

WVU POLLUTION PREVENTION NEWSLETTER

DECEMBER 2025

ENERGY EFFICIENCY IN PRACTICE: HIGH-IMPACT MOTOR SYSTEMS AND SMART BUILDING ANALYSIS

Welcome to this edition of the WVU Pollution Prevention Newsletter. This issue highlights practical strategies for improving energy efficiency through optimized electric motor systems and Building Energy Modeling. These approaches help identify cost-effective opportunities, reduce energy consumption, and improve system performance. Building Energy Modeling allows facilities to evaluate upgrades before implementation, minimizing risk and maximizing returns. In parallel, motor system efficiency improvements such as proper sizing, maintenance, and controls deliver reliable savings with short payback periods. Together, these strategies help businesses lower operating costs while supporting sustainable, efficient operations across West Virginia’s industrial and commercial sectors.

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WHAT IS POLLUTION PREVENTION



Pollution Prevention (P2) is one of the key approaches towards an initiative to improve the energy efficiency and productivity of key industries while prioritizing environmental sustainability. The initiative focuses on reducing or preventing pollution at its source.

The primary objective of our Pollution Prevention program is to provide technical assistance to Small and Medium Enterprises in **key industries** in West Virginia by assisting with the identification, development, and implementation of P2 methods. The recommendations provided to the industries are designed to help the business lower operational costs by reducing expenditures, water and energy usage, waste, and disposal costs, while at the same time maintaining and often improving productivity.

Key Industries:

1. Food and Beverage Manufacturing and Processing
2. Chemical Manufacturing, Processing, and Formulation
3. Automotive Manufacturing and Maintenance
4. Aerospace Product and Parts Manufacturing and Maintenance
5. Metal Manufacturing and Fabrication

OUR SERVICES

1. **Pollution Prevention Assessments:** The project team will make a planned visit to your facility to assess and gather data on energy, water, material, and personnel use. Assessment data, along with input from the facility managers, will be used to develop P2 recommendations. A detailed report based on the findings will be submitted to the facility shortly after the on-site assessment.
2. **Energy Audits/Assessments:** Applying for a USDA-REAP grant and need an assessment? Want to save money? The project team will visit your facility and identify opportunities to improve energy efficiency. A detailed report will be provided to the business, including estimates of implementation costs, energy use savings, energy cost savings, and simple payback period for each identified opportunity.
3. **Training Workshops:** Training workshops will be conducted to help businesses learn P2 Best Practices, tools, techniques, and resources available, and how to modify their process or site to improve energy efficiency, productivity, and environmental sustainability.
4. **Technical Assistance:** The project team can provide on-site or off-site technical assistance on a variety of industrial concerns related to topics including pollution prevention, energy efficiency, sustainability, environmental impact, and process improvement. Contact us for assistance!
5. **USDA-REAP Application Assistance:** Applying for grant funding can be a challenge, especially for the small businesses that do not have an expert at grant-writing on the payroll. Our project team can help you navigate the application process and assist with completing the application for USDA-REAP funding.

POLLUTION PREVENTION FOCUS

Electric Motors & Motor System Energy Efficiency

Electric motors are the backbone of industrial operations, powering pumps, fans, compressors, conveyors, mixers, and many other critical processes. According to the U.S. Department of Energy (DOE), [electric motors consume more than 50%](#) of all electrical energy in the United States and more than 85% of industrial production's electrical energy.

How Electric Motors Use Energy

Electric motors convert electrical energy into mechanical energy through electromagnetic interaction between the stator and rotor. Motor performance is defined by horsepower, speed (RPM), and torque. Efficiency depends strongly on how well the motor is matched to its load. Motors operating far below or above their optimal load range tend to waste energy and experience increased wear.

Opportunities to Improve Motor System Efficiency

Energy efficiency opportunities extend beyond the motor itself and include improvements at multiple system levels:

- **Input level Improvements:**

Maintaining proper voltage balance, correcting power factor, and ensuring good shaft alignment can significantly reduce electrical and mechanical losses. Even small voltage imbalances can increase current draw, overheating, and motor degradation.

- **Process-Level Improvements:**

Installing **Variable Frequency Drives (VFDs)** allows motor speed to match actual process demand. For variable-load applications such as pumps, fans, and compressors, VFDs can deliver around [40-50% energy savings](#).

- **Output-Level Improvements:**

Simple operational practices such as shutting motors off when idle, reducing system friction, and recovering waste heat can further reduce energy use.

Motor Management & Maintenance:

A structured **Motor Management System** helps facilities decide when to repair, rewind, or replace motors. Tools such as the DOE's [MEASUR](#) software support motor inventories, efficiency evaluation, and life-cycle cost analysis.

Preventive and predictive maintenance is also essential. Proper lubrication, alignment, and mounting reduce vibration and friction losses, while techniques such as thermal imaging and vibration analysis help identify faults before failures occur.

Common Motor Efficiency Measures

- Correct voltage imbalance and distribution issues
- Implement a motor inventory and management program
- Replace standard V-belts with notched or synchronous belts
- Install VFDs for variable-load applications
- Use timers or controls to shut motors off during idle periods
- Use Proper Motor Sizing

Why Motor Efficiency Matters

Improving motor system efficiency lowers electricity costs, reduces greenhouse gas emissions, and improves system reliability. For small and medium-sized manufacturers, these measures may offer short payback periods and long-term operational benefits, making motor efficiency a cornerstone of effective pollution prevention strategies.



Variable Frequency Drive

Building Energy Modeling: A Simple Tool for Smarter Energy Decisions

Buildings use a significant amount of energy every day for heating, cooling, lighting, and equipment. In fact, building operations account for nearly [30% of global energy use](#). Reducing this energy use can lower utility bills, improve comfort, and reduce environmental impact. One practical tool that helps achieve these goals is **Building Energy Modeling (BEM)**.

What Is Building Energy Modeling?

Building Energy Modeling is the process of creating a virtual model of a building on a computer. This digital model uses basic information such as building size, construction materials, heating and cooling systems, lighting, and local weather to estimate how much energy the building will use throughout the year.

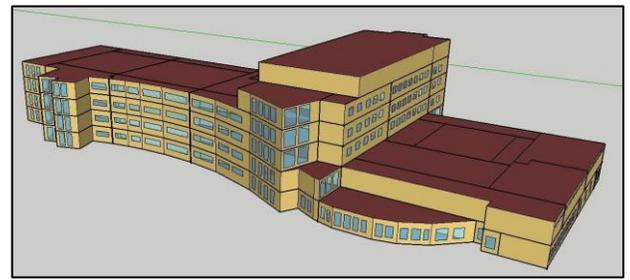
Instead of guessing which upgrades will work best, BEM allows building owners and managers to **test ideas before spending money**.

Why Is Building Energy Modeling Important?

Energy modeling helps answer key questions about building performance and costs. Buildings that use energy modeling during design or upgrades often see [20-30% savings](#) in annual energy costs. BEM is also widely used to meet **energy codes and green building standards**, such as ASHRAE, IECC, and LEED.

Important Questions Building Energy Modeling Can Answer

- Where is most of my building's energy being used?
- Why are my utility bills higher than expected?
- Which upgrades will save the most energy and money?
- Will better lighting or insulation make a real difference?
- How will new heating or cooling equipment affect costs?
- Can I meet energy code or certification requirements before construction?
- What changes improve comfort without increasing energy use?



Example Building Energy Model

How Does It Work?

Energy models use one of three approaches:

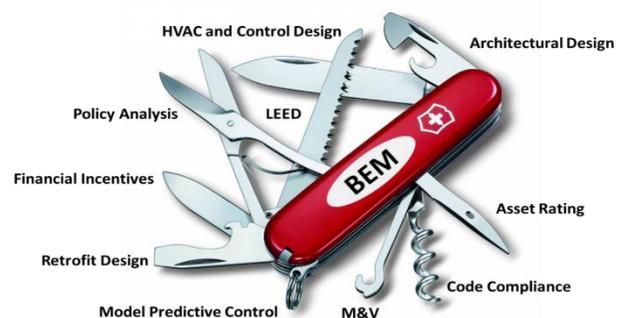
- **Physics-based models** use building materials and system details best for new buildings or major renovations.
- **Data-based models** use past utility bills best for existing buildings with good energy records.
- **Hybrid models** combine both approaches for a balance of speed and accuracy.

Software tools developed by the [U.S. Department of Energy \(DOE\)](#), such as EnergyPlus, OpenStudio, and eQUEST, are commonly used to run these models.

Real Benefits in the Real World

Energy modeling has helped buildings:

- Cut energy use by approximately [20-30%](#)
- Save **thousands of dollars annually**
- Improve indoor comfort and temperature control
- Avoid costly design mistakes
- Plan upgrades with confidence



Use of BEM

To gain a clearer understanding of Building Energy Modeling and see how tools like eQUEST are applied in real-world scenarios, watch our recorded [webinar](#).

HIGHLIGHTING OUR IMPACT

The WVU Pollution Prevention (P2) team takes great pride in the impact we have within the borders of West Virginia since January of 2023. From energy savings to CO₂ reduction, the recommendations we develop for these businesses not only help these businesses improve their sustainability, but also their bottom line!

Look at the impact of the opportunities we have found! →

33 Energy Efficiency/P2 Assessments

79 Recommendations

With Annual Savings of...

\$939,400 in Energy Costs

7,331 MWh of Electricity

16,080 MMBtu of Natural Gas

5,810 Metric Ton CO₂ Equivalent

CONTACT US

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P2 Website



Inquire about or services



Questions or Comments?