

April 2022



# Newsletter

## Executive Information

The work described in this newsletter is for the period of 02/01/2022 to 03/31/2022 based on the activities of the West Virginia University Industrial Assessment Center ([WVU-IAC](#)). The [center](#) supports and carries out activities that are funded by US [DOE Industrial Assessment Center program](#), [EPA's Pollution Prevention](#) (P2) program and [USDA's Rural Energy Audit Program](#). The center promotes "efficiency improvements" through structured onsite assessments that target [energy efficiency](#), environmental and process waste, [lean](#) and [smart manufacturing](#). 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.

Website: [WVU-IAC](#)

Email: [Dr. Bhaskaran Gopalakrishnan](#), Director, WVU-IAC  
[bgopalak@mail.wvu.edu](mailto:bgopalak@mail.wvu.edu)  
[Dr. Ashish Nimbarte](#), Assistant Director, WVU-IAC  
[ashish.nimbarte@mail.wvu.edu](mailto:ashish.nimbarte@mail.wvu.edu)



The newsletter is prepared by [Mr. Raghu Vamshi Sunkasari](#) in collaboration with the [WVU-IAC](#) students and Directors. The [WVU-IAC](#) is located in the [Statler College of Engineering](#) at [WVU](#).



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

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## 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 [U.S. Department of Energy](#) 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](#)

### 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 construction equipment supplier, a hydraulic repair service plant, a metal stamping facility, a hotel, a cinema hall, a bowling alley, a chocolate manufacturing facility, a steel fabrication facility, a medium-duty truck assembly facility, and, a steel coating mill. We sincerely thank [Ms. Karen Lasure](#), Program Manager at [WVOE](#) for continued support.

### U.S. EPA Pollution Prevention (P2) Program:

Reduction of waste at the source level by providing Technical Assistance and Training is one of the most effective methods to assist facilities with identification, development and adoption of [Pollution Prevention](#) (P2) approaches.

The [Industrial Management and Systems Engineering Program](#) at [West Virginia University](#) offers Technical Assistance and Training Programs for the food and beverage manufacturing and processing facilities, and the Metal Manufacturing facilities in the state of West Virginia to assist facilities with identification, development and adoption of Pollution Prevention (P2) methods.

Technical Assistance program involves on-site [P2 assessments](#). The project team makes a planned visit to the facility to assess and gather data on energy, water, material and manpower use. The data and inputs from the facility personnel is used to develop P2 recommendations. A detailed report based on the findings of the on-site visit are submitted to the facility within a few days from the on-site P2 assessment. The report contains several recommendations concerning

- [Energy efficiency](#)
- [Water](#) and [material waste reduction](#)

- [Lean implementation](#)
- [Air Pollutants](#) and [Greenhouse Gas Evaluations](#)

Training Workshops are organized to train businesses/facilities about the source reduction techniques to help them adopt and implement P2 approaches, and to increase the development, adoption, and market penetration of greener products and sustainable manufacturing practices.

- [Participate in the Technical Assistance program and/or Training Workshops](#)
- To learn more about the [P2 program](#)

### **USDA Program:**

This program is specifically designed to provide energy efficiency assistance to agricultural producers and for-profit small businesses located in the rural parts of West Virginia. The project team conducts on-site energy audits specifically developed for agricultural producers and rural small businesses and a detailed [energy assessment report](#) is submitted to the client.

**Eligibility:** Rural agricultural producers and for-profit small business are eligible to receive energy audit through this program. A for-profit small business is defined as any business that employs less than 500 people in a designated rural area and makes under a certain revenue based upon the type of business.

**Benefits:** Our energy assessment recommendations can help save from 5 to 10 % of energy costs in areas of lighting, HVAC and building envelope thermographic analysis per year. The analysis of high energy consuming processes could result in even higher cost saving recommendations.

Using the energy assessment report, the clients can apply for financial assistance through [USDA-REAP](#) grants and guaranteed loans programs. The grants range from \$1,500 to \$250,000, and cannot exceed 25% of total project costs. The maximum guaranteed loan is \$25 million, which may not exceed 75% of total project costs.

**Audit costs:** As a participant in this program the client is only expected to pay \$125 for a full energy audit of their facility and will receive a comprehensive [energy assessment report](#). This type of audit normally averages around \$3,000 but funding from the [USDA](#) covers the majority of the cost.

[More info about program](#)

## **A Glimpse of this Cycle**

- Ten on-site assessments have been completed during this cycle under IAC, P2, and USDA programs.
- [WVU-IAC](#) has hosted a virtual training workshop on Energy Efficiency, Energy Benchmarking, Productivity Improvement, and Pollution Prevention (P2).
- [WVU-IAC](#) students received certificates from [U.S Department of Energy](#).

## Recommendations from On-site Assessments

The [WVU-IAC](#) has conducted several assessments at various manufacturing facilities in the states of West 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 (West Virginia)**

##### **Develop A Demand Monitoring System to Reduce Electrical Demand Cost**

[Power](#) companies [charge](#) their customers for the peak kW [demand](#) each month. This is done to encourage their customers to reduce the power spikes in their operations. Therefore it was recommended to Install a demand controller to monitor the [electrical demand](#) pattern and schedule the equipment accordingly to reduce the demand cost.

**Energy Savings:** 288,823 kWh/yr Electricity consumption is reduced as a result 632,522 lbs of CO<sub>2</sub> emission is reduced.

**Implementation Cost:** \$22,111

**Total Savings per year:** Energy Cost Savings: \$31,738/yr

**Payback Period:** 9 months.

#### **IAC Assessment Recommendation (West Virginia)**

##### **Heat Recovery from Exhaust to Utilize in Absorption Chiller**

An absorption [chiller](#) can be utilized to combat high demand charges through peak-shaving and a need for [HVAC](#) assistance [Absorption chillers](#) operate differently than the more popular compression chillers. The cooling effect is essentially driven by heat energy rather than mechanical energy. It is recommended to utilize the [waste heat](#) from the RTS exhaust in an absorption chiller to be used for office cooling.

**Energy Savings per year:** 2,722,865 kWh/yr Electricity consumption, and, 30,905 MMBtu/yr Natural Gas consumption is reduced, as a result 9,455,339 lbs of CO<sub>2</sub> emission is reduced.

**Implementation Cost:** \$254,051

**Total Savings per year:** Energy Cost Savings: \$220,901 /yr

**Payback Period:** 14 months.

## **IAC Assessment Recommendation (West Virginia)**

### **Reduce Infiltration on Dock Doors by Installing Air Curtain and Insulating Rubber Strip**

It was observed that 36 dock [doors](#) have infiltration problem. Installing air [curtain](#) can reduce the [air infiltration](#) when the dock doors are remained open and installing [insulating](#) rubber strip on the gap can [eliminate the infiltration](#) remaining time as the facility is conditioned all the time with the [HVAC](#) system regardless of the operation. Hence it will reduce the annual [energy](#) consumption required for [heating](#) and [cooling](#) purposes.

**Energy Savings:** 174,051 kWh/yr of Electricity consumption, and, 3,915 MMBtu/yr Natural Gas consumption is reduced, as a result 823,567 lbs of CO<sub>2</sub> emission is reduced.

**Implementation Cost:** \$148,862

**Total Savings per year:** Energy Cost Savings: \$53,983/yr

**Payback Period:** 29 months.

## **P2 Assessment Recommendation (West Virginia)**

### **Recover Junk Area Space**

The facility is having unused space, which is filled with old machinery and scrap materials. Industrial space should not sit idle as it is possible to generate revenues in many ways. The [scrap material](#) and machinery in the unused space of the facility can be sold out for its estimated salvage value. It is recommended to use the unused junk area space for the rental.

**Energy Savings:** 267,755 kWh/yr Electricity consumption, and, 777 MMBtu/yr Natural Gas consumption is reduced as a result 674,184 lbs of CO<sub>2</sub> emission is reduced.

**Implementation Cost:** \$27,733

**Total Savings per year:** Energy Cost Savings: \$37,814/yr

**Payback Period:** 9 months.

## **USDA Assessment Recommendation (West Virginia)**

### **Increase Heat Absorption in Sun houses**

The facility currently has 4 [Sun houses](#). These Sun houses are used for salt production. Solar salt extraction is a 2,000-year-old method of evaporating water from a saltwater combination using solar radiation. It is recommended for the facility to increase the [heat absorption in Sun houses](#) during the daytime and nighttime with the help of barrels painted in black filled with water.

**Energy Savings:** 12,648 kWh/yr Electricity consumption, and 3 MMBtu/yr Natural Gas consumption is reduced as a result 28,038 lbs of CO<sub>2</sub> emission is reduced.

**Implementation Cost:** \$5,485

**Total Savings per year:** Energy Cost Savings: \$1,058 /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, and Pennsylvania having the following [NAICS](#) codes.

<a href="#">NAICS Code</a>	State
332710	WV
332812	WV
336120	WV
335	PA
423510	WV
311351	WV
721110	WV
333991	WV
53241	WV
332119	WV

- [WVU-IAC](#) has hosted a virtual training workshop on Energy Efficiency, Energy Benchmarking, Productivity Improvement, and Pollution Prevention (P2). The workshop was held on 29th March 2022. WVU-IAC clients and students have attended the workshop.

## 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 \(NxEAT\)](#)

## Awards and Recognition:

- Dr. [Bhaskaran Gopalakrishnan](#) has been designated to serve on the [AEE SEP](#) Performance Verifier ([SEP PV](#)) Certification Board and the [AEE](#) 50001 Certified Practitioner in Energy Management Systems (50001 [CP EnMS](#)) Certification Board.

## Partners of WVU-IAC:

[WV Office of Energy](#)  
[WV ASHRAE](#)  
[WV MEP](#)

[USDA](#)  
[Oakridge National Laboratory](#)  
[EEWV](#)

[EPA](#)  
[WV DEP](#)



# The Team of WVU-IAC



[Dr. Bhaskaran Gopalakrishnan](#)

Director, WVU-IAC

Website: [Dr. Gopala](#)

Email: [hgopalak@mail.wvu.edu](mailto:hgopalak@mail.wvu.edu)

Phone Number: [304-293-9434](tel:304-293-9434)



[Dr. Ashish D. Nimbarte](#)

Asst. Director, WVU-IAC

Website: [Dr. Nimbarte](#)

Email: [ashish.nimbarte@mail.wvu.edu](mailto:ashish.nimbarte@mail.wvu.edu)

Phone Number: [304-293-9473](tel:304-293-9473)

## Students



Ms. [Roseline Mostafa](#)

Lead Student



Mr. [Nahian Ismail Chowdhury](#)

Co- Lead Student



Mr. [Gage Donovan](#)



Mr. [Raghu Vamshi Sunkasari](#)



Mr. [Prakash Bisht](#)



Mr. [Sabin Wagle](#)



Ms. [Hailee Hammerquist](#)