

INDUSTRIAL ASSESSMENT CENTERS

The IAC Update, Summer 2015



About the IAC Program

Beginning in 1976, the Industrial Assessment Centers (IACs) have provided small and medium-sized manufacturers with site-specific recommendations for improving energy efficiency, reducing waste, and increasing productivity through changes in processes and equipment. A typical IAC client will receive recommendations that save more than \$47,000 annually.

Currently located at 24 of the nation's top engineering schools, the IACs combine a traditional engineering curriculum with a unique blend of hands-on experience gained through conducting assessments. Upon graduation, approximately 63 percent of IAC students obtain employment for which energy efficiency or energy management is a significant responsibility.

To sign up for an IAC assessment, please visit <http://iac.university> or contact your nearest center directly.

IAC Program: Quarterly Results

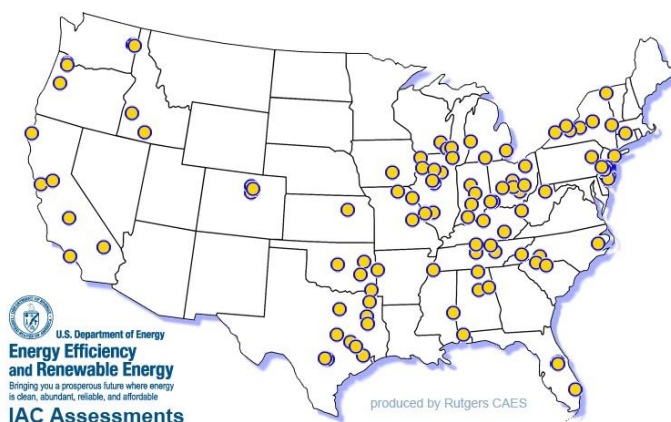
During the first quarter of 2015, the IACs conducted 119 assessments (see Table 1). As a result, IACs made 1,052 recommendations that identified more than \$14M in potential cost savings.

Table 1. 2015 January – March Results

Total Assessments	119
Total Recommendations	1,052
Total Recommended Annual Savings	
Energy Savings	19.0 M Therms
Electricity Savings	99,974,225 kWh
(approx) Generation Reduction	11.41 MegaWatts
Natural Gas Savings	8.1M Therms
CO₂ Reduction	0.11 Tons
TOTAL Cost Savings	\$14.46 Million
- Energy Related Savings	\$12.93 Million
- Productivity Savings	\$1.08 Million
- Waste & Water Savings	\$0.45 Million

Plants assessed were located in 28 states (see Figure 1). The assessed plants represent a broad range of industries, with food, fabricated metals, plastics and rubber, and chemical manufacturing being the most common (see Table 2).

Figure 1. IAC Assessments Nationwide, 2015 Jan - Mar



During the quarter, a total of 300 engineering students participated in the IAC program across the 24 centers; more than one-third of the students were new to the program. IACs issued 36 certificates to students meeting all of the certification requirements. These requirements include mastering a number of core skills and participating in at least six assessments.

Table 2. 2015 Jan – Mar Assessments by NAICS Industrial Category

Industrial Category (NAICS #)	Assessments
Food Manufacturing (311)	21
Fabricated Metal Product Manufacturing (332)	18
Plastics and Rubber Products Manufacturing (326)	15
Chemical Manufacturing (325)	12
Machinery Manufacturing (333)	8
Paper Manufacturing (322)	7
Primary Metal Manufacturing (331)	6
Transportation Equipment Manufacturing (336)	5
Wood Product Manufacturing (321)	4
Nonmetallic Mineral Product Manufacturing (327)	4
Furniture and Related Product Manufacturing (337)	4
Printing and Related Support Activities (323)	3
Electrical Equipment Manufacturing (335)	2
Computer and Electronics Manufacturing (334)	2
All Other Manufacturing	7

IAC Program Highlights

Assistant Director Research Grants

The Advanced Manufacturing Office recently awarded four supplemental grants to support applied energy efficiency research for junior faculty members serving as Assistant Directors at the IACs. These faculty members provide many important benefits to the IAC program, including developing new ideas and program innovations, strengthening IAC leadership, and ensuring a smooth transition and continuing program accomplishments when stepping in as Director.

"It's exciting to be leading efforts into increasing competitiveness and efficiency for industrial facilities. Everyone wins. The industrial facilities become more efficient. The students become significantly more competitive. Professors gain access to real-world research environments."

-- Dr. Zheng O'Neill, University of Alabama

The grants will support faculty needs to perform research and publish papers in applied engineering areas that support the mission of the IAC while also supporting the faculty members' commitment to the IAC. This year's winners are:

- **Dr. Ehsan Languri (Tennessee Tech University) – Development of a Cooling Tower Evaluation Software System.** This research will support a robust software system designed to evaluate potential energy savings from installing VFDs on tower fans, improving cooling tower controls, or adopting physical changes to the towers.
- **Dr. Zheng O'Neill (University of Alabama) – Data-driven Approach for Estimation of Industrial Facility Energy Consumption.** This research will employ Gaussian Mixture Regression models for application to industrial facilities to learn if such models offer advantages over traditional change-point temperature models.
- **Dr. David Goodman (Indiana University, Purdue University Indianapolis) – Extended Leak Detection Tools.** This research will support the development of algorithms relating leak data from various gasses to ultrasonic data.
- **Dr. Karl Haapala (Oregon State University) – Analysis Tool and Guide for Energy Modeling of Additive Manufacturing.** This research will explore the effects of various additive manufacturing design, material and process parameters on energy consumption, thereby identifying the most significant factors influencing energy use response.

Fourth Annual Student Research Awards

The Advanced Manufacturing Office sponsors an annual applied research awards competition to honor exceptional students participating in the IAC program. The program provides students at IACs with hands-on training and real world experience in energy engineering and management.

Beginning this fall, each winning IAC will receive up to \$25,000 in additional program funds. The research awards are designed to create incentives for undergraduate and graduate students to pursue assessment-inspired research projects in the areas of manufacturing and industrial energy efficiency. The awards are intended to enhance traditional student-led research efforts and to recognize research proposals that stand out as being exceptional and particularly innovative. Information about this year's two winning student projects is below:

- **University of Alabama: Joseph Carpenter, Andy Cloyd and Saba Lalani, IAC Students; Dr. Keith Woodbury, Advisor - Energy Performance Estimation of Industrial Cooling Towers**

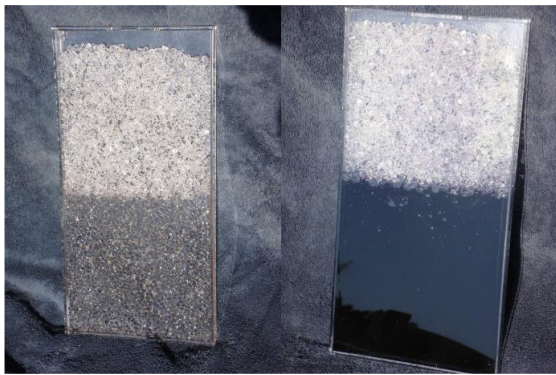
Industrial cooling towers are utilized to remove heat from a variety of sources such as machinery, furnaces and heated process, etc. Energy conservation measures (ECMs) for improving industrial cooling tower operation efficiency including fan and pump speed control have been proposed to IAC clients. However, a systematic and scalable, yet simple and relatively accurate, approach to estimate annual energy performance of industrial cooling towers is still lacking. Comparisons of an effectiveness-NTU method with an empirical model using field data from past AIAC clients will be conducted and a recommended model will be proposed. Total annual cost of operation with different ECMs will be estimated based on the proposed model and field measurements.



A typical industrial cooling tower on the University of Alabama campus

- **University of Delaware: Dan Wolfe and Christine Longhitano, IAC Students; Dr Keith Goossen, Advisor - Controllable Reflectance Roofing System to Tailor Building Solar Loads for Increased HVAC Efficiency**

This project proposes and demonstrates the concept of an active roofing system in which the solar reflectance can be controlled, for high solar absorbance during heating months and high albedo during cooling months. We propose an active shingle presenting an optically faceted structure for high albedo, which can consist simply of packed acrylic beads. When high absorbance is needed, a fluid reservoir injects optical matching fluid, or simply dark ink, into the shingle, filling the spaces between the beads.



University of Delaware proposed shingle modes of operation: high albedo (top left and top right), high absorbance (bottom left and bottom right)

IAC Student and Alumni Awards

The Advanced Manufacturing Office recently announced the winners of the second annual IAC Outstanding Student and Distinguished Alumni awards. These awards allow DOE to recognize the IAC personnel who have made significant impacts through their work in energy efficiency as well as for their outstanding accomplishments in promoting the practices and principles of energy engineering. These awards have been given to current IAC engineering students as well as alumni who have gone on to work within the energy community. These professionals have demonstrated exceptional ability as engineers and have advanced energy efficiency in the often hard to engage small and medium sized manufacturing community. This year's winners are:

Outstanding IAC Engineering Student Awardees

- **Trevor Terrill (Texas A&M University):** Trevor has participated on nearly 20 assessments – acting as lead student on more than a quarter of these – and also served as a mentor to five



separate design teams consisting of more than 40 students from seven different engineering disciplines that were researching options for automating elements of IAC assessments. In 2014, he was selected to receive an IAC award for excellence in applied energy research for his innovative efforts on non-intrusive detection of air leaks in compressed air systems. He has already published, or has under review, numerous papers relating to industrial energy efficiency and has maintained a 4.0 GPA during both his undergraduate and graduate studies.

- **Arash Edalatnoor (Indiana University – Purdue University Indianapolis):** Arash has participated on more assessments than any other student at IUPUI since the Center was founded in 2012. He has played an important role in developing curriculum for the school's energy engineering undergraduate degree, which is targeted to receive general ABET accreditation in 2016. He re-founded the Energy Club at IUPUI, which recruits energy experts from industry and academia to lecture at the school and was instrumental in growing the IAC from nine students in 2012 to nearly 30 today.



Distinguished IAC Alumni Awardees

- **Dustin Pohlman (University of Dayton, 2013):** Dustin founded Energize Engineering in Lima, OH – a start-up company that specializes in residential and commercial energy efficiency engineering and consulting. In addition, working with the City of Lima, Dustin helped recruit more than 750 commercial and residential customers to participate in the Community Energy Savers program. Due, in part, to his efforts, the City achieved its annual goal in only six months. Dustin also helped the local chapter of Habitat for Humanity design and build its first Energy Star certified home in 2014.
- **Kevin Ng (San Francisco State University, 2009):** Since graduating, Kevin has worked on both private and public sector energy efficiency projects, including the planning, design and construction of utility and community scale buildings. In particular, Kevin designed a photovoltaic microgrid system on Alcatraz Island that reduced the island's greenhouse gas emissions by more than 50 percent. He has assisted a number of Federal agencies in meeting Presidential mandates relating to energy independence and achieving zero net energy. While at Berkeley, he has focused on promoting campus-wide operational and behavioral changes of 50,000 plus students and faculty by providing real-time energy management dashboards and daily messages.

- **James Eggebrecht (Texas A&M University, 1994):** James is Assistant Director of the Texas A&M IAC and has served as the Executive Director of the Industrial Energy Technology Conference since 1997. He oversees an award program that recognizes individuals and corporations that adopt energy efficiency practices. During his tenure as both a student and faculty member, he has participated on nearly 360 assessments and has played a central role in recruiting IAC clients, mentoring students, and improving assessment results for nearly two decades.



Jim Eggebrecht, Assistant IAC Director at Texas A&M, prepares to demonstrate a boiler test for his students.

IAC Spotlights

IUPUI Offers Bachelor of Science Degree in Energy Engineering

Advancement of energy efficiency and renewable energy improves the manufacturers' competitiveness and protects the environment. As more companies need energy management professionals and more research is devoted to energy, more high school students are interested in pursuing "green" careers. To meet these needs, IUPUI developed a BS degree in Energy Engineering (BSEEN). The program focuses on producing energy engineering professionals who will play major roles in energy management, meet the needs of energy related industry, and develop new technologies.

The curriculum covers the energy related fundamentals from disciplines such as mechanical, chemical, and electrical engineering and sustainable design. It has three tracks: renewable energy and energy storage; energy management; and vehicle technology. The program will seek ABET accreditation in 2016.

"The potential for energy engineering is endless. I have the skill set to work with renewable energies as well as efficiencies, energy storage, energy auditing, and project management. Overall, this program has provided me with a unique opportunity that I am excited to explore."

-- Emily Damian, IUPUI Energy Engineering graduate

Recent IAC Client Feedback

As part of the assessment process, IACs routinely solicit feedback from their manufacturing clients, both on the assessment and the final report. A selection of recent feedback is provided below:

- The report was pretty self-explanatory, more detailed than what we expected, easily understood. (*Texas A&M*)
-- Patrick Elles, Plant Engineer, Jeld-Wen Doors
- The Giles facility and our Manufacturing Operations President loved the report. They are already implementing some of the recommendations and we've forwarded the report to all our Facility General Managers for them to evaluate their own facilities. (*Tennessee Tech*)
-- Gavin Mabe, Engineer, Giles Industries
- We appreciated everyone's efforts to identify and quantify opportunities to reduce energy costs. We enjoyed the audit and we hope your team enjoyed the day at Thermoseal. (*Delaware*)
-- Dan Nichols, Director of Operations, Thermoseal
- I would like to thank the IAC team for the assessment at the Germantown facility. It is extremely useful to have an objective evaluation of our processes and savings opportunities. We are currently focusing on high potential projects, including compressed air efficiency, low pressure blow offs, and furnace insulation. In early 2015, I plan on revisiting the power factor correction. (*UW - Milwaukee*)
-- Bob Harry, Mfg. & Facility Engineering Mgr., GKN Sinter Metals

IAC Database

More information on the services and results of assessments performed since 1981 can be found in the IAC database located here: www.iac.rutgers.edu/database

For Additional Information

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