IAC 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.

SPRING NEWSLETTER **2021**

IN THIS ISSUE

IAC

SIGN UP for an assessment at **http://iac.university**

or contact your nearest center.

PROGRAM HIGHLIGHTS

U.S. DEPARTMENT OF ENERGY WELCOMES NEW ROUND OF IACS TO THE PROGRAM

In summer 2021, the U.S. Department of Energy's (DOE) Advanced Manufacturing Office (AMO) announced the largest-ever cohort of university-based Industrial Assessment Centers (IACs). This cohort of 32 IACs located across 28 states were selected to help small- and medium-sized manufacturers reduce their carbon emissions and lower energy costs, while training the next generation of energy-efficiency workers. The 2021 cohort will operate for 5 years through 2026. (see Figure 1 below). There are also six associated satellite centers who will work to extend the geographic coverage of the lead centers. With this cohort, ten centers joined the program, including:

- University of Washington
- Louisiana Tech University
- Michigan State University
- University of North Carolina, Charlotte
- University of California, Irvine
- Mississippi State University
- Kennesaw State University
- Colorado School of Mines
- University of Louisville
- University of Connecticut

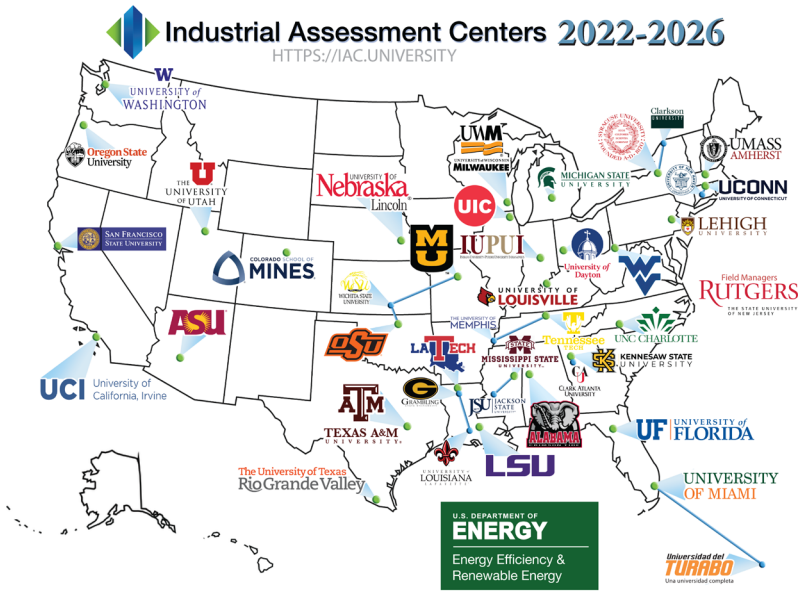

Figure 1. Location of IACs

Nine of the centers in the 2021 cohort will also participate in a pilot project to expand workforce development programs and create opportunities for more diverse applicants and students to work within the commercial building market. Centers participating in the pilot include:

- Oregon State University
- University of California, Irvine
- Colorado School of Mines
- Arizona State University
- Louisiana State University
- Mississippi State University
- Michigan State University
- University of Illinois, Chicago
- Texas A&M University

Under the pilot program, IACs will provide hands-on technical training to building efficiency students through partnerships with community colleges and technical programs. Diverse students and professionals will conduct assessments of small to medium-sized buildings, including those located in disadvantaged communities, to identify and provide on-site efficiency improvements. The IACs will plan and track the results of these assessments, while the assessments themselves will be conducted by the building efficiency students and professionals. AMO anticipates the training and assessments conducted under the commercial buildings pilot project to commence early in 2022. ■

CENTER HIGHLIGHTS

ARIZONA STATE UNIVERSITY (ASU) CONDUCTS ITS 500TH ASSESSMENT

The IAC at ASU recently conducted its 500th assessment, which was at a wastewater treatment plant in the Phoenix metro area. A typical IAC will conduct between 20 to 30 assessments per year, so when a center achieves such a significant milestone, it demonstrates a meaningful and long-term commitment to IAC program goals. The IAC at ASU has been a part of the program since the early-1990s.

The program at ASU consistently ranks among the top performing centers throughout the United States. The ASU IAC mission is to identify technology, systems, and productivity opportunities that result in increasing energy efficiency, reducing waste, and providing better financial results for small and medium-sized manufacturers, while educating and training the next generation of energy and productivity experts. The center conducts energy, waste, and productivity assessments through one-day site visits at no cost to the facility.

Since its inception, the program at ASU (https://iac.engineering.asu.edu/) has provided more than 3,900 recommended actions with a cumulative recommended savings of more than $77 million in operating costs and over 1,100 gigawatt-hours of energy — an amount equivalent to electricity needed to power approximately 80,000 homes for a year. Companies and facilities that have implemented the IAC's recommendations have seen an average annual energy cost savings of almost $65,000 and an average reduction in carbon emissions of over 420 tons per year.

Students participating in ASU's IAC receive hands-on experience with calculations, measurements, and site visits. In the last four years alone, 36 students have participated in the center across a wide range of engineering disciplines including electrical, mechanical, environmental, and industrial engineering, as well as computer science and engineering management.

The IAC at ASU also conducts applied research that supports its mission. Current research areas include energy supply side management, smart manufacturing, and energy in the food cold chain.

For more information visit https://iac.engineering.asu.edu/ or email: phelan@asu.edu, ryan.milcarek@asu.edu or ggungord@asu.edu. ■

CENTER SPOTLIGHT

ENERGY SAVINGS OPPORTUNITIES FOR DISTILLED SPIRIT MANUFACTURER

The IAC at West Virginia University (WVU) discovered an opportunity to decrease energy use and enhance corporate competitiveness for Smooth Ambler Spirits, a distilled spirits manufacturing facility located in Maxwelton, West Virginia. The assessment team focused on the manufacturing process and energy utilities feeding that process. The recommendations at this facility may serve as a model for potential savings at similar sites.

Drums and Liquid Mash Process, Smooth Ambler Spirits, Maxwelton, West Virginia

The IAC team (https://industrialassessmentcenter.wvu.edu/) made several recommendations and identified specific energy savings opportunities for the facility's manufacturing and operational processes.

Energy Conservation Analysis

The management and employees of Smooth Ambler Spirits are oriented towards energy conservation and follow many good practices to save energy. For example, the facility uses efficient lighting on some office areas, an on-demand water heater, and one variable frequency drive (VFD). The assessment team discussed their recommendations with plant personnel and was pleased with the level of energy efficiency awareness amongst the staff. Facility personnel were encouraged to engage with the WVU IAC for further discussion about the implementation of the assessment recommendations.

Lighting Replacements

The assessment team suggested LEDs in the place of fluorescent and metal halogen lamps. These LEDs, in combination with the installation of occupancy sensors in designated areas, have increased the efficiency of the lighting system and reduced the facility's overall energy use.

Process Equipment

The WVU team helped the facility adjust the air-to-fuel ratio of the natural gas run boiler to increase the efficiency and reduce fuel consumption. The team also helped identify improvements that could be made to the controls on the compressor to minimize the electricity consumption. Additionally, the assessment team used a software tool, AirMaster+, to perform the full load calculation of the compressor and identify the performance profile, energy savings, and cost savings for proposed unloading controls of the compressor.

The assessment team recommended that the facility recover heat from effluent, insulate their hot water boiler, burner housing, and hot water tank, and preheat the combustion air for the water boiler burner to minimize the waste of natural gas used in the process. The team used software tools to inform their assessment, including the Steam System Modeler Tool (SSMT), 3E Plus, and the Process Heating Assessment and Survey Tool (PHAST).

Preventative Maintenance

Because electrical motors were widely used throughout the facility, the assessment team suggested performing a vibration analysis on the motors as preventive maintenance. Motor efficiency can be improved by performing regular vibration analysis, thereby minimizing the energy usage by the motors.

Summary

The table on the next page presents the annual cost savings that will occur at the Smooth Ambler Spirits due to the wide range of recommendations that are planned for implementation. The energy conservation opportunities that were identified during the assessment will reduce annual electrical usage by 104,878 kilowatt hours (kWh), and natural gas usage by 1,830 metric million British thermal units (MMBtu) per year. This equates to annual cost savings of $59,174 and an annual reduction in CO_2 emissions of 436,473 pounds. The overall return on investment (ROI) for every recommendation within this assessment – expressed in terms of a simple payback period – is only 30 months, which is significant because waste heat recovery recommendations typically have higher capital costs. ■

Assessment Recommendations	Annual Resource Savings		Annual Savings ($/yr)	Capital Costs	Simple Payback (months)
	MMBtu	kWh			
Install evaporators for effluent waste minimization	-	-	24,050	90,000	45
Recover CO_2 from fermentation process	-	-	15,085	15,000	12
Adjust air-fuel ratio for boiler	851	-	5,944	3,000	7
Install a variable speed drive on the chiller compressor	-	70,080	4,392	6,660	19
Recover heat from effluent going to tanker	411	-	2,885	13,900	58
Replace the existing lamps with LEDs in the plant and office and install occupancy sensors in designated areas install occupancy sensors in designated areas	-	28,926	2,355	1,691	9
Preheat combustion air for the water boiler burner	353	-4,487	2,303	10,560	56
Insulate hot water boiler, burner housing and hot water tank	215	-	1,509	2,170	18
Improve the controls on the compressor	-	8,181	514	1,425	34
Reduce pressure set point for the compressor	-	2,178	137	530	47
TOTAL	**1,830**	**104,878**	**59,174**	**144,936**	**30**

CLIENT TESTIMONIALS

North Carolina State University

"We are almost 100% back up and running! We have read through the report provided by you and your students and I've began looking into your recommendations. After talking with a business energy advisor at DEP, we estimate that we will save about $11,600/year. We truly appreciate you all for taking the time to gather data and create this report for us. It has definitely been beneficial."

– **Christina Coley, Facility Engineer, 02/16/2021**

University of Missouri

"I would like to take a moment and express my gratitude to you and your students for completing the energy audit at our manufacturing facility. Your team was polite, professional, knowledgeable, curious, safety-conscious, and resourceful in determining areas of improvement. I appreciate the feedback we received on your very detailed report. We will use it as a guide as we move forward in our efforts to reduce energy waste. I would highly recommend your group to other facilities looking to improve their processes. Your team identified issues we've had for years but have never taken a step back and realized on our own. Thank you again for the audit, detailed report, and recommendations for our facility. Job well done!"

– **Travis Fulks, Superintendent, 02/20/2021**

IAC Program Quarterly Results

Between January and March 2021, IACs conducted **91 assessments** (Table 2). This represents an increase of approximately **10 percent** over the previous quarter. During these assessments, IACs made **625 recommendations** that identified nearly **$17.2 million** in potential cost savings. A total of 313 engineering students were active across the 31 centers, and approximately one-fourth of these students were new to the program.

IDENTIFIED SAVINGS

Total Assessments	91	
Total Recommendations	625	
	Total Recommended Annual Savings	**YTD**
Energy Savings	11.6 M Therms	26.5 M Therms
Electricity Savings	95,469,375 kWh	224,051,353 kWh
Generation Reduction (approx.)	10.90 MW	25.58 MW
Natural Gas Savings	1.7 M Therms	2.1 M Therms
CO_2 Reduction	0.07 tons	0.17 tons
TOTAL Cost Savings	$17.16 million	$30.94 million
- Energy Related Savings	$10.31 million	$22.01 million
- Productivity Savings	$6.22 million	$7.93 million
- Waste & Water Savings	$0.63 million	$1.01 million

Table 2. January – March 2021

LOCATIONS

Plants assessed were located in **29 states** (Figure 2). The assessed plants represent a broad range of industries, fabricated metals, transportation equipment, and food manufacturing being the most common. (Table 3).

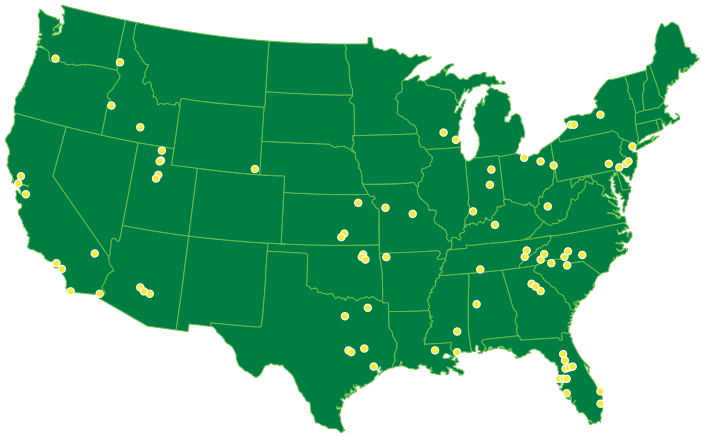

Figure 2. IAC Assessments Nationwide, January – March 2021

INDUSTRIES

Industrial Category (NAICS #)	Assessments
Fabricated Metal Product Manufacturing (332)	13
Transportation Equipment Manufacturing (336)	10
Food Manufacturing (311)	9
Beverage and Tobacco Product Manufacturing (312)	7
Machinery Manufacturing (333)	6
Nonmetallic Mineral Product Manufacturing (327)	5
Wood Product Manufacturing (321)	4
Plastics and Rubber Products Manufacturing (326)	3
Electrical Equipment, Appliance & Component Manufacturing (335)	3
Primary Metal Manufacturing (331)	3
Paper Manufacturing (322)	3
Furniture and Related Product Manufacturing (337)	3
All Other Manufacturing	10
Others	12

Table 3. October – December 2020 Assessments by NAICS Industrial Category

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

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