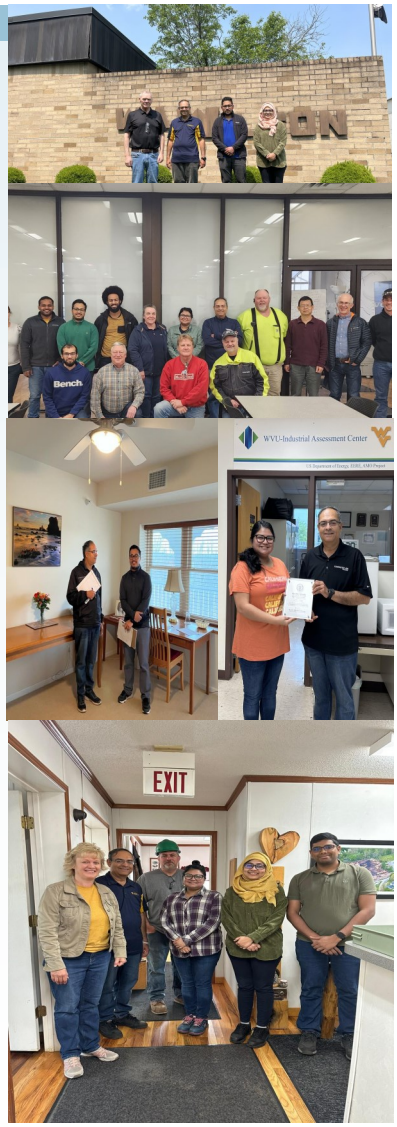
June 2023

Newsletter



Dr. Bhaskaran Gopalakrishnan along with the students at the industrial assessments.

Executive Information

The work described in this newsletter is for the period of 01/01/2023 to 06/12/2023 based on the activities of the West Virginia University Industrial Assessment Center (WVU-IAC). 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 sized enterprises (SME) across the state of WV.

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The newsletter is prepared by Mr. Nagendra Sanka 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. The WVU-IAC identifies the opportunities to save energy and water, reduce waste, and improve energy 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 $3.5 million
- No in-house professional staff to perform the assessment

More info about IAC Program

WV Office of Energy Sponsored Energy Assessments (WVOE):

This program caters to all businesses and government organizations in West Virginia. Activities include energy assessment and benchmarking. The assessments are provided at no cost to the businesses and organizations. Recent assessments in West Virginia include those conducted for a Lumber manufacturing facility, quality glass manufacturing facility, a medical technology facility, cabinet manufacturing facility, outdoor recreational goods facility, a global motion and control technology facility, a skin care products company, a truck manufacturing facility, a high quality industrial coating facility, and an automobile showroom. We sincerely thank Ms. Karen Lasure, Program Manager at WVOE for continued support.

A Glimpse of this Cycle

- Sixteen on-site assessments have been completed during this cycle under IAC, E3 and site visit programs.
- WVU-IAC students received certificates from U.S Department of Energy.
- Dr. Bhaskaran Gopalakrishnan, Director, WVU-IAC received an award for exceptional 35 years of loyal and dedicated service to West Virginia University and to the state of West Virginia, recognized at the Governor's Public Employees Service Recognition Ceremony by Dr. Matt Turner(Executive Vice Chancellor for Administration at West Virginia Higher Education Policy Commission).
- WVU-Industrial Assessment Center (WVU-IAC) directed by Dr. Bhaskaran Gopalakrishnan was selected to receive funding from the U.S. Department of Energy (DOE) to partner with Lehigh University Industrial Assessment Center (IAC) directed by Dr. Alparslan Oztekin, to institute the Mid Atlantic Regional Industrial Assessment Center of Excellence (MARICE). Through MARICE, the WVU-IAC will extend its outreach efforts across the state of WV, therefore supporting WVU's land grant mission.

Recommendations from On-site Assessments

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

Sample Recommendations

IAC Assessment Recommendation

Reduce Outside Ventilation Air for Makeup Air System

Currently, the facility uses 4 AHU which take outside air as well as return air. In the winter these units use outside cold fresh air. The AHU unit's function is to make up air for the paint booth that has been exhausted by exhaust systems. To keep the paint booth pressure constant, the paint booth ventilation and AHU systems must function together. Air balance is an aspect of AHU systems that is sometimes disregarded. To ensure that each area receives the right amount of air, the system should be monitored and rebalanced on a regular basis. The assessment team recommended to reduce the percentage of fresh air intake in air handling units (AHU) in winter months to reduce the heating load on those units and hence save energy.

Energy Savings: 2,222 MMBtu/yr natural gas consumption is reduced, as a result 251,086 lbs of CO_2 emission is reduced.

Implementation Cost: $4,400

Total Savings per year: Energy Cost Savings: $16,843/yr

Payback Period: 4 months.

IAC Assessment Recommendation

Install and Use Screw Expanders in parallel with Pressure Reducing Valves to Generate Electricity.

Currently, the plant is equipped with two natural gas fired steam boilers that have an input capacity of 12.55 MMBtu and 12 MMBtu respectively. The boilers are generating 110 psig steam. Two pressure reducing valves are served by the boilers. Outlet steam pressure of these pressure reducing valves are 60 psig and 15 psig respectively. So, the assessment team recommended a screw expander can be installed in parallel with a pressure reducing valve station and used to generate electricity. This electricity can be used to operate small motors or lighting in the facility.

Energy Savings per year: 169,112 kWh/yr electricity consumption, and 577 MMBtu/yr natural gas consumption is reduced, as a result 370,355 lbs of CO_2 emission is reduced.

Implementation Cost: $48,224

Total Savings per year: Energy Cost Savings: $9,785/yr

Payback Period: 60 months.

IAC Assessment Recommendation

Install a Variable Frequency Drive on Dust Collector Motor

The facility has the wood processing machines used to manufacture wooden cabinets. These machines are connected to the dust collection system with the ducts to extract the dust generated during wood fabrication work. The plant personnel estimated that the wood processing machines operate about 60% of the time only, which means that suction at the some of the machines, when not operational continues to happen, wasting energy. The assessment team recommends installing the VFD on the dust collector along with the sensors, control mechanism, and gates at the suction port.

Energy Savings per year: 10,272 kWh/yr electricity consumption, and, 250 MMBtu/yr Propane consumption is reduced, as a result 57,246 lbs of CO_2 emission is reduced.

Implementation Cost: $29,560

Total Savings per year: Energy Cost Savings: $6,092/yr

Payback Period: 59 months.

IAC Assessment Recommendation

Reduce the Use of Chillers for Mold Cooling Process

The facility is equipped with four interconnected chillers, consisting of three 450-ton chillers and one 350-ton chiller. These chillers operate in accordance with the load requirements. Based on data obtained from the plant, each chiller runs for a total of 3,700 hours/year, 2,800 hours/year, 5,150 hours/year, and 2,950 hours/year, respectively. During the peak summer months, the average tonnage utilized from all four chillers is 506 tons, while in the peak winter months, it is 315 tons. The corresponding kW per ton values for these periods are 1.14 and 0.72, respectively. The assessment team recommends The implementation of free cooling in the injection molding process involves utilizing ambient water to cool the machines, thereby reducing the reliance on chillers.

Energy Savings per year: 108,185 kWh/yr electricity consumption as a result 236,925 lbs of CO_2 emission is reduced.

Implementation Cost: $16,181

Total Savings per year: Energy Cost Savings: $5,257yr

Payback Period: 37 months.

E3 Assessment Recommendation

Install Blowers to avoid the Use of Compressed Air in Painting Booth

Currently, the facility is using compressed air for cleaning the dust and other dirt from the workpiece surfaces prior painting work, as well as for the floor surface cleaning. Producing compressed air is a high energy intensive process and using a blower instead of using compressed air would save a significant amount of energy. Hence, it was suggested by the assessment team to replace the compressed air used for the cleaning purpose with an air blower that will result in energy savings.

Energy Savings: 6,428 kWh/yr electricity consumption is reduced as a result 14,077 lbs of CO_2 emission is reduced.

Implementation Cost: $240

Total Savings per year: Energy Cost Savings: $453/yr

Payback Period: 7 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, and Maryland having the following NAICS codes.

State	NAICS Code
VA	336120
MD	339112
MD	325620
VA	325212
WV	337110
WV	55,551
WV	335999
WV	339112

State	NAICS Code
WV	326199
WV	321211
WV	327211
WV	55,551
WV	33332
WV	112519
WV	55,551
WV	32325

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:

- WVU-IAC lead student Roseline Mostafa was selected as a recipient of this year's Award by DOE for Outstanding Achievement in Energy Engineering by an Industrial Assessment Center Student. Roseline Mostafa is pursuing her PhD in Industrial Engineering under the guidance of Dr. Bhaskaran Gopalakrishnan, working in the area of aggregate planning subject to real time utility rates in a deregulated environment.
- New students Mr. Abednego Abdi and Rumana Subnom have joined WVU-IAC in January 2023.
- WVU-IAC alumni Subodh Chaudhari, and Alexandra Botts currently working at Oak Ridge National Laboratory, and Goutham Challa, PE currently working at InSITE received the "Outstanding Achievement Awards" from the Office of Manufacturing and Energy Supply Chains of the U.S. Department of Energy (DOE).
- WVU-IAC student Mr. Nahian Ismail Chowdhury graduated with a Master's degree in Industrial Engineering in April 2023. Nahian joined WVU-IAC in August 2021
- Mr. Sabin Wagle successfully completed his thesis proposal on Synergistic Analysis of Equest Based Building Energy Modeling and Benchmarking.
- Mr. Prakash Bisht successfully completed his thesis proposal on Parametric Energy Efficiency Impact Analysis of Industrial Process Heating using MEASUR.

Partners of WVU-IAC:

Federal & State Organizations :

WV Office of Energy USDA 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.

The Team of WVU-IAC

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