Janeiro, Brazil in March 2009 with approximately 70 delegates from 19 countries in attendance. There are a total of 35 countries participating in the development of this international standard. The future ISO 50001 will establish a framework for industrial plants, commercial facilities or entire organizations to manage energy and could influence up to 60% of the world's energy use. See the ISO Web site for more information. ITP mechanical engineer Paul Scheihing will attend.

The United Nations Climate Change Conference will be held in Copenhagen, Denmark, December 7 through December 18, 2009. See COP15 Web site for more information.

The International Energy Agency's **Energy Management Action Network Workshop** will be held in Paris, France, on January 26 and 27, 2010. ITP's Program Manager, Doug Kaempf, plans to attend. More information will be available on the International Energy Agency's Web site.

The Alliance to Save Energy is hosting its **Energy Efficiency Global Forum and Exposition** in Washington, D.C., May 10 through 12, 2010. Visit Aliance to Save Energy's Web site for more details.

Funding Resources

Recovery Act Funding Opportunities

The *American Recovery and Reinvestment Act* is providing $256 million for the following industrial energy-efficiency projects:

- $156 million for combined heat and power, district energy systems, waste-energy-recovery systems, and efficient industrial equipment
- $50 million for improved energy efficiency for information and communication technology
- $50 million for advanced materials in support of advanced clean-energy technologies and energy-intensive processes.

For more details about *Recovery Act* funding,

- Watch ITP's solicitations Web page
- Sign up to receive e-mail updates from ITP
- Read the ITP news article
- Monitor www.grants.gov and FedConnect
- Checkout the InDEED Web Site.

Look for Us...

ITP Calendar of Events

December 2009

1–3: Climate Leaders Conference

7–9: NSF Nanoscience Grantees Conference

January 2010

17–20: 2010 Northwest Food Manufacturing & Packaging Expo

Industrial Technologies Program Contacts

Click below to request more information about ITP and the services we provide.

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