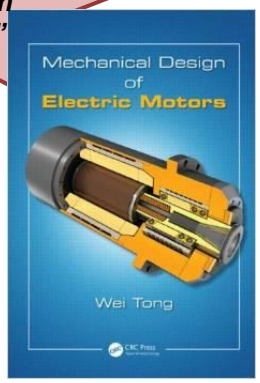
ADVANCED MOTORTECH LLC
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727-412-8200 SALES@ADVANCEDMOTORTECH.COM

Includes Book!
"Mechanical Design of Electric Motors" by Dr. Wei Tong



Practical knowledge based on years of experience

MOTOR MANUFACTURING METHODS

April 28th, 29h, & 30th, 2020 in Denver CO

The only course of this kind available anywhere!

Learn practical understanding & essential concepts of motor manufacturing methods.

- **Overview of Motor Components and their Manufacture**
- **Lamination Options & Assembly Techniques**
- **Coil Options & Inserting Techniques**
- **Low & High Volume Manufacturing Processes, CAPEX**
- **Difference in Rotor Fabrication Among Motor Types**
- **Handling Parts, Sub-Assemblies, Final Assemblies, & Test**
- **Optional Accessories & Features, Finishing Touches**



Objectives and Benefits:

This course provides a foundation of technical and practical principles used for electric motor and generator component manufacturing, assembly, and testing. The purpose of this one-of-a-kind course is to provide understanding of methods and choices for electric motor manufacturing, with attention to effect of design choices on cost, performance and reliability.

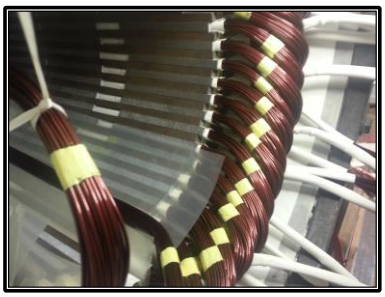
The focus is on topics important to managers, engineers, and production staff associated with motor engineering, manufacturing engineering & production of electric motors and generators. This unique information is also important to sales engineers, technical purchasers, customer service staff, and users of electric motors.

Your expert instructor will help you understand the technology of electric motors and then describe the many manufacutring methods options and tasks condisering design requirements, materials, and tolerance issues. A heavy dose of what is practical and cost-effective is used throughout the course. Instruction assumes no formal technical education.

This acclaimed course uses a real-world, common sense attitude to help demonstrate how key choices affect the motor in terms of performance, quality and value delivered to the customer. Primary focus will be on integral horsepower Permanent Magnet motors and NEMA-frame squirrel-cage Induction machines, including both random-wound and form-wound configurations. Other motor types will be discussed to illustrate their unique features and benefits. Most of the material is on topics and issues common to all motors, as well as most generators.

Those who will benefit:

- **Electrical, Mechanical, and Manufacturing Engineers & Managers**
- **Production, Assembly, Test Technicians for Electric Motors**
- **Application Engineers for Motor Manufacturers, OEMs & Distributers**
- **Sales, Marketing & Customer Service Personnel at All Levels**
- **Facility Engineers, Users, & Purchasers of Electric Motors**
- **Manufacturing Equipment Sales Staff and Engineers**



Course Schedule

Day 1:

7:30-8:00 Registration

8:15 Session Begins

1. Overview of Motors, their Components & Functions

- ☑ Motor types:-What is same & different
- ☑ Key components and their functions
- ☑ Manufacturing issues, operation effects
- ☑ Stator parts & some variations
- ☑ Rotor parts & many variations
- ☑ Major subassemblies
- ☑ Full motor assembly
- ☑ Importance of NEMA-MG1, IEC

2. Laminations

- ☑ Electrical steel materials
- ☑ Lamination dimensions & tolerances
- ☑ Segmented and hinged laminations
- ☑ Punching laminations
- ☑ Laser cutting laminations
- ☑ Coating & annealing, storage

3. Housing

- ☑ Housing types and materials
- ☑ Key housing features, tolerances
- ☑ Housing fabrication & machining
- ☑ Importance of feet tolerances
- ☑ Miscellaneous: fan, fan cover, terminal box, bearing caps, baffles

4. Endbells

- ☑ Endbell types and materials
- ☑ Key endbell features, tolerances
- ☑ Endbell fabrication & machining
- ☑ Importance of mounting face
- ☑ Miscellaneous: oil and grease ports, fan cover bolt-holes, bearing insulation

5. Shafts

- ☑ Common shaft designs, materials
- ☑ Key shaft features, tolerances
- ☑ Providing for rotor core attachment
- ☑ Shaft machining
- ☑ Adding special features to shafts

6. Bearings

- ☑ Common bearing types
- ☑ Why so many bearings?
- ☑ Key bearing features, tolerances
- ☑ Provisions for lubrication, service

16:45 Session Ends

We will keep you nourished!

Daily schedule includes:
Mid-morning break (10:00)
Lunch (12:00-13:00)
Afternoon break (15:00)

Day 2:

8:15 Session Begins

7. Coil Insulation components

- ☑ Slot cell liner, powder coat
- ☑ Wedges, topsticks, sleeving
- ☑ Slot cell divider, mid-sticks
- ☑ Phase separator for end-turns
- ☑ Mica & cloth tapes
- ☑ Surge rope, blocking, lace

8. Random-wound Coils

- ☑ Round wire & coils for motors
- ☑ Key random winding coil features
- ☑ Common methods to manufacture coils
- ☑ Random coil manufacturing—lap coils
- ☑ Random coil manufacturing—concentric & concentrated coils
- ☑ In-slot winding methods

9. Form-wound Coils

- ☑ Types of wires & coils for motors
- ☑ Construction of form coils
- ☑ Form coil manufacturing
- ☑ Bobbin and field coil winding
- ☑ Hair-Pin coils

10. Stator & Rotor Core Stack

- ☑ Stacking methods, important issues
- ☑ Aligning the core slots
- ☑ Clamping methods and effects
- ☑ Bonding cores, pro's and con's
- ☑ Options for PM rotors cores
- ☑ Some post-assembly options
- ☑ Making individual stack, poles

11. Coil Insertion & Connections

- ☑ Effect of slot fill on manufacturing
- ☑ Inserting slot liners
- ☑ Methods for Inserting Coils
- ☑ Inserting wedges, likely problems
- ☑ Phase separator at endturns
- ☑ Connections, lead wires
- ☑ Bench test of winding assembly
- ☑ Lacing and shaping

12. Winding Resin Process

- ☑ Key functions of impregnation
- ☑ Impregnation methods, pro's & con's
- ☑ Compatibility of materials
- ☑ Choice of resins, effect on process
- ☑ No resin at all? Bondable wire
- ☑ Encapsulation or overmold
- ☑ Getting Stator into housing, fixing it

16:45 Session Ends

**Course content is subject to change.*
All issued material may not be covered

Day 3:

8:15 Session Begins

13. Rotor SubAssembly

- ☑ Construction concepts, features
- ☑ Methods of making cage rotors
- ☑ Performance issues of mfrg process
- ☑ Methods of making rotors with coils
- ☑ Getting rotor onto shaft, fixing it
- ☑ Shaft fans, accessories
- ☑ Dynamic balance principles

14. Rotor Magnets & Installing

- ☑ Magnets types & coatings
- ☑ Placing/inserting magnets
- ☑ Fixing in place, more than adhesive?
- ☑ Retention methods, pro's & con's
- ☑ 'Charged magnet' assembly safety

15. Motor Assembly

- ☑ Getting rotor in stator without damage
- ☑ Attaching endbells, bearing caps
- ☑ Fastener choices; torques, adhesives
- ☑ Lifting eyebolts, safety in handling
- ☑ Nameplates & connection diagrams
- ☑ Box labels: What they care about
- ☑ Installation & operating manuals
- ☑ Terminals marking
- ☑ Accessories: thermals, space heaters, resolvers

16. Motor Testing

- ☑ In-process testing
- ☑ Full dynamometer testing
- ☑ Efficiency testing
- ☑ Commercial test
- ☑ Large motor testing
- ☑ Environmental qualification testing
- ☑ The "Acceptance Test Procedure"

17. Other Motor Manufacturing

- ☑ High speed motors
- ☑ High voltage motors
- ☑ Axial flux motors
- ☑ EV/HEV motors
- ☑ Reluctance motors
- ☑ Wind generators
- ☑ Liquid cooled motors

15:00 Closing & Adjourn

Onsite training is available!
Send inquiries to
sales@advancedmotortech.com

Instructor:



Dr. Keith W. Klontz is President and CEO of Advanced MotorTech LLC, an engineering services company with emphasis on electric machine 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 and instructor in electric machine design and has over 50 years of hands-on experience with electric machine applications and design engineering, from concept to performance to repair and failure analysis. He has been involved in the research, development, prototyping, testing and training of very high performance machines from 10 Watts to 50 MW, with speeds ranging from angle positioning torque-motors to 90,000 rpm machines. Recent work includes design of very high efficiency PM and induction motors, very high power density machines, permanent magnet alternators, brushless d.c. traction motors, brush d.c. motors, and low cost manufacturing.

Tuition Fees Include:

- ☑ Text Book: "**Mechanical Design of Electric Motors**" by Dr. Wei Tong (700 pgs, hardcore)
- ☑ Extensive Training Manual (full color)
- ☑ Mid-Morning & Afternoon Breaks w/ Refreshments
- ☑ Lunch Each Day in Session
- ☑ Signed Certificate of Course Completion



Host Training Location:

Denver Marriott West
1717 Denver West Boulevard
Golden, CO 80401, USA
Phone: 303-279-9100

Hotel Accommodations:

A discounted block of rooms with an excellent rate has been reserved at the beautiful **Denver Marriott West** in Golden, Colorado. Reservations should be made before March 27, 2020. Just identify yourself as a participant of the Advanced MotorTech group to reserve a room at the reduced rate.

Enrollment:

☐ Yes! Please enroll me in **Motor Manufacturing Methods – April 28-30, 2020**
Fee: $1925.00 (USD only) **Course No. MMM-2004**
Early Registration Fee: $1800.00 (USD only); Payment received by March 27, 2020
(We reserve the right to not enroll anyone considered to be a competitor or unsuitable, at our sole discretion.)

PAYMENT: (Deadline: *Payment 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) ☐ Purchase Order

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How did you hear about us?

☐ Email/Constant Contact ☐ Electrical Apparatus Magazine
☐ Social Media (Facebook/Twitter/LinkedIn) ☐ Other (Please Specify) _____

* Cancellations received earlier than 14 days before the course are subject to a 15% late cancellation fee. Cancellations made within 7- 13 days before the course starts are subject to a 50% cancellation fee. Cancellations made 6 or less days before the course starts are subject to the full fee.

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