July 2024

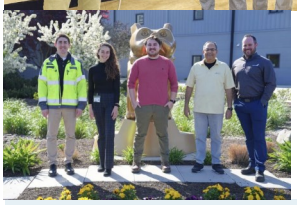
West Virginia University

Industrial Assessment Center

U.S. DEPARTMENT OF ENERGY

MID ATLANTIC REGIONAL INDUSTRIAL ASSESSMENT CENTER OF EXCELLENCE (MARICE)

Newsletter



Executive Information

The work described in this newsletter is for the period of 01/01/2024 to 06/30/2024 based on the activities of the West Virginia University Industrial Assessment Center (WVU-IAC) in collaboration with Lehigh University Industrial Assessment Center (LU-IAC) under project MARICE. The WVU-IAC supports and carries out activities that are funded by US DOE Industrial Assessment Center Program. The Industrial Assessment Center at West Virginia University (WVU -IAC), is one of many centers around the country, funded by the U.S. Department of Energy to provide no-cost energy, waste, water, cyber security, decarbonization, resiliency planning, electrification and smart manufacturing assessments to small and mid- sized manufacturers. Technical assistance and training is also provided to the interested entities. Our clients range from local small businesses in the rural settings to small and medium

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The newsletter is prepared by Mr. Sidhartha Sunkasari in collaboration with the WVU-IAC students and Directors. The WVU-IAC is located in the Statler College of Engineering at WVU.

Inside this issue

Overview of Programs

IAC Program:

The Industrial Assessment Center at West Virginia University (WVU-IAC), is one of many centers around the country, funded by the Office of Manufacturing and Energy Supply Chain MESE) of the Office of Energy Efficiency & Renewable Energy(EERE) within U.S. Department of Energy(DOE) to provide no-cost energy, waste, water, cyber security, and smart manufacturing assessments to small and mid- sized manufacturers. A team of students and professors collect data from facilities about various energy consuming equipment and model the facility in terms of energy and resource usage. Then, the WVU-IAC identifies the opportunities to save energy, reduce waste, and improve productivity through application of smart sensors and controls, and alleviate cyber security threats.

Small and medium sized manufacturers are eligible to receive a no-cost assessment provided by the WVU-IAC. The WVU-IAC team performs detailed process analysis to generate specific recommendations with cost and resource savings, implementation cost, and payback on investment. Within 60 days, the plant receives a confidential report detailing the analysis, findings and recommendations.

Eligibility for IAC Assessment:

- Within Standard Industrial Codes (SIC) 20-39 and NAICS 33-39
- Water and waste water treatment facility or institutional facility
- Within 3 to 4 hour drive from Morgantown
- Gross annual sales below $100 million
- Fewer than 500 employees at the plant site
- Annual utility bills more than $100,000 and less than $2.5 million
- No in-house professional staff to perform the assessment

More info about IAC Program

Significant Accomplishments

- WVU-IAC and Lehigh University received $3.75 million in funding that will be split evenly between the two entities over five years to support the development of the Mid Atlantic Regional IAC Center of Excellence, or MARICE.

- A peer reviewed paper has been published in the journal ***Processes*** which has an impact factor score of 2.8 and a cite score of 5.1 on topic "**Parametric Energy Efficiency Impact Analysis for Industrial Process Heating Furnaces Using the Manufacturing Energy Assessment Software for Utility Reduction**".

- A peer reviewed paper has been published in the journal ***Energies*** which has an impact factor score of 3.0 and a cite score of 6.2 on topic "**Evaluating Electrification of Fossil-Fuel-Fired Boilers for Decarbonization Using Discrete-Event Simulation**".

A Glimpse of this Cycle

- Nine on-site assessments have been completed during this cycle under IAC and MARICE and site visit programs.
- WVU-IAC students received certificates from U.S Department of Energy.
- BridgeValley Community and Technical College, located in South Charleston, WV, will receive $3,000,000 through the U.S. Department of Energy, funded by Chairman Manchin's Bipartisan Infrastructure Law, to develop an Industrial Assessment Center in partnership with Blue Ridge Community and Technical College in Martinsburg, WV, and the WVU-IAC, focusing on training students for careers in smart manufacturing and electric vehicle manufacturing .

Recommendations from On-site Assessments

The WVU-IAC has conducted several assessments at various manufacturing facilities in the states of West Virginia, Virginia and Pennsylvania. The team has given several energy efficiency, lean, waste, water and smart manufacturing recommendations to improve the functionality of the manufacturing facilities.

Sample Recommendations

IAC Assessment Recommendation (Virginia)

Implement the Timers to Deactivate Press Motors During Break Times

The facility has 19 industrial presses. One of them is a 125-ton press, another one is a 100-ton press, and the rest are 30-ton each. Currently, these motors do not have any timers to shut down when they are idle, such as during break times. Current consumption of one of these motors was recorded on the day of the assessment. However, these data showed that these motors consume some amperage during idle break times. The facility has many breaks totaling 3 hours per day. Figure 4.10.1 shows that during these break hours, the industrial presses consume 1 Ampere of current. Turning down the machine during this period can reduce the amperage to 0, resulting in significant energy savings. Use timers to shut off the industrial press motors during break times. This will result in reduced energy usage by these motors.

Energy Savings per year: 11,373 kWh/yr of electricity consumption, and, 39 MMBtu/yr natural gas consumption is reduced, as a result 7,301 lbs of CO2 emission is reduced.

Implementation Cost: $2,660

Total Savings per year: Energy Cost Savings: $770/yr

Payback Period: 42 months.

IAC Assessment Recommendation (West Virginia)

Setback Temperature in the Office Area in Winter and Peak Summer Months

The office area operates 10 hrs/day for 5 days per week. The HVAC units are turned on at all times, however they may be set back during nights and weekends. Effective temperature setback will be achieved through the time of day and day of week programming. Energy savings will be achieved by using a control system to implement a deeper temperature setback for periods when the building is generally not occupied. Currently the temperature is set at 70 oF throughout the year. The control system will schedule the temperature setback to 60 oF for nights and weekends during the heating months and to 73 oF during the peak cooling months. It will automatically switch to the original temperature set points two hours before the beginning of the working day. Table 4.4.1 gives the list of HVAC units in the facility that serve the office heating and cooling. Install setback controls on the heating and air conditioning units in the office area to allow for night and weekend temperature setback during the winter months and peak summer months.

Energy Savings: 43,499 kWh/yr of electricity consumption, and, 611 MMBtu/yr natural gas consumption is reduced, as a result 154,127 lbs of CO2 emission is reduced .

Implementation Cost: $1,125

Total Savings per year: Energy Cost Savings: $8,713/yr

Payback Period: 2 months.

IAC Assessment Recommendation (West Virginia)

Replace the Diaphragm Pumps with Electric Pumps

Pumps are devices that expend energy to raise, transport, or compress fluids by using mechanisms such as reciprocating or rotary actions, and they can be powered by various energy sources including manual operation, electricity, engines, or wind power. These pumps range in size from microscopic for medical applications to large industrial pumps, and their energy cost depends on the work output, pump efficiency, and power unit efficiency. Diaphragm pumps, a type of positive displacement pump, use the reciprocating action of a rubber, thermoplastic, or Teflon diaphragm along with suitable valves to pump fluids, providing a hermetic seal between the drive mechanism and the compression chamber. On the other hand, electric water pumps, known for their performance, efficiency, and precision, are increasingly replacing traditional mechanical pumps in various high-performance applications, including water production and saving equipment, hot tubs, smart toilets, irrigation systems, and automotive water-cooling systems. During an assessment, it was found that the facility currently has four diaphragm pumps, with plant personnel indicating that two more need replacement. It is recommended to replace these diaphragm pumps with more energy-efficient electric pumps to reduce compressor energy usage and achieve cost savings.

Energy Savings: 3,166 kWh/yr of electricity consumption, and 11 MMBtu/yr natural gas consumption is reduced, as a result 6,193 lbs of CO2 emission is reduced.

Implementation Cost: $314

Total Savings per year: Energy Cost Savings: $523/yr

Payback Period: 8 months.

IAC Assessment Recommendation (Ohio)

Reduce Outside Ventilation Air for Makeup Air System

The facility currently has eight distinct makeup air units (MUA) of various capacities that use outside fresh air in the winter. The MUA units compensate for air exhausted by kitchen, bathroom, and dryer systems to maintain building pressure. Effective air balance, often overlooked, ensures each area receives the correct airflow, measured in cubic feet per minute (CFM). The total CFM of the MUA system is compared to the nameplate rating, with hallway grills on each floor balanced and adjusted to ensure proper airflow. In this facility, the old MUA unit lacked a nameplate, so the estimated CFM per ton of conditioning (12,000 Btu/hr) is 400 CFM. Makeup air units are essential for maintaining adequate oxygen levels and eliminating impurities, found in both professional areas and homes as air purifiers. They replenish oxygenated air removed by HVAC exhaust fans, preventing the inefficiency of drawing air through building gaps. Makeup air units also filter air, working with ambient temperatures to maintain comfortable conditions. To reduce the heating load on these units in winter, it is recommended to reduce the percentage of fresh air intake.

Energy Savings: 4,687 MMBtu/yr natural gas consumption is reduced, as a result 529,631 lbs of CO2 emission is reduced.

Implementation Cost: $14,572

Total Savings per year: Energy Cost Savings: $36,465/yr

Payback Period: 5 months.

IAC Assessment Recommendation (Virginia)

Install Variable Frequency Drives on the Dust Collector Motors

An adjustable speed drive (ASD) controls the rotational speed of motor-driven equipment, with variable frequency drives (VFDs) being the most common type. VFDs efficiently meet varying process requirements by adjusting the frequency and voltage of the power supplied to an AC motor, allowing operation over a wide speed range. External sensors monitor parameters such as flow or pressure and transmit signals to a controller that adjusts the frequency and speed accordingly. Pulse-width modulated (PWM) VFDs are typically used in variable torque applications for motors in the 1 to 1,000 HP range. Variable speed drives (VSDs) are significantly more efficient than single-speed drives for operations with cycle times greater than 35 seconds, as they consume less real power. However, for shorter cycle times, they are less efficient due to frequent speed changes. For motors larger than 5 HP, VSDs can reduce real power requirements by up to 40% compared to single-speed drives. Currently, the facility has three motors for a dust collector that can be upgraded from single-speed to variable frequency drives, which is particularly beneficial given the variable operational load of the motors. Operating these motors at lower speeds when demand is low can result in substantial energy savings, as peak conditions typically occur for limited periods. Traditional motor systems without VFDs frequently cycle on and off or run at unnecessarily high speeds, leading to excessive wear and shortened motor life, as well as wasted energy and increased costs. Replacing the single-speed drives on the dust collector motors with VFDs will reduce electrical energy usage, lower costs, and benefit the environment by reducing overall energy consumption.

Energy Savings: 20,087 kWh/yr of electricity consumption, and, 69 MMBtu/yr natural gas consumption is reduced, as a result 38,828 lbs of CO2 emission is reduced.

Implementation Cost: $12,134

Total Savings per year: Energy Cost Savings: $2,469/yr

Payback Period: 59 months.

Cyber Security

Cyber terrorism is a real and growing threat. Standards and guides have been developed, vetted, and widely accepted to assist with protection from cyber attacks. WVU-IAC has conducted cyber security assessment for one of the participating SMEs using the Industrial Control Systems Cyber Security Assessment Tool. The tool promotes awareness of cybersecurity risk areas associated with Industrial Control Systems (ICS) in industrial facilities. Tool includes 20 simple questions to characterize ICS and plant/facility operations and produces a preliminary assessment of risk (high, medium, or low). It also generates a customized list of action items to help improve preparedness for a cybersecurity event .

Recommendations given using CSET Tool

Area of concentration: People:

- Work with your vendor to determine how strong their internal security practices are and whether or not their remote access is a risk for your plant. Consider implementing an enhanced login procedure for vendors to be able to access systems remotely.
- Critical equipment should be protected with firewalls, secure hardware that does not allow for memory transfer with USBs or other external media devices, and alarms that sound when operating under unusual parameters.
- Speak with your vendors about their cybersecurity training, practices, and certifications. Consider adding a clause requiring cybersecurity training in future contracts with vendors.
- Develop training procedures for vendors who work on-site that inform them about cybersecurity best practices. You could also develop guidelines on what equipment vendors are allowed to bring into your facility/plant to increase on-site security.

Area of concentration: Process

- Work with your plant manager to create a central repository, containing information on all IT systems and ICS. Consider maintaining this resource offline, separate from the plant's IT system (i.e., on an isolated computer, on a mainframe, or in a physical file), to ensure that information remains accessible when the IT system is shutdown during a cyberattack or system outage.
- Explore which, if any, software programs have the ability to schedule automatic scanning of equipment and select those settings.
- Consider restricting the use of external media devices for cybersecurity issues to reduce contamination.

Area of concentration: Technology:

- Install firewalls to control data flow between different machinery components and ICS computers.
- Ensure that remote connections are made using a virtual private network or VPN. Consider implementing an enhanced login procedure for vendors to be able to access systems remotely.
- Regularly scan PCs for malware and viruses. For added protection, consider isolating the PCs from internet and email to avoid outside contamination .

Center Activities.

- WVU-IAC has conducted assessments in West Virginia, Virginia, Ohio having the following NAICS codes.

State	NAICS Code
WV	321113
WV	326111
VA	339112
WV	333611
WV	332813
OH	332216
WV	332322
WV	325211
VA	337110

- WVU-IAC and Lehigh University-IAC participated in an energy treasure hunt at Volvo and Legrand Industries under the project MARICE.
- Deputy Secretary of the U.S. Department of Energy Mr. David Turk visited Cleveland Price, where the WVU-IAC team was invited to tour the plant, and the company obtained an implementation grant based on the energy recommendations provided by the WVU-IAC.

Resources available for efficiency enhancement

1) AIRMASTER+
2) Pumping System Assessment Tool
3) Fan System Assessment Tool
4) Mechanical Insulation Assessment and Design Calculators
5) Steam System Tool Suite (SSTS)
6) Industries Facilities Scorecard
7) Plant Energy Profiler/Integrated Tool Suite (ePEP)
8) Combined Heat and Power(CHP) Application Tool
9) NOx and Energy Assessment Tool (NxEAT)

Student Activities:

- New students Mr. Addison Hockins, Mr. Sidhartha Sunkasari has joined WVU-IAC in Jan 2024.
- WVU-IAC student Mr. Bibek Prajapati, who joined IAC in August 2023 has been promoted to Co-Lead student.
- WVU-IAC welcomes undergraduate students Ms. Maria Zakir, Mr. Abdullah Alfadhil, Mr. Chris Iser who joined the IAC team in the Summer of 2024.
- WVU-IAC student Mr. Nagendra Sanka graduated with a Master's degree in in December 2023 and joined Car Max as a senior software engineer.
- WVU-IAC student Mr. Bibek Prajapati has created a new cyber security self assessment questionnaire.
- WVU-IAC student Mrs. Rumana Subnom has presented a poster and a paper at ASES 53rd Annual National Solar Conference, GWU, Washington, D.C, 2024 on "**Development of a Methodology Assessing Solar Array Performance Degradation Rate**".
- A peer reviewed paper has been published by WVU-IAC student Mr. Nishan Adhikari along with WVU-IAC alumni Mr. Nahian Ismail Chowdhury in the ***Energies*** journal, which has an impact factor score of 3.0 and a cite score of 6.2 on topic "**Evaluating Electrification of Fossil-Fuel-Fired Boilers for Decarbonization Using Discrete-Event Simulation**".
- A peer reviewed paper has been published by WVU-IAC student Mr. Rupesh Dahal along with WVU-IAC alumni Mr. Prakash Singh Bisht in the ***Processes*** journal, which has an impact factor score of 2.8 and a cite score of 5.1 on topic "**Parametric Energy Efficiency Impact Analysis for Industrial Process Heating Furnaces Using the Manufacturing Energy Assessment Software for Utility Reduction**".
- WVU-IAC students Mr. Nishan Adhikari, Mr. Bibek Prajapati and Mr. Rupesh Dahal have presented a poster highlighting the impactful work at the WVU-IAC at the Statler Research Week Poster Symposium.

Partners of WVU-IAC:

Federal & State Organizations :

Oak Ridge National Laboratory Lawrence Berkeley National Lab

Industry Partners:

Lehigh University IAC ILZRO Volvo Group Legrand Blenko Glass Paul Wissmach Glass Simonton Windows & Doors Wheeling Nippon Steel and others.

Local entities, energy service providers and other organizations.

WVMA WVU Industrial Extension Baltimore Gas and Electric and others .

Faculty of WVU-IAC

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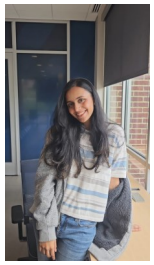
Mr. Nishan Adhikari

Mrs. Rumana Subnom

Mr. Addison Hockins

Mr. Sidhartha Sunkasari

Mr. John Recktenwald



Ms. Maria Zakir

Mr. Chris Iser

Mr. Rupesh Dahal

Mr. Abdullah Alfadhli

Industrial Assessment Centers (IAC) Implementation Grants Program Overview

IAC Implementation Grants Bipartisan Infrastructure Law Provision 40521.b1

- $80M in funding available in the first year (additional funding available in the next couple years depending on demand)
- Grants awards of up to $300,000 per grant to implement unique assessment recommendations on a quarterly funding round basis, at a 50% cost share (valid cost share options include internal capital, in-kind contributions, state and local public programs, private loans – including SBA-guaranteed sources, utility programs, leases, and Energy Savings Performance Contracts). *50% cost share means that the applicant must cover at least 50% of the project cost. So, for instance, if an implementation project or projects costs $100k, DOE can make a $50k grant.*
- Eligibility exclusively for small- and medium-sized manufacturing firms, and water and wastewater treatment facilities. *Small and medium-sized manufacturer (an entity that engages in the mechanical, physical, or chemical transformation of materials, substances, or components; or, a water or wastewater treatment facility) is a firm with: gross annual sales of less than $100M, fewer than 500 employees at the plant site, and annual energy bills of $100,000 - $3,500,000. If the manufacturer/facility is an individual LLC that pays separate taxes from the parent company, then eligibility is based on the LLC.*
- To address energy assessment recommendations by IACs, DOE Combined Heat and Power/ OnsiteEnergy Technical Assistance Partnerships, or other third-party assessors deemed equivalent by DOE

Workstream 1:Implementation Grants Funding

Provide federal funding to eligible SMMs to implement recommendations made in:

- No-cost IAC or CHP/Onsite Energy TAP assessments starting in 2018, or
- Qualified third-party assessments starting in 2021

Covered projects include energy assessment report recommendations that:

- Improve site energy and/or material efficiency
- Improve site cybersecurity infrastructure
- Improve site productivity
- Reduce site waste production
- Reduce site greenhouse gas emissions and/or non greenhouse gas pollution

Grant Eligibility Requirements

All three grant eligibility requirements can be determined using either last completed fiscal year or year in which the assessment was completed (if different).

If the manufacturer/facility is an individual LLC that pays separate taxes from the parent company, then eligibility is based on the LLC.

Annual Gross Sales

- Less than $100M.
- Based on the manufacturing firm/entity.

Number of employees

- Fewer than 500.
- Based on the facility/plant site.

Annual Energy Bills

- Between $100K - $3.5M
- Based on the manufacturing firm/entity.

Workstream 2:Third-party Accessor Qualification

Identify entities interested in qualifying as a "third-party assessor that provides an assessment equivalent" to an Industrial Assessment Center or CHP/Onsite Energy TAP assessments

Eligible assessors meet the following criteria:

- Applicant is a domestic entity.
- The assessor's protocol and implementation recommendations are vendor-agnostic for implementation-related products and services
- Their assessments are not limited to one or a small set of technology areas or interventions.
- The assessor is willing, if selected for qualification, to provide its assessment protocols and details on calculations when requested, and to interact with, DOE, the IACs, and other keyprogram stakeholders to share best practices and ensure quality.
- There is a reasonable effort to ensure affordability for SMMs

To qualify as a domestic entity, the entity must be organized, chartered or incorporated (or otherwise formed) under the laws of a particular state or territory of the United States; have majority domestic ownership and control; and have a physical place of business in the United States

Getting a Qualified Assessment:

- **Option1- Industrial Assessment Centers (IACs):** Receive a no-cost comprehensive assessment from one of 36 IACs located at four year-universities around the country. To locate the closest IAC and apply, visit: IAC.
- **Option2- Onsite Energy Technical Assistance Partnerships (TAPs):** Receive a no-cost screening assessment for onsite clean energy technology deployment from one of 10 regional TAPs. To locate the closest Onsite Energy TAP and apply, visit: Onsite Energy.

IAC Implementation Grants Program Process:

1. **Receive a Free Qualified Assessment:** Small- to medium-sized manufacturer receives an energy assessment from a qualified assessor (IAC, CHP/Onsite Energy TAP, or third-party* assessor).
2. **Apply for Grant Funding:** Manufacturer applies for IAC Implementation Grant funding of up to $300,000 (with 50% cost share) to implement project recommendations from qualified assessments.
3. **Get Selected and Receive Grant Funding:** DOE selects and works with manufacturer to finalize award size and sign award documents; after project implementation, manufacturer submits invoice(s) of incurred costs to DOE to receive grant funding.

(DOE cannot guarantee that third-party assessments will be free)

To learn more about the grants program, including FAQs and how to apply, visit Energywerx.

The Application Process

When to Apply?

The IAC grants program operates on a rolling basis and applications may be submitted at any time through the year, pending receipt of qualified assessment report, with reviews after the following deadlines:

- October 1, 2024
- January 10, 2025
- Later deadlines to come!

How to Apply?

Thanks to a unique partnership, in contrast to traditional DOE funding opportunities, the IAC grants program has a very simple and straightforward application form and process. Applications should not take more than a couple hours and are filled out via Submittable.com, not a federal government web-site. www.energywerx.org/iac

Other Questions?

The IAC grant program team will be hosting informational monthly office hours:

- August 15, 2024 from 2:00 – 3:00PM ET (RSVP Link)
- September 19, 2024 from 2:00 –3:00 pm ET (RSVP Link)

Click here to review frequently asked questions (FAQs).

If you have additional questions, please

contact ENERGYWERX:
info@energywerx.org