



**INDUSTRIAL  
ASSESSMENT  
CENTERS**

A Program of the U.S. Department of Energy

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.

## SUMMER NEWSLETTER 2019

### IN THIS ISSUE

Sixth Annual Student Research Awards

Oklahoma State University Celebrates 1,000<sup>th</sup> Industrial Assessment

Client Testimonials by Louisiana State University – Tennessee Tech University

IAC Program Quarterly Results



## IAC PROGRAM HIGHLIGHTS

### SIXTH ANNUAL STUDENT RESEARCH AWARDS

The Office of Energy Efficiency and Renewable Energy’s Advanced Manufacturing Office (AMO) sponsors an annual applied research awards competition to honor exceptional students participating in the [Industrial Assessment Center \(IAC\)](#) program. The program provides students at IACs with hands-on training and real world experience in energy engineering and management.

Each winning IAC student/faculty team will receive \$25,000 in 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.

Congratulations to the 2019 winners of AMO’s Applied Research Awards Competition!

University of Alabama: Roohany Mahmud, IAC Student; Dr. David MacPhee, Advisor—Confined Tube Aeration – Increasing Efficiency of U.S. Wastewater Treatment

- There are currently around 15,000 wastewater treatment facilities in the U.S., many of which utilize the activated sludge process in which micro-organisms eliminate organic matter and nutrients through a process known as aerobic digestion. To accomplish this, an adequate supply of oxygen is needed to feed cellular respiration and treat the wastewater in an effective and timely matter. Due to a high biochemical oxygen demand (BOD) in the waste stream, additional oxygen must be added during the treatment process to ensure the carbonaceous biological matter can be properly digested. The proposed concept, a confined tube aerator (CTA), aims to deliver oxygen to the wastewater stream more efficiently at a lower cost than existing technologies. With the CTA design, an optimized piping network will be included at the outlet of a Venturi aspirator, enhancing bubble hang-time and aeration efficiency while ejecting the multi-phase mixture horizontally below the surface to ensure optimal circulation.

West Virginia University: Alexandra Davis, IAC Student; Dr. Ashish Nimbarte, Advisor—Energy Efficiency Evaluation of Twin Tower Regenerative Desiccant Dryers

- Compressed air is one of the most versatile and convenient power sources available in industry today. More than two-thirds of the cost of a compressed air package goes towards energy cost. Hence, optimization of compressed air systems should be at the forefront of energy efficiency efforts. When ambient air is compressed to high pressures, the process produces water droplets due to the moisture present in the air.



SIGN UP for an assessment at <http://iac.university> or contact your nearest center.

## PROGRAM HIGHLIGHTS

This moisture can be harmful to instrumentation, air system infrastructure, and the end product. Energy assessments of compressed air systems will be used to gather data from three types of desiccant dryers (BHNP, CHP, and BHP). The data will be used to develop a comparison matrix and a simulation model. The comparison matrix will focus on various aspects of energy efficiency. The simulation model will provide sufficient information to prospective users so that they can make informed decisions regarding the impact that a desiccant dryer (BHNP, CHP, and BHP) can have on their operations and energy load.

**University of Utah: Landen Blackburn, Micale Ward, Derek Machalek, Christopher Hillam and Jake Tuttle, IAC Students; Dr. Julie Sieving, Advisor—Implementation of Machine-Learning-Based Optimization of Industrial Cooling Towers**

- The proposed project will apply advanced computing techniques for energy optimization from readily-available machine learning software and a strong collaborative relationship with the operations staff at a nearby 960 MW coal-fired power plant. Specifically, the proposed project presents the opportunity to implement cutting-edge, machine-learning-based optimization on a very large-scale cooling tower system while working in close conjunction with plant personnel. The plant has the necessary software license it obtained from a separate research project involving neural-network-based combustion optimization. The IAC team identified the opportunity to extend this optimization software to the cooling towers for energy minimization following an IAC assessment of the plant's water treatment facilities.

**San Diego State University: Andrew Benedict-Phillip and Daniela Cantor, IAC Students; Dr. Joaquin Camacho, Advisor—Solar Energy / Energy Storage Discharge Models and Analysis of Regional Electricity Utility Usage Based on Interval Data in West IAC Region**

- Interval data of electric utility usage is difficult to obtain from IAC assessment sites. This challenge affects analysis of productivity, waste reduction, and energy savings for the manufacturing plants served by the IAC. For example, only one audit site of the last 100 sites provided access to the utility interval data. A large barrier to obtaining interval data from IAC audit sites is the excessive level of coordination between authorized utility bill managers of the site and the IAC auditors. Persistence on both ends is required to navigate the utility provider system and carry out a transfer of the data to the IAC. The current proposal provides a solution to streamline attainment of interval data and proposes valuable applications of interval data. This capability will improve audits and energy storage Assessment Recommendations (ARs) for manufacturing

plants. The research project proposes using powerful energy utility analysis software to analyze electric utility usage and improve the accuracy of ARs. The payback period for energy storage systems is heavily dependent on electric utility data that is not reported on standard billing records. ■

## CENTER SPOTLIGHT

### OKLAHOMA STATE UNIVERSITY CELEBRATES 1000<sup>TH</sup> INDUSTRIAL ASSESSMENT

In December 2018, the Oklahoma State University (OSU) Industrial Assessment Center (IAC) celebrated its 1,000th industrial assessment/energy audit milestone. IAC team members, acting and retired faculty, OSU administrators, officials from the U.S. Department of Energy (DOE), Rutgers University, and Wichita State University gathered at the College of Engineering, Architecture and Technology (CEAT) newest undergraduate laboratory, ENDEAVOR, to celebrate. The industrial assessment/energy audit was performed the following day at ASCO Aerospace.

OSU IAC is home to one of the oldest and most successful industrial energy efficiency programs in the nation. In 1982, Dr. Wayne Turner, Emeritus Regents Professor in industrial engineering and management (IEM) founded the OSU IAC chapter and led it until his retirement in 2001. Dr. William Kolarik, also an Emeritus Regent's Professor of IEM, took over from 2001-2017 until he retired. Currently Dr. Hitesh D. Vora, assistant professor of mechanical engineering technology, serves as the acting director of the center. The OSU IAC program is funded by the Department of Energy with \$1.8M allocated for 2017 to 2021.

"The IAC team continues to support economic development in Oklahoma by helping manufacturers improve their efficiency and lower their energy costs," said Ed Kirtley, assistant dean of the college of engineering, Architecture and Technology. "I believe this adds to our state's competitiveness in national and international commerce. Consequently, this brings jobs to our state that benefits all Oklahomans."

There are 28 IACs in the United States and OSU IAC serves small and mid-sized manufacturers from Oklahoma, Kansas, Arkansas and North Texas. OSU IAC is the first to reach the 1000th assessment milestone among the 28 IACs nationwide.

"My first-hand experience with OSU IAC and Dr. Vora has included the 1,000th industrial assessment celebration this past December. What an accomplishment!" said Dr. Kenneth Sewell, OSU vice president for research. "I was impressed to learn that the OSU IAC is the first IAC nationwide to reach this milestone."

## CENTER SPOTLIGHT

Overall, the IAC program has achieved over \$4.5 billion of implemented energy cost savings since its inception. Particularly, the OSU IAC program has contributed \$308.2 million or 30.28 Tbtu of implemented energy cost savings since 1982, according to the DOE IAC database. “This single OSU/DOE energy partnership saved Oklahoma industries more than three times the State’s annual investment in all of the Oklahoma State University and more than 20 times the 37-year cumulative investment of OSU in the IAC itself.” said Paul Tikalsky, Dean of CEAT.

The structure of the IAC program is also unique and innovative and fulfills the land-grant mission of Oklahoma State University to provide good economic impact to the region. The OSU IAC program integrates the three important pillars—teaching, research, and outreach—of the land-grant mission. The main mission of IACs is to provide small and mid-sized manufacturers with industrial assessments or energy audits at no cost to help reduce energy and waste and increase productivity, and educate and train students to become the next generation of energy, waste, and productivity professionals.

The mission of the IACs is to work throughout the region to coordinate with utility companies, manufacturing extension programs, and manufacturing associates to provide potential clients (in addition to the ones directly served) with relevant information on plant energy conservation projects and the facilitation of effective and efficient energy management



From left: Abhimanyu Sah, IAC Student; Dr. Paul Tikalsky, CEAT Dean; Jon Chisum, Maintenance/Facilities Manager of Asco Aerospace USA; Dr. Ron Van Den Bussche, Associate Vice President for Research; Bruce Tiff, Asco Aerospace USA; John Smegal, US DOE; Pragya Niraula, IAC Student; Justin Kirby, IAC student; Dr. Hitesh Vora, OSU IAC Director; Dr. Michael Muller, Rutgers University; Devarshi Tharwala, IAC Student; Dr. Mehmet Bayram Yildirim, WSU-IAC Assistant Director; Dr. Chuck Bunting, CEAT Associate Dean of Research; Evan Hawk, IAC Student; Dr. Deepak Gupta, WSU-IAC Assistant Director; Dr. Michael McCombs, IAC Professional Staff member

systems. eApart from the routine energy audits which cover a broad scope of industrial settings and subsystems, the IACs also provide technical material and workshops promoting energy efficiency. Under the leadership of Dr. Vora, the OSU IAC supports smart manufacturing, cybersecurity for energy efficient manufacturing, productivity improvement, and ISO 50001 initiatives along with the existing areas of energy management. Read more about the Oklahoma State University Industrial Assessment Center. ■

## CLIENT TESTIMONIAL

### Louisiana State University

“I am so thankful to you and your team for getting this done for us, and I know it will go a long way in helping us move forward with our water and energy sustainability.”

–William David Motes  
Management Systems Manager  
Coca-Cola Bottling Company UNITED, Inc.

### Tennessee Tech University

“The energy assessment went very well. Thank you, to all of you, for your time and attention to detail. The team has already been generating some great ideas, for savings opportunities. This was a great hands-on experience, and it was also a networking opportunity, as we offer internships.... We are definitely interested in a Cybersecurity assessment!.... Thank you, Michelle, for your helping coordinate both assessments. We are so excited to partner with you!”

–Jennifer Stockman  
HSE Specialist  
MANN + HUMMEL Group

## IAC Program Quarterly Results

IACs conducted 130 assessments (Table 1) in the third quarter of 2018 (July to September). As a result, IACs made 899 recommendations that identified more than \$17.3 million in potential cost-savings.

### IDENTIFIED SAVINGS

	Total Assessments	Total Recommendations
	130	899

	Total Recommended Annual Savings	YTD
<b>Energy Savings</b>	18.8 M Therms	56.9 M Therms
<b>Electricity Savings</b>	132,755,040 kWh	403,660,170 kWh
<b>Generation Reduction (approx.)</b>	15.15 MegaWatts	46.07 MegaWatts
<b>Natural Gas Savings</b>	5.1 M Therms	9.1 M Therms
<b>CO2 Reduction</b>	0.12 Tons	0.21 Tons
<b>TOTAL Cost Savings</b>	\$17.31 Million	\$52.68 Million
- Energy Related Savings	\$14.14 Million	\$43.51 Million
- Productivity Savings	\$2.24 Million	\$6.38 Million
- Waste & Water Savings	\$0.92 Million	\$2.77 Million

Table 1. July – September 2018

### LOCATIONS

Plants assessed were located in 30 states (Figure 1). The assessed plants represent a broad range of industries, with fabricated metals, food and transportation equipment being the most common (Table 2).

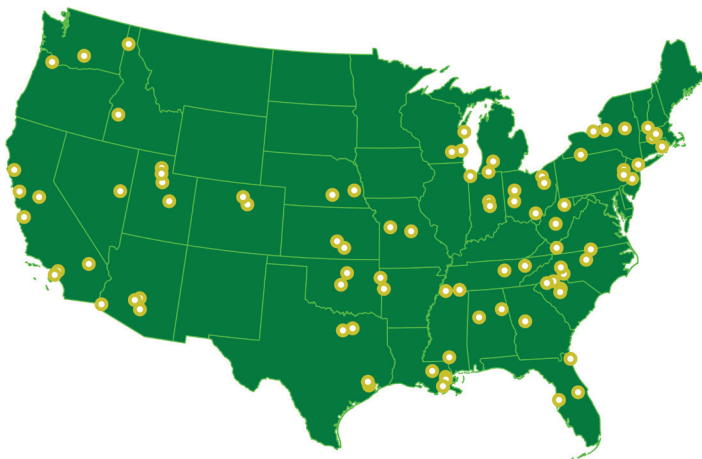


Figure 1. IAC Assessments Nationwide, July – September 2018

### PARTICIPATION

Nearly 300 engineering students were active during the quarter in the IAC program across the 28 centers; and nearly 20% were new to the program.

### INDUSTRIES

Industrial Category (NAICS #)	Assessments
<b>Fabricated Metal Product Manufacturing (332)</b>	19
<b>Food Manufacturing (311)</b>	17
<b>Transportation Equipment Manufacturing (336)</b>	15
<b>Plastics and Rubber Products Manufacturing (326)</b>	10
<b>Nonmetallic Mineral Product Manufacturing (327)</b>	8
<b>Machinery Manufacturing (333)</b>	7
<b>Chemical Manufacturing (325)</b>	6
<b>Primary Metal Manufacturing (331)</b>	6
<b>Beverage and Tobacco Product Manufacturing (312)</b>	5
<b>Paper Manufacturing (322)</b>	3
<b>Computer and Electronic Manufacturing (334)</b>	3
<b>Wood Product Manufacturing (321)</b>	2
<b>Printing and Related Support Activities (323)</b>	3
<b>Furniture and Related Product Manufacturing (337)</b>	2
<b>Apparel Manufacturing (315)</b>	2
<b>All Other Manufacturing</b>	11
<b>Others</b>	14

Table 2. July – September 2018 Assessments by NAICS Industrial Category

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

For more information contact: **John Smegal**  
Advanced Manufacturing Office  
U.S. Department of Energy  
(202) 287-6225  
[john.smegal@ee.doe.gov](mailto:john.smegal@ee.doe.gov)

Visit us at:

<https://www.energy.gov/eere/amo/industrial-assessment-centers-iacs>

