Achieving Pollution Prevention Success

Using the Economy, Energy, and Environment (E3) Approach in Michigan

Project Description

Funded by a four-year U.S. Environmental Protection Agency (EPA) Pollution Prevention (P2) grant, the Michigan Department of Environmental Quality (MDEQ), in partnership with several other organizations, supported 11 manufacturers to conserve energy and water, reduce waste, and achieve cost savings using the Economy, Energy and Environment (E3) approach[2]. The grant partners recruited companies to participate in E3, performed E3 assessments and supported the companies to implement E3 recommendations.

Snapshot

Grantee: Michigan Department of Environmental Quality

Title: E3-Michigan: A Strategic Manufacturing and Supply Chain Alliance to Measure Waste Outputs, Greenhouse Gas Emissions and the Cost Benefits of Environmental Protection

EPA Funding: $ 99,054

Total Funding: $ 198,108

Project Period: 10/1/2010 – 11/21/2012, extended to 9/30/2014

EPA Pollution Prevention[1] Grant Number: 00E00352

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E3 Site Assessments

MDEQ worked with EPA, utilities and the Michigan Manufacturing Technology Center (MMTC) to recruit 11 companies to participate in the initial E3 assessments. MMTC and the University of Michigan's Industrial Assessment Center (IAC) performed these initial E3 assessments. The Green Suppliers Network, the Manufacturing Initiative Consortium (GMIC) at Western Michigan University (WMU), which placed college interns in facilities, and the Michigan Retired Engineer Technical Assistance (ReTAP) engineers working within MDEQ, provided technical assistance to companies. A total of 45 on-site visits occurred at the companies. The WMU student interns were provided valuable on-site workforce development opportunities; their E3 assessments considered zero waste to landfill[3] options, energy management, energy efficiency, and lean processes resulting in E3 recommendations to the participating companies. Examples of the WMU interns' work include the following:

- Energy Savings:
  With mentoring assistance from ReTAP engineers, WMU student interns provided a manufacturing facility with an energy baseline including their electrical and natural gas usage along with recommendations for savings. They estimated that by insulating an electric oven used for plastics forming and enrolling in the utility's interruptible service provision, the facility could save more than $227,000 annually.
- Lean Manufacturing:
  WMU student interns conducted a lean assessment – used to increase efficiency and reduce waste in manufacturing processes -- on a process finishing line for a wood product manufacturer. Their process recommendations resulted in significant estimated raw material savings for the company.
- Zero Waste to Landfill:
  WMU student intern teams worked with several companies in southwest Michigan to audit and achieve zero waste goals. One company's audit resulted in the identification of 382,000 pounds of solid waste reduced, 280 metric tons of greenhouse gas emissions reduced, and $44,000 in annual savings.

E3 Case Studies

WMU student interns working with the GMIC developed E3 case studies at five different manufacturing facilities, focusing on resource reduction strategies. These case studies highlighted the environmental and cost benefits of using the E3 approach. Some of the case study strategies included the following: compressed air leak study, waste to energy audit, waste assessment, and a zero waste to landfill program. Details and outcomes from the WMU-GMI interns five initial E3 case studies: http://www.michigan.gov/documents/deq/Final_Green_Manufacturing_in_Michigan_3_467446_7.pdf.

Three additional case studies were developed during the grant period. One of the case studies resulted in a number of environmental benefits and cost savings including:

- Installation of a boiler condensate return line reduced both the water and natural gas consumption by 60% and 34% respectively, and resulted in $15,000/year cost savings.

- Adjustment of set pressure on air compressors, reduced 10,000 kWh[4] of electricity annually.
- Adjustment of the boiler air/fuel ratio, reduced 1,200 MMBTU[5]/year of natural gas usage and resulted in a $15,000/year cost savings.
- Replacement of pneumatic pumps used to move waste oil with direct drive electric pumps, resulted in approximately 600,000 gallons of water conserved annually.
- Design of an emission control system that eliminated the need for a chiller system, resulted in significant reductions in energy and water use, and operational costs.

Training and Outreach

MDEQ, with EPA support, provided training on EPA environmental tracking tools, through three webinars. MDEQ and WMU held two on-site workshops and assessments, and a 2014 P2 Week Sustainable Manufacturing Seminar where several companies shared their successes and challenges relating to their P2 goals and objectives. In total, 355 individuals participated in these events.

Results

Implemented recommendations saved facilities $133,651. Environmental benefits are as follows:

- 73,491 kWh of electricity conserved[6] (similar to the electricity consumed by 9.4 people in Michigan each year)
- 709,487 gallons of water saved[7] (similar to the amount of water in 1.1 Olympic-size swimming pools)
- 842 MTCO2e[8] (similar to removing 177 cars from the road each year)
- 1,205,692,000 BTUs natural gas conserved
- 20,319 lbs of hazardous waste reduced
- 446,428 lbs of non-hazardous waste reduced[9] (equivalent to the amount of trash that 276 people annually generate in the U.S.)

[1] Pollution Prevention involves the reduction or elimination of pollution at the source by modifying production processes, using less toxic substances, implementing resource conservation techniques, conserving water and energy, and reducing greenhouse gases. Energy and water conservation, hazardous materials and greenhouse gas reductions, and cost savings are all benefits of a P2 approach. EPA provides grant assistance to states and tribes to help businesses identify and implement P2 practices.

[2] E3 coordinates federal, state and local resources to provide technical assistance that supports sustainable manufacturing through increased efficiency and conservation of natural resources. E3 is supported by six federal agencies, and state and local entities. An E3 assessment combines a facility P2 assessment with an energy efficiency and a production efficiency assessments to produce recommendations for improvement, which when implemented typically results in cost savings.

[3] Zero Waste to Landfill refers to the management of products to eliminate the volume and toxicity of waste and minimize or eliminate the need to landfill.

[4] kWh = kilowatt hour

[5] MMBTU = million British Thermal Units

[6] To calculate the equivalent of the electricity saved (equivalent to what 9.4 people consume in Michigan each year), the 2014 average per capita electricity consumption from the Michigan monthly electricity bill (654 kWh) was used. The source is the U.S. Energy Information Administration located at: http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

[7] To calculate the equivalent of the water saved (equivalent to the amount of water in 1.1 Olympic-size swimming pools), Olympic sized swimming pool capacity of 660,000 gallons was used to calculate the water savings. The 600,000 gallon value was found at EPA's Water Trivia Facts found at: http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm

[8] MTCO2e = metric tons of greenhouse gases. To calculate the equivalent of the greenhouse gas emissions reduced (equivalent to removing 177 cars from the road each year), we used a value of 4.75 MTCO2e emitted from the average vehicle, and using that, we calculated the equivalent. The 4.75 MTCO2e value is from EPA's GHG-equivalencies online calculator located at: http://www2.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references

[9] To calculate the equivalent of the non-hazardous waste reduced (equivalent to the amount of trash that 276 people annually generate), we used a value of 1,617 pounds that the average person in the U.S. generates annually found in EPA's Electronics Environmental Benefits Calculator found at: http://www2.epa.gov/fec/publications-and-resources#calculator