



Advanced MotorTech, LLC
9117 Park Blvd.
Largo, FL 33777



ENERGY EFFICIENT ELECTRIC MOTORS

Selection & Operation to Save Energy

Learn practical understanding of electric motor performance, energy efficiency and cost savings by proper selection and operation.

June 1 - 3, 2009,

Indianapolis Area (Carmel, IN)

- ◆ ***Principles of Electric Motor Performance & Energy Conversion***
- ◆ ***Understanding Electric Motor Efficiency by Design & Control***
- ◆ ***Electric Motor Energy Economics***
- ◆ ***Ways to Use New Technology to Save Energy & Costs***
- ◆ ***Power Factor & VFD Effects***
- ◆ ***Hands-on Workshops***

Objectives and Benefits

Energy savings is possible for nearly every electric motor application, but not every case can justify the costs to change to a higher efficiency motor. Practical considerations of the real costs for initial purchase, installation, operation and maintenance must be part of the decision process. Also, performance differences between similar motors can lead to unexpected problems.

This course will explain basic principles of electric motor operation to understand how operation of new energy efficient motors differ from older motors. Special emphasis will be on understanding what affects the efficiency of a motor, how to calculate the potential savings of alternative choices, and how to ensure energy savings is realized in the long term. Three number-crunching workshops are included – bring your calculator.

The primary goal of this short course is to extend the practical experience of electric motor users to a solid understanding of electric motor performance, losses, efficiency, how to assess energy costs, and which energy savings projects are likely to be successful.

Those who will benefit include:

- Facility and Energy Engineers & Managers
- Operations Manager
- OEM Equipment Engineers
- Application & Sales Engineers
- Suppliers to Electric Motor Manufacturers and OEMs
- Energy Policy Decision-Makers
- Engineering and Hardware Technology Managers
- Others with Interest in Electric Energy Conservation

You should have some background or general knowledge of electric motor applications and operation. This course is intended primarily for industrial and large commercial motor users, such as manufacturers, utility operations, service companies, large building operations, campus and government operations, value added OEM's.



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Course Schedule

Day 1: Monday, June 1

7:30 – 8:00 Registration

8:15 Welcome & Intro

Fundamentals of Electric Motor Performance

- The Energy Conversion Process
- Types of Electric Motors & Efficiency Differences
- Understanding Performance, Losses and Efficiency
- Recognizing Energy Saving Opportunities

How Losses in Electric Motors Can Be Reduced by Design and Control

- Stator Conductor Losses
- Rotor Conductor Losses
- Stator Core Losses
- Rotor Core Losses
- Windage & Friction Losses
- Stray Losses

Energy Efficient Motors

- What is an Energy Efficient Motor? Premium Efficiency?
- How Efficiency is Measured
- Electrical Motor Standards, NEMA, IEEE, IEC, NEC
- Understanding Catalog & Nameplate Data
- US Regulations, EPACT, New Regs

Electric Motor Economics

- Purchase & Install Cost
- Operating Cost
- Maintenance Cost
- Secondary & Unexpected Costs
- Comparing Electric Motors
- Specification & RFQ Writing
- Retrofit Economic Analysis
- Repair or Replace Decision

Electric Motor Economics Workshop

Day 2: Tuesday, June 2

4:45 Session Ends

8:15 Session Begins

Power Factor & Harmonics

- Power Factor & THD Explained
- How Power Supply Control Can Save Some Energy
- Effects of Harmonics
- Disadvantages of Power Supply Improvement Devices/gimmicks

Application Considerations for Energy Efficient Motors

- Evaluating the Load & Motor
- Performance Differences of High Efficiency Motors
- Evaluating the Power Supply
- Matching Load & Motor
- Slow, Big Motor or Fast, Small Motor?
- Understanding Varying Loads, Supply, Environment

Pump Application Workshop

Operation Considerations to Ensure Energy Savings

- Evaluating Installed Motors
- Monitoring & Testing Options, Recommendations
- Operating Environment
- Bearing Choices & Maintenance

How Variable Frequency Drives Can Save or Waste Energy

- Principles of VFD
- Changes in Losses due to VFD
- Evaluating New Application of VFD System
- Avoiding Unexpected Problems
- Key Application Do's & Don'ts
- Common Control Options

HVAC Motor Application Workshop

4:45 Session Ends

Day 3: Wednesday, June 3

8:15 Session Begins

Opportunities Using New Technology

- Permanent Magnet Machines
- Concentrated Coil Design
- Copper-Rotor Induction Motors
- Application Specific Design
- Optimal Control Methods

Resources for Information

- Design Technology
- Application Ideas & Case Examples
- Selection, Comparison Aids
- Manufacturer & Supplier Information

Resources for Financial Incentives

- Federal Agency Programs
- State & Local
- Utilities
- Cooperative & Non-Profit Organizations

Opportunities to Increase Efficiency of any Motor during Repair/Rebuild Process

- Lowering Copper Losses
- Lowering Core Losses
- Lowering Windings & Friction Losses
- Re-Design to Load & Supply
- Changing the Cooling

11:45 Adjourn

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 Content, agenda, instructors & dates subject to change without notice.

Instructors:

Dr. Keith W. Klontz is President and Founder of Advanced MotorTech LLC, an engineering services company, with emphasis on electric machine and magnetic component design. He holds BS & MS degrees in Electrical Engineering from the University of Illinois, Champaign-Urbana, and a PhD in Electrical Engineering from the University of Wisconsin-Madison. Dr. Klontz is a world-recognized expert in electric machine design and has been teaching energy efficiency of electric machines for over 25 years. He has been involved in the research, development, application and testing of electric machines from 10 Watts to 8 MW, with speeds ranging from angle positioning torque-motors to 60,000 rpm machines. Recent work includes implementing CAE tools and developing design techniques for the design of high efficiency induction motors, permanent magnet alternators, brushless d.c. motors, brush d.c. motors, and very high power density machines.

Dr. Howard Li is a Senior Engineer at Advanced MotorTech LLC. He holds BS and MS degrees in Electrical Engineering from Shenyang University of Technology, China, and a PhD degree in Electrical Engineering from Clarkson University, USA. Dr. Li has more than 5 years of experience in the design, simulation, modeling, and development of a wide variety of conventional and innovative machines, drives, controls and electromechanical components. His work has ranged from linear generators deriving power from ambient vibration to FEA short-circuit transient analysis of megawatt-class machines, to 3D analysis of transverse-flux machines based on new SMC core materials. His main fields of interest are CAE electrical machine design, modeling and analysis of motor drives, thermal analysis and coupled-physics field analysis.



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General Information

Fee Includes: Workbook, program materials, break refreshments, lunch voucher, and certificate.

Cancellation: Notify us at least seven days before the course starts for 100% refund. Cancellations received later than seven days before the course are subject to a 15% late cancellation fee. Cancellations made after the course starts are subject to the full course fee.

Location: Renaissance Indianapolis North
11925 North Meridian St.
Carmel, Indiana
Phone: 317-816-0777



Accommodations: A **reduced-rate block** of rooms has been reserved at the Renaissance Indianapolis Hotel for reservations made **before May 11th**. Identify yourself as a participant in this course to reserve a room at the reduced rate. Additional directions and information will be sent with your enrollment confirmation. Please make your own reservations.

- Yes! Please enroll me in Course No. EEEM-0906**
Energy Efficient Electric Motors, June 1-3, 2009
Fee: \$ 975.00 (USD only)

PAYMENT: (Deadline: must be received before start of course)

- MasterCard VISA Amex
- Cardholder Name _____
- Card No. _____
- Exp ___/___/___ Billing Zip _____ Security Code: _____

- Check enclosed (payable to Advanced MotorTech, LLC) *
 - Bill my company* Purchase Order*
- * Please note payment deadline above; no exceptions; subject to approved credit.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone () _____ email _____

Future Courses:

To receive brochures on upcoming courses, please tell us your interests (send to Training@AdvancedMotorTech.com):

- This Course, another time, another place (when) _____ (where) _____
- AC Machine Design-- Taking Theory to Practice
- Electric Motor Technology for Managers and Sales Staff of Repair & Rebuild Services
- Electric Motor Monitoring and Diagnostics
- Design of High Frequency Magnetic Components for Power Electronic Circuits
- Switched Reluctance Machine Design
- Interior Permanent Magnet & BLDC Machine Design
- Traction Motor Design and Drives
- High Speed Motor Design
- Small Motor Design for Energy Efficiency
- Focused motor type or issue: _____
- Other _____