May 2021

West Virginia University

Industrial Assessment Center
U.S. DEPARTMENT OF ENERGY

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 09/01/2020 to 4/30/2021 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 on-sight 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.

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The newsletter is prepared by Mr. Raghu Vamshi Sunkasari in collaboration with the WVU-IAC students and Directors.

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 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 metal fabrication facility, a plastic injection molding facility, a creamery, a commercial printing press, and an automotive stamping and sub-assembly facility. 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 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 audit 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

- Fourteen on-site assessments have been completed during this cycle under IAC, P2, and USDA programs.
- Dr. Ashish Nimbarte, Assistant Director of WVU-IAC has been named the "College's Educator of the Year" for the 2020-2021 academic year by WVU Benjamin M. Statler College of Engineering and Mineral Resources.
- WVU-IAC students received certificates from U.S Department of Energy.
- WVU-IAC student Ms. Rupa Das started a new position as a Planning Engineer at Amazon.
- Mr. Pradyumna Bettagere Jagadish has joined WVU-IAC as a Research Engineer in April 2021.

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)

Install Thermal Energy Recovery (TER) in the Regenerative Thermal Oxidizer (RTO)

The facility has two Regenerative Thermal Oxidizers (RTO), that do not have heat recovery systems. It is recommended to install Thermal Energy Recovery (TER) systems in the regenerative thermal oxidizer (RTO) to preheat the combustion air, thereby reducing natural gas consumption and cost.

Energy Savings: 4,535,828 kWh/yr Electricity consumption is reduced as a result 35,799,049 lbs of CO_2 emission is reduced.

Total Savings per year: Energy Cost Savings: $386,971/yr.

Implementation Cost: $762,271

Payback Period: 24 months.

IAC Assessment Recommendation (West Virginia)

Recover waste heat from the sludge dryer burner to re-use it for sludge drying process

Use the exhaust heat generated by the sludge dryer to dry the sludge. The usage of waste heat for drying would reduce the load on the main sludge dryer burner.

Energy Savings per year: 370,125 kWh/yr Electricity consumption, and 5,204 MMBtu/yr Natural Gas consumption is reduced as a result 1,260,656 lbs of CO_2 emission is reduced.

Implementation Cost: $51,217

Total Savings per year: Energy Cost Savings: $33,515/yr

Payback Period: 19 months.

IAC Assessment Recommendation (Pennsylvania)

Recycle Phosphate Rinse water and Regular Water

Install a phosphate rinse-water recycling system and one wastewater recycling unit to reduce the phosphate rinse water usage cost and regular wastewater disposal cost.

Energy Savings: 520,141 kWh/yr Electricity consumption is reduced as a result 1,139,109 lbs of CO_2 emission is reduced.

Implementation Cost: $101,850

Total Savings per year: Energy Cost Savings: $52,061/ yr

Payback Period: 24 months

IAC Assessment Recommendation (West Virginia)

Install Demand Controlled Ventilation System and Zone Control System

Install a demand-controlled ventilation system and zone control system to reduce the energy consumption of HVAC systems and maintain healthy indoor air quality.

Energy Savings: 343,575 kWh/yr Electricity consumption, and 462 MMBtu/yr Natural Gas consumption is reduced as a result 804,635 lbs of CO_2 emission is reduced

Implementation Cost: $93,756

Total Savings per year:$27,593/yr

Payback Period: 41 months.

USDA Assessment Recommendation (West Virginia)

Recover CO_2 from Fermentation Process

Recover CO_2 from the fermentation process to save on capital spent on the purchase of CO_2 and sale excess CO_2.

Energy Savings: 1,830 MMBtu/yr Natural Gas consumption, and 104,878 kWh/yr Electricity consumption is reduced as a result 7436,473 lbs of CO_2 emission is reduced.

Implementation Cost: $48,936

Total Savings per year: Energy Cost Savings: $43,894/yr

Payback Period: 13 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.

NAICS Code	State
488119	WV
312140	WV
327420	WV
323113	WV
333999	WV
927110	WV
541200	WV
332119	PA
311212	WV
323111	WV
332119	WV
333241	WV
326199	WV
423510	WV

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)

Alumni Activities:

- Ms. Alexandra Botts and Mr. Unique Karki delivered a seminar to graduate students of the WVU Industrial Engineering department. "From WVU Lab to National Lab" was presented by Ms. Botts & "WVU IAC and Beyond" by Mr. Karki.

Student Activities:

- New students Mr. Raghu Vamshi Sunkasari and Ms. Roseline Mostafa have joined WVU-IAC in Spring 2021.

Awards & Recognition:

- Contributions of WVU IAC to improve the energy efficiency was discussed in the virtual roundtable hosted by the Secretary of Energy Jennifer M. Granholm on 3/8/2021.

Partners of WVU-IAC:

WV Office of Energy	USDA	EPA
WV ASHRAE	Oakridge National Laboratory	WV DEP
WV MEP	AMP-Ohio	EEWV

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