West Virginia University-
Industrial Assessment Center

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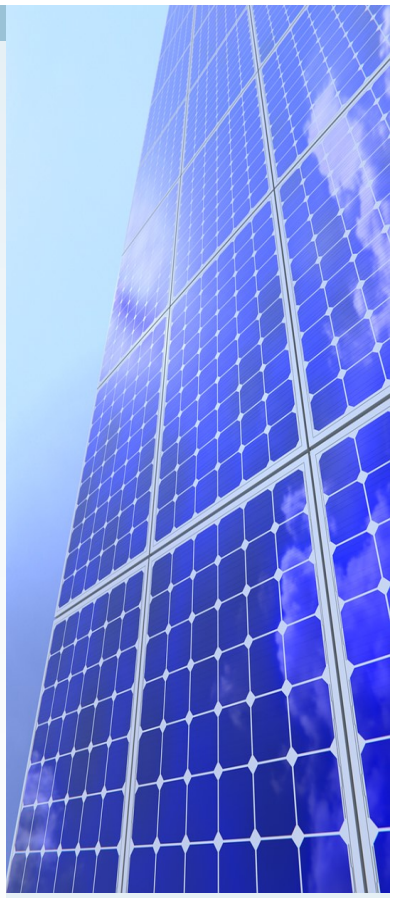

Newsletter

Executive Information

The West Virginia University Industrial Assessment Center (WVU-IAC) is an integral part of the US DOE Industrial Assessment Center program that supports University based centers to provide no-cost energy, productivity, water and waste, and smart manufacturing assessments to small and medium sized enterprises (SME) nationwide and train the next generation of engineers imparting them with knowledge and experience and preparing them for a career in sustainable development.

Preface

The work described in this newsletter is for the period of 09/01/2016 to 05/01/2017 based on the activities of the West Virginia University Industrial Assessment Center (WVU-IAC). The project is funded by the U.S. Department of Energy – Office of Energy Efficiency and Renewable Energy (EERE), Advanced Manufacturing Office (AMO) with overall project management provided by the Center for Advanced Energy Systems (CAES) at Rutgers, The State University of New Jersey.

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The newsletter is prepared by Mr. Praneeth Reddy Araka in collaboration with the IAC students.

Inside this issue

A Glimpse of this Cycle

- Twelve on-site assessments including one water treatment plant assessment done for SME.
- Nine assessment reports uploaded to the DOE database.
- A webinar on the topic of smart manufacturing and energy efficiency was presented by the Director Gopalakrishnan and 2002 WVU-IAC graduate Amol Mate, who is the Vice President of Altizon Inc.
- A few WVU-IAC students and Director Gopalakrishnan attended the SAE World Congress held in Detroit, Michigan in April 2017 and presented and published papers.
- All the students working with WVU IAC were awarded tuition scholarships.
- WVU-IAC client, Simex Inc won the West Virginia Governor's Award for Energy Efficiency at the IOf-WV day at the Capitol, March 2017.

Energy Efficient technologies approved by DOE

The following are some energy efficient technologies developed and approved by DOE which saves energy and cost for the manufacturing industries.

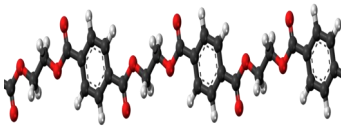
1)Die Casting rotor motors
2)Titanium matrix composite tooling material aluminum die castings
3)Vanadium Carbide coating process

More energy efficient technologies can be found at the following link

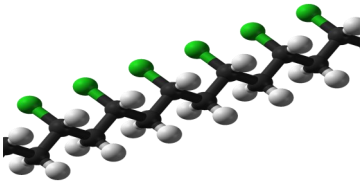
Energy efficient technologies for different industries

Recommendations from On-site Assessments

The WVU-IAC has conducted an assessment at a manufacturing plant in Ohio.
The primary product of the plant is Poly Ethylene and Polypropylene grind.
The team has given several energy efficient and innovative recommendations to improve the functionality of the plant.



Polyethylene



Polypropylene

Sample Recommendations

1. Installation of Evaporators for Effluent Waste Minimization

Evaporators offer the simplest and most effective approach to industrial wastewater minimization. Wastewater evaporation is a tested method for reducing the water content of liquid wastes leaving the higher boiling contaminants behind. This greatly minimizes the amount of waste that needs to be hauled off-site. By converting the water portion of aqueous waste to vapor and separating solids and oils, evaporators provide an environmentally safe method of disposal.

Waste water reduced using evaporators: 608,400 gallons per year
Implementation Cost: $80,000
Savings per year: Savings from waste water reduction: $67,600/ yr
Expenditure on Solid waste disposal: $15,760/yr
Expenditure on Operating : $33,800/yr
Total Savings: $18,040/yr
Payback Period: 54 months

2. Install Smart Water Sensor to Increase Production Rate and Reduce Energy Intensity

The facility utilizes water to separate plastic from the waste product. The water level is important to ensure the production rate of the product. With the reduction in the water level the separation of plastic may be reduced. The smart manufacturing recommendation is to utilize a water sensor within the tank to monitor the water levels within the tank. The sensor will adjust the level of the water within the tank to ensure optimal production rate and decrease product loss. The water sensor would monitor the water level in the tank and either add or remove water to keep the level of the water such that the production rate is optimal.

Energy Savings: 29,000 kWh
Implementation Cost: $2,700
Savings per year: $2,323
Payback Period: 14 months

The WVU-IAC has conducted an assessment at a manufacturing plant in Maryland.
The primary product of the plant is Steel pipes and tubes.
The team has given several energy efficient and innovative recommendations to improve the functionality of the plant.

Sample Recommendations

1. Preheat the Charge Using Stack Gases from Hydrogen Exhaust and Install a Smart Temperature based Control System

Install a heat exchanger and necessary ductwork to preheat the charge before entering the furnace using the exhaust gases from hydrogen exhaust. The preheated air can be directed into the air intake port of the furnace using galvanized steel insulated ductwork. Install a smart temperature based control system in furnace to turn on and off the burners as per heat available in the preheat zone.

BestPractices Tools used:

- Process Heating Assessment and Survey Tool (PHAST)
- MotorMaster+4.0

Energy Savings: 6,833 MMBtu Natural gas utilization is reduced as a result 772,129 lbs of CO_2 emission is reduced.
Implementation Cost: $37,800
Savings per year: $27,106
Payback Period: 17 months.

2. Preheat Combustion Air for the Furnace

Presently, the plant has two furnaces, only one is operated all the time. So, only one furnace is considered for preheating of combustion air using hot flue gases. The average flue gas temperatures, air intake temperature, and the operating conditions for the furnace were measured or assumed based on discussion with the facility personnel on the day of assessment. The suggestion given is installation of a heat exchanger and necessary ductwork to preheat the combustion air for the furnace. The preheated air can be directed into the air intake port of the furnace using galvanized steel insulated ductwork.

BestPractices Tools used:

- Process Heating Assessment and Survey Tool (PHAST)
- MotorMaster+4.0

Energy Savings: 3,349MMBtu Natural gas utilization is reduced as a result 378,437 lbs of CO_2 emission is reduced.
Implementation Cost: $34,450
Savings per year: $12,961
Payback Period: 32 months.

3. Operate Furnace on low Fire and Install Two Speed Drive on Cooling Fan

The plant has two natural gas furnaces, in which only one is operational. They are maintained at high temperatures around $2,000^0$ F the whole year. The boilers have 11 burners each distributed in two zones. The current energy usage by the present system is around 41.2 MMBtu per day. A suggestion is given to operate the furnace at low fire on Sundays to save energy and install a two speed drive on the furnace cooling fan to reduce the electrical energy usage of these motors. By implementing this the energy usage will be reduced to 37.1 MMBtu per day.

BestPractices Tools used:

- MotorMaster+4.0

Energy Savings:

- 207 MMBtu Natural gas utilization is reduced as a result 23,391 lbs of CO_2 emission is reduced.
- 12,064 kWh electricity is saved and as a result 26,420 lbs of CO_2 emission is reduced.

Implementation Cost: $3,840

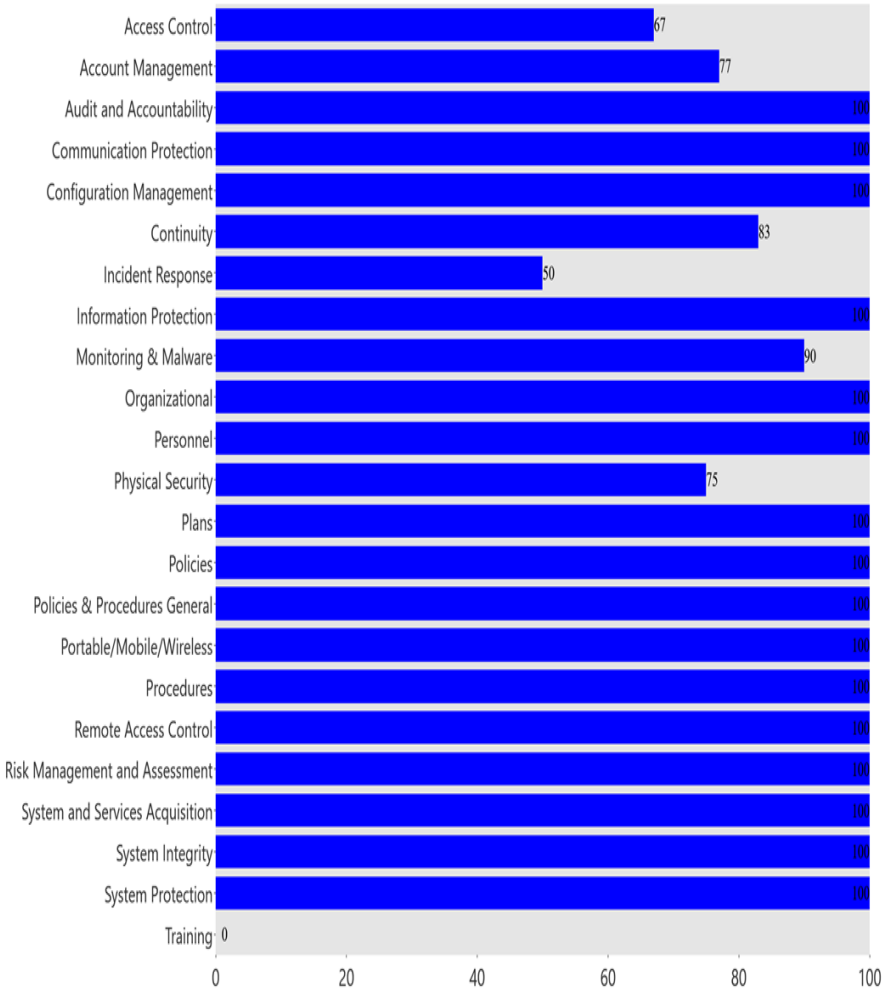
Savings per year: $1,660 is saved by the reduction in usage of Natural Gas and electricity

Payback Period: 28 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 Cyber Security Evaluation Tool (CSET). The CSET includes a selectable array of available standards for a tailored assessment of cyber vulnerabilities. Once the standards were selected and the resulting question sets answered, the CSET creates a compliance summary, compiles variance statistics, ranks top areas of concern, and generates security recommendations.

Results obtained using CSET



Recommendations given based on the results

Area of concern: Access Control:

- There must be administrative procedures for initial authenticator distribution, for lost/damaged authenticators and for revoking authenticators.
- System must employ multifactor authentication for remote access.

Area of concern: Personnel Security:

- Update and review access agreements periodically.

Area of concern: Physical and Environmental Security:

- Review Physical access logs frequently.
- Coordinate the results of reviews and investigations with organization's incident response capability.

Area of concern: Security Awareness and Training:

- Provide basic security awareness training to all the users before authorizing them into the system.
- Review the effectiveness of security awareness training at least once a year.
- Define and document system security roles and responsibilities throughout the system development cycle.
- Provide security related technical training to authorize access to the system.

Area of concern: Incident Response:

- Coordinate incident handling activities with contingency planning activities.
- Implement incident handling capability for security incidents that include preparation, detection and analysis, containment, eradication and recovery.
- Perform backups of a user level information on a defined frequency.

Student Successes

- A special project on “Green Heated Glass” is being done by Hari Jammalamadaka.
- A special project on “Energy Efficiency for Morgantown WV City Buildings” was done by Alexandra Davis.
- Alexandra Davis presented her special project work at the undergraduate research day at the capitol in Charleston WV during February 2017.
- Alexandra Davis won second place in the best paper competition held at the IISE student regional conference in Tennessee in March 2017 for her paper “Energy Assessment - The City of Morgantown” and she was selected to present her paper at the IISE national conference in May 2017.
- Students presented a webinar organized by ORNL on water and waste water treatment energy efficiency.
- Former Lead Student Dr. Amir Abolhassani graduated with a PhD and is currently a data analyst for Ford Motor Corporation in Dearborn, MI.

Awards and Accomplishments

- Simex Inc., located in Parkersburg, WV received energy assessment in 2016 and implemented several recommendations. Simex won the WV Governor’s award for energy efficiency at the IOF Day at the Capitol in March 2017.

Upcoming/ Conducted events

- The all-day ISO 50001 and SEP training took place on May 18th, 2017. The training was conducted by Dr. Edward Crowe of the Manufacturing Extension partnership of West Virginia (WVMEP). Dr. Crowe is a CPEnMS and has actively participated in ISO 50001 projects.

Peer-Reviewed Papers Published through Assessment Inspired Research

1) Kaiser, J.J., Nimbarte, A.D., Davari, D, Gopalakrishnan, B., and He, X. “Study of skin conductance and perceived discomfort of the hand/finger system under controlled atmospheric conditions.” Theoretical Issues in Ergonomics Science: In press.
2) Amir Abolhassani, Ky Layfield, Bhaskaran Gopalakrishnan , "Lean and US manufacturing industry: popularity of practices and implementation barriers", International Journal of Productivity and Performance Management, Vol. 65, Issue 7, pp. 875 – 897, 2016.
3) Hasan H. Latif, Bhaskaran Gopalakrishnan, Ashish Nimbarte, Kenneth Currie, Sustainability index development for manufacturing Industry, Sustainable Energy Technology and Assessments Journal, https://doi.org/10.1016/j.seta.2017.01.010, 2017
4) Al-Shebeeb, O. and Gopalakrishnan, B., "Influence of Materials Properties on Process Planning Effectiveness", SAE Technical Paper 2017-01-0227, 2017, doi:10.4271/2017-01-0227, 2017.
5) Al-Shebeeb, O. and Gopalakrishnan, B., “Computer Aided Process Planning Approach for Cost Reduction and Increase in Throughput”, Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Detroit, Michigan, USA, September 23-25, 2016.

The Team of IAC

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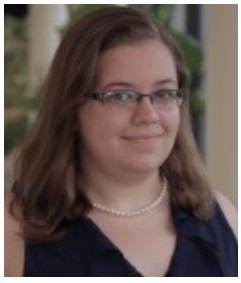

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Mr. Nathaniel Smith

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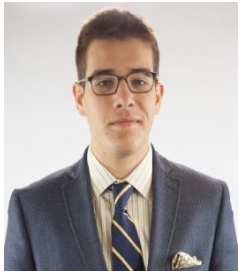

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