CLEAN ENERGY
MANUFACTURING CENTER

AN INITIATIVE OF THE BLUEGREEN ALLIANCE FOUNDATION

Webinar Series:
Innovations in Energy Efficiency

www.theCEMC.com

MEP • MANUFACTURING EXTENSION PARTNERSHIP

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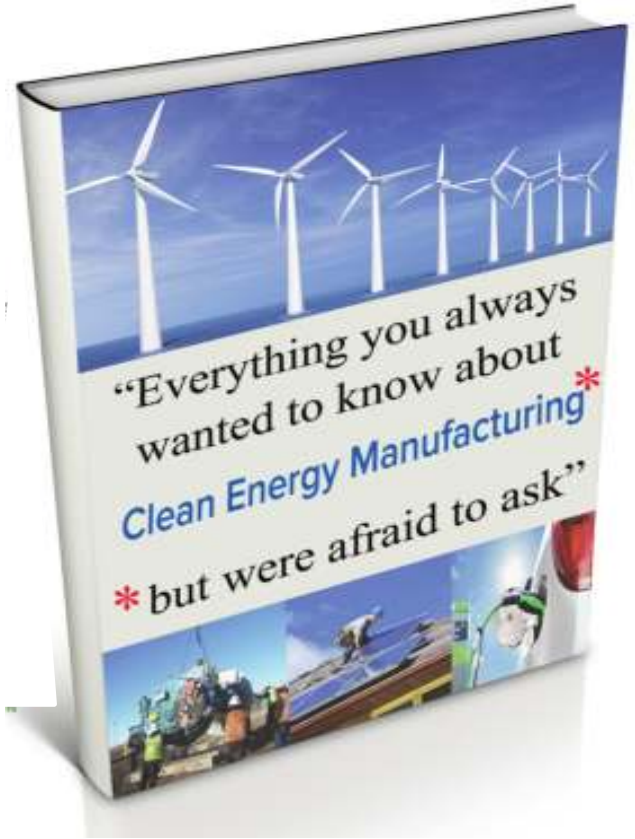
Objectives

- Increase number of domestic suppliers in clean energy sectors
- Help communities expand job creation opportunities in clean energy sectors

Services

- supply chain opportunity workshops / webinars
- technical assistance to companies
- clean economy strategic plans for communities



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Webinar Schedule

January 23rd

Offshore Wind Manufacturing Opportunities

February 27th

Solar Industry Domestic Supply Chain Opportunities (PV)

March 27th

U.S. Department of Energy Clean Energy Manufacturing Initiatives

April 24th

Manufacturing Opportunities in Mass Transit

May 22nd

Latest Update on the Wind Energy Supply Chain and Opportunities

June 26th

Exploring Growth Opportunities in the Natural Gas Industry

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July 24th

Batteries for Electrical Energy Storage in Transportation

August 28th

Geothermal Market and Manufacturing Opportunities

September 25th

Opportunities in Various Clean Energy Sectors

October 23rd

Innovations in Energy Efficiency Markets

November 27th

Latest Update on Offshore Wind Manufacturing Opportunities

**View archived webinars at www.thecemc.com under "Latest News"*

Agenda

- Jacques Koppel, CEMC Director
- Industry Introduction and Pacific Northwest Energy Management Project
  - Jim Haider, Energy Specialist, CEMC
- US Department of Energy
  - Andre de Fontaine, DOE Advanced Manufacturing Office
- A Manufacturing Perspective
  - Simon M Gidney, President, EC Fans & Drives
- Questions and Answers
  - Submit using Chat




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Jim Haider, PE

INDUSTRY INTRODUCTION AND PACIFIC NORTHWEST ENERGY MANAGEMENT PROJECT

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More than One Way to View Energy Conservation

Is the energy bill overhead or a cost of goods sold?

Who is responsible for energy conservation

- **The company?**
- **The utility?**
- **The workforce?**
- **Others?**

Is energy conservation about equipment or people?

Is energy conservation an environmental issue or a business concern?

Which is better– one big energy conservation measure or a collection of small ones?

How many energy audits has your company done?

Can you track the effectiveness of your companies energy conservation efforts?

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Moving up the Energy Maturity Model

5 Incorporates energy into all aspects of business operations.

4 Pursues capital energy saving projects.

3 Implements no-cost/low-cost energy projects.

2 Reduces energy costs through cheaper energy.

1 Perceives energy costs as fixed

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Pacific Northwest Energy Management Project

Worked with several stakeholders to introduce Strategic Energy Management to Montana

- NEEA
- Northwestern Energy

- Enernoc

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Energy Management Systems

An effort to move past a project approach and build energy management into the culture of a company

This has already been done – think safety or quality management.

It creates a structured system fueled by the good ideas of people that actually effect the energy bill on a daily basis

Produces long term results that can be tracked and measured

Management System Approach

- A ***management system*** is a framework of processes and procedures used to ensure that an organization can fulfill all tasks required to achieve its objectives (again, think safety or quality).
- Modern Management Systems are based on Continuous Improvement.(Deming - PDCA)
- Management System *Standards* require external audit for registration. (ISO)

Strategic Energy Management

ISO 50001

US DOE

Superior Energy Performance

System

Standards

CEI

IEI

HPEM

Management Systems for Energy

Strategic Energy Management Programs

Controls

Metering

Employee Awareness

Technical Training

Benchmarking

Analysis

Software

Capital Projects

Plant Assessments

Performance Indicators

Energy Management *Elements*

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How it Works

Assessment

Planning

Implementation

Monitoring & Support

- Energy Management Assessment (where are we?)
- Development of Energy Management Action Plan (EMAP), planning other activities
- Establishing energy policies, energy teams, and organizational communication
- Assisting success at the local team and higher-level program levels

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Some Results

"When we started this effort, I thought it was an energy program that looked like a quality program. Now I realize that it's called an energy program, but it's really a productivity program."

– Plant Manager participating in Energy Management Initiative

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Some Results

"Individually, we always paid a lot of attention to our energy consumption. But this caused us to come together as a group and focus on energy savings and saving the company money."

– Production Manager at a large western mining operation

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Some Results

"It helped us develop goals that were actually meaningful to the company"

– General Manager at a consumer products manufacturing company

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U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

ADVANCED MANUFACTURING OFFICE

Andre de Fontaine, DOE Advanced Manufacturing Office

US DEPARTMENT OF ENERGY

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Better Plants
U.S. DEPARTMENT OF ENERGY

OVERVIEW FOR THE CLEAN ENERGY MANUFACTURING CENTER

Andre de Fontaine
October 23, 2013

U.S. DEPARTMENT OF ENERGY

Today

- About DOE's Advanced Manufacturing Office
- Better Plants Program
- Better Plants Challenge

DOE's Advanced Manufacturing Office

Carbon Fiber exiting Microwave Assisted Plasma (MAP) process

POM laser processing Additive Manufacturing equipment

AMO's purpose is to increase U.S. manufacturing competitiveness through:

- ✓ **Industrial efficiency for specific energy intensive industries**
  - examples: Aluminum, Chemicals, Metal Casting, Steel
- ✓ **Broadly applicable industrial efficiency technologies and practices**
  - examples: industrial motors, combined heat and power (CHP), efficient separations, microwave processing
- ✓ **Manufacturing innovations for advanced energy technologies**
  - examples: carbon fiber composites, advanced structural metals/ joining, wide bandgap semiconductors/ power electronics

AMO Key Program Areas

R&D Projects

- Industrial Efficiency – Specific Industries
- Industrial Efficiency – Broadly Applicable
- Cross-Cutting for Advanced Energy Technologies

R&D Facilities

- Industrial Efficiency – Broadly Applicable
- Cross-Cutting for Advanced Energy Technologies

Industrial Technical Assistance

- Industrial Efficiency – Broadly Applicable

Industrial Efficiency Opportunity

- Across the United States, manufacturers **spend more than $200 billion on energy** each year to operate their plants.
- The industrial sector has the potential to **invest more than $100 billion in energy-efficiency technologies** by 2020, which would result in annual energy savings of almost $50 billion.
- DOE data demonstrates that many facilities can **save 15% or more** annually in energy use through projects with payback periods of less than three years.

Better Buildings, Better Plants Program

- Better Buildings, Better Plants is a national, voluntary industrial energy efficiency leadership initiative.
- It is a key component of the President's Better Buildings Initiative, which seeks to improve the energy efficiency of commercial and industrial buildings by 20% by 2020.
- Through Better Plants:
  - Companies set long-term efficiency goals
  - Receive technical assistance and national recognition for their leadership
- Manufacturers have two opportunities to engage in Better Plants:
  1. Broader-based *Program* level
  2. Higher-level *Challenge*

Value of Setting Energy Efficiency Goals

Organizations with publicly stated energy reduction goals*:

- Implemented **50% more efficiency and renewable energy measures** than organizations without goals.
- Are **2.7 times more likely to increase investments** next year than other organizations.
- Adopted **more energy management practices.**
- Indicated they see **brand value, property value, and other co-benefits as drivers for efficiency and renewable energy** beyond energy savings.

**2013 Energy Efficiency Indicator Survey by the Institute for Building Efficiency*

EERE Deputy Assistant Secretary poses with from Better Plants Partners companies at Oct. 2013 WEEC

EERE Assistant Secretary poses with from Better Plants Challenge companies at the May 23 IETC

Better Plants U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY

Energy Savings from Better Plants Partners

Better Plants consists of over 120 companies, representing more than 1,750 plants and close to 8% of the U.S. manufacturing energy footprint.

	2010	2011	2012*	Cumulative
Energy Intensity Improvement (%)	4.3%	3.7%	2.7%	N/A
Energy Savings	37 TBTUs/yr	32 TBTUs/yr	17 TBTUs/yr	190 TBTUs
Cost Savings (million dollars)	$200/yr	$170/yr	$80/yr	$1000

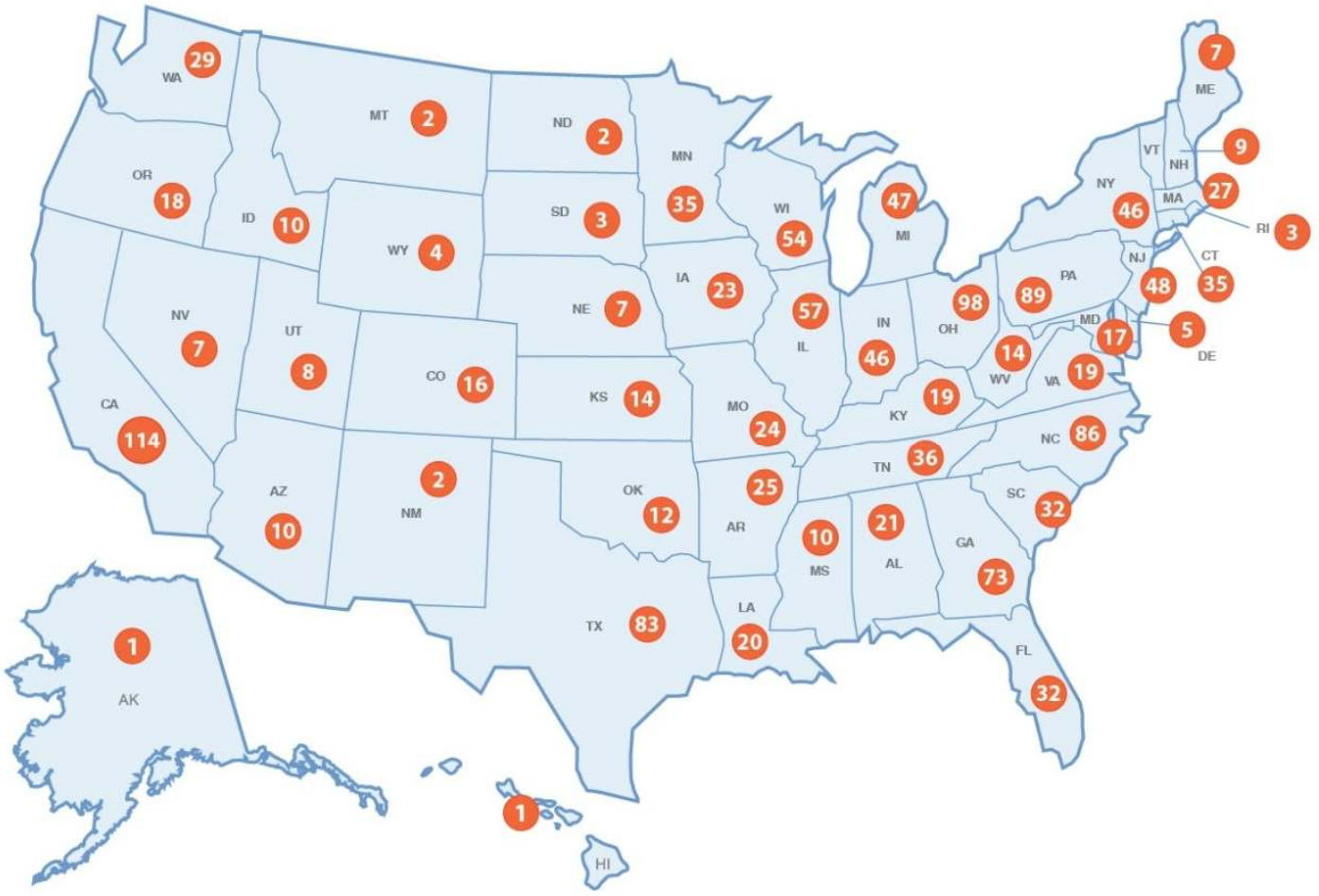
*2012 energy savings numbers are expected to increase as more 2012 reports are submitted

Better Plants Facility Locations*

123
Partner companies

1,750
Plants

**As of Fall 2013*



Partner Benefits

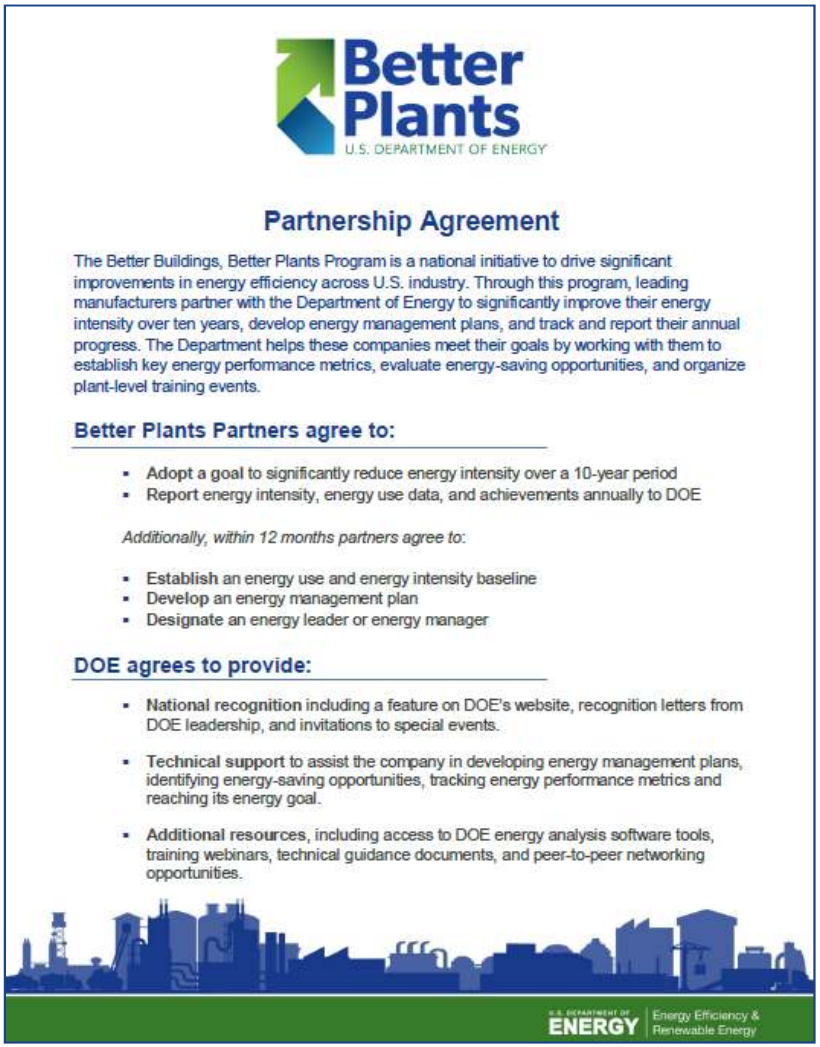
Better Plants Program Partners receive:

- **National recognition** through web profiles, annual recognition letters, invitations to special events, and other opportunities
- Access to a **technical account manager** who can help establish an energy intensity baseline, refine metrics, identify energy saving opportunities, and introduce the company to tools and resources from DOE and other organizations
- **In-Plant Trainings**, 3-4 day sessions that train multiple participants to identify and implement energy efficiency projects in major energy-use systems
- **Opportunities to network** with peers and learn from other leading companies

DOE energy expert Greg Harrell and an Alcoa employee at a recent INPLT event

How Do I Join?

- Simple 2-page partnership agreement form
- Should be signed by CEO or a senior executive
- Lists Partner and DOE roles; explains voluntary nature of agreement
- For more information contact: Joseph Hughes (joseph.hughes@ee.doe.gov) or BetterPlants@ee.doe.gov



Better Plants
U.S. DEPARTMENT OF ENERGY

Partnership Agreement

The Better Buildings, Better Plants Program is a national initiative to drive significant improvements in energy efficiency across U.S. industry. Through this program, leading manufacturers partner with the Department of Energy to significantly improve their energy intensity over ten years, develop energy management plans, and track and report their annual progress. The Department helps these companies meet their goals by working with them to establish key energy performance metrics, evaluate energy-saving opportunities, and organize plant-level training events.

Better Plants Partners agree to:

- Adopt a goal to significantly reduce energy intensity over a 10-year period
- Report energy intensity, energy use data, and achievements annually to DOE

Additionally, within 12 months partners agree to:

- Establish an energy use and energy intensity baseline
- Develop an energy management plan
- Designate an energy leader or energy manager

DOE agrees to provide:

- National recognition including a feature on DOE's website, recognition letters from DOE leadership, and invitations to special events.
- Technical support to assist the company in developing energy management plans, identifying energy-saving opportunities, tracking energy performance metrics and reaching its energy goal.
- Additional resources, including access to DOE energy analysis software tools, training webinars, technical guidance documents, and peer-to-peer networking opportunities.

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Better Plants Challenge Overview

Select number of manufacturers have stepped up to Better Plants Challenge, which calls for a higher level of leadership, innovation, & transparency

Challenge Partners Agree to:

Commit

- Establish energy efficiency goal
- Announce innovations/market solutions

Take Action

- Create a showcase project
- Set an organization-wide plan

Report Results

- Share information and implementation models
- Share portfolio-wide energy performance annually
- Provide periodic updates on milestones

President Obama and former President Clinton take a tour of the upgrades of a Transwestern Building in Washington, DC, December 2, 2011.
(Official White House Photo by Lawrence Jackson)

Current Challenge Partners and Allies

120+ Public, Private, and Non-Profit Organizations:

- 28 Commercial partners
- 13 Better Buildings, Better Plants Partners
- 48 Community partners
- 17 Education partners
- 14 Financial allies
- 3 Utility allies

Together they Represent:

- 2 billion+ square feet of commercial and industrial space committed
- 300+ manufacturing plants
- ~$2 billion in private sector financing

Better Plants Challenge Partners

For more Information

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Better Buildings, Better Plants:
http://www1.eere.energy.gov/manufacturing/index.html

Better Buildings Challenge:

http://www4.eere.energy.gov/challenge/

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an EPEC company

Simon M Gidney, President, EC Fans & Drives

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- ELECTRONICALLY COMMUTATED MOTORS & FANS

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About Us

- EC Fans & Drives is a Massachusetts based company specializing in the design and manufacture of electronically commutated, energy efficient motors and fans.
- With additional offices in the UK and China we are able to offer a global solution.
- EC Fans & Drives has assembled an international team of experts in motor design, fan technology, electronics development and the manufacture of electronic drives and air moving equipment.
- EC Fans & Drives is a division of Epec Engineered Technologies.

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Governmental Focus on Power Consumption

- ENERGY STAR

  - Established by the US Environmental Protection Agency in 1992 (www.energystar.gov)

  - Products can earn the Energy Star label by meeting the energy efficiency requirements set forth in detailed product specifications.

  - A new refrigerator bearing the Energy Star sticker in 2014 will have to consume 25% less electricity than an equivalent model sold in 2013.

  - A typical refrigerator for sale in 2014 will use 20% of the energy as one sold in the mid-1970s, before energy efficiency laws first took effect, according to the Natural Resources Defense Council. At the same time, the average new fridge is 20% larger but costs 60% less, showing how energy efficiency rules don't, as critics sometimes argue, lead to higher costs or inferior service.

Major corporations on board

- Coca Cola 20/20 vision
  - A stated intention to reduce CO2 emissions embedded in ‘the drink in your hand’ by 25%.

  - Coca-Cola are focused on reducing greenhouse gas emissions across its entire value chain, targeting comprehensive carbon footprint reductions across its manufacturing processes, packaging formats, delivery fleet, refrigeration equipment and ingredient sourcing.

Link to Coca Cola Energy Initiative

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Product Overview



Brushless DC & Electronically Commutated Impellers & Fan Units

Frequency Switching Axial Fans


Electronically Commutated & Brushless DC Motors

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Why Electronically Commutated (EC) motors?

- Conventional motors use metallic brushes within the motor to deliver current and cause rotation of the shaft. These brushes wear over time and generate internal heat, which reduces efficiency

- EC motors use commutation electronics to sense the rotor position and electronically switch supply current. This electronic elimination of physical contact dramatically reduces wear and significantly increases reliability

  - Efficiency over 70%, as opposed to 15%
  - Less wear, longer life
  - Lower internal temperature rise
  - Huge reduction in power consumption

  - Motor Comparison

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Commercial Refrigeration

- ECplus ™

- 120V or 220 VAC input
- Versatile Power - one model covers 1-22 Watt shaft power
- Flexible Speed - three pre-set speeds, from 600 – 3,200 rpm
- Efficiency – in excess of 70% (*ratio of usable shaft power to electric input power*)
- Soft Start - quiet ramp up to operating speed, eliminates power surge, vibration & noise
- IP55 – (for an amusing demonstration: (Waterproof!)
- Time Reverse

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Refrigeration Display Cases & Vending Machines
Ecplus motor

EXR motor series

- Low voltage DC – 12, 24 or 48V
- Slim profile - all control electronics incorporated within the motor casing.
- Versatile Power - One model covers 1 Watt to 22 Watt shaft power
- Variable Speed - fully variable speed control within the full speed range of 600 to 5000rpm via PWM or 0-10VDC control input
- Efficiency - in excess of 65% (independent tests in a range hood application exceeded the Energy Star air flow requirement by over 600%)

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Ventilation Products
EXR Motor

Cooker Range Hood

Residential Exhaust Fans

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Motorized impellers

Motorized Impellers

- available with forward or backward curved blades
- high quality, high efficiency external rotor motor integrated into the impeller on all models
- Impellor diameter - 133mm (5”) to 450mm (18”) with varying depths
- Available with ECAC technology
  - AC input but with on-board electronics to convert to DC
  - 0-10V or PWM speed control
  - Thermistor control

Multiple Applications
Motorized Impellers

- Server racks, Telecom switching stations, air conditioning
- Energy Advantages
  - Variable speed control
  - Thermistor control
  - Remote speed adjustment

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Low Energy Axial Fans

- High Performance “AF” Range of axial fans
  - Frequency switching technology
  - Global voltage – same unit will run anywhere from 100V to240VAC
  - Reduced hub gives twice the air flow of a conventional AC fan
  - Frequency switching reduces power consumption to half that of a conventional AC fan
    - In a recent exercise involving a fan tray application using three 120x120x38mm axial fans, the substitution of three AF fans for conventional fans of the same size showed a reduction in power consumption of over 14 watts *per fan,* for a total reduction in power consumption of over 42 watts per fan tray

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Questions and Answers

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For Further Information

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- Or visit our website at www.thecemc.com

Be with us next month

Latest Update on Offshore Wind Manufacturing Opportunities

Wednesday November 27th at 1:00 PM Eastern

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