



FIVE DAY SYLLABUS

PRECISION MAINTENANCE COURSE

Location & Dates (TBA)

Integrating practical Bearing Assembly, Lubrication & Dynamic Analysis to extend your machines lives

1. How to extend Bearing and Seal Life
 - Film thickness vs. friction and load wear vs. machinery life
 - Establishing an on site oil analysis program
2. Creating the Mental Model
 - Rotor behaviour, bearing clearances, orbits, energy waste, seal wear and bearing life
 - Vibration terminology, why & how machinery behaviour creates the vibration pattern and how to relate them
3. How to find most common failures
 - Resonance: Mass/Stiffness relationships, effects of resonance (*Fatigue, Energy Loss*)
 - Unbalance: Cause/Effect, shop field balance considerations and limitations
 - Misalignment: Cause/Effect, foundations & bases, determining thermal growth, precision alignment tolerances
4. Separating Sources occurring at 1X running speed
 - Identifying & preventing unbalance, misalignment, bent shaft, eccentricity and resonance
5. How to fix problems forever
 - Proper-bearing installation and maintenance techniques.
 - On-site analysis to maximize bearing and seal life
6. Electrical Theory for Motor Diagnostics
 - Motor and Transformer Theory
7. Motor Faults — Multiple Technology (*Electrical & Mechanical*)
8. Introduction to Motor Circuit Analysis (*Off-line Testing*)
 - Three Phase AC Motors
 - DC Motors
 - Transformers
9. Introduction to Electrical Signature Analysis (*On-line Testing*)
 - Understanding the FFT and Interpretation of Electrical Signatures
10. Developing a Motor Diagnostics Program
 - Estimating Time to Failure
11. Real World Program Considerations
 - How to establish goals and objectives
 - Financial considerations
 - How to recognise and correct troublesome equipment
 - How to determine if you are getting the most from your condition monitoring equipment or program



SEE OVER FOR ENROLMENT FORM

THREE OR FIVE DAY SYLLABUS

MOTOR DIAGNOSTIC WORKSHOP

Location & Dates (TBA)

CERTIFIED COURSE

To improve Motor System Reliability

1. Introduction to Off-line Motor Circuit Analysis (MCA)
2. Review of Electrical & Magnetic Theory for Static Motor Testing
3. Hands-on exercise, to measure the winding system:
 - Insulation Resistance to Ground
 - Winding Resistance
 - Inductance
 - Impedance
 - Phase Angle
 - Current Frequency Response
4. Three Phase Motors:
 - Construction & Operation
 - Induction Motors
 - Synchronous Motors
5. Major Components: uses, construction & operation
6. Transformer Construction
7. DC Motors: construction, application & operation
8. Understanding & Evaluating Winding Systems & Failures using MCA
9. Identify Rotor Faults with MCA
10. Hands-on testing using MCA Troubleshooting & Analysis Instruments
11. Advanced Analysis using MCA
12. Using MCA TREND/EMCAT Software
 - Generate Reports
 - Estimate Time to Failure
13. Develop an Off-line motor diagnostic program
14. Improving Inventory Integrity by Acceptance Testing using MCA
15. Bring it all together

Final MCA segment (below) runs concurrent with On-line Electrical Signature Analysis (ESA) Workshop if combined
16. Maintenance Philosophies, Multiple Technologies, Motor Testing Safety Considerations.
17. Implementing a Motor Testing Program

ESA Workshop continues participant bring PC
18. Introduction to Dynamic Motor *Mechanical* Faults, understanding & correcting motor system failures
 - Unbalance, Misalignment, Rolling Element Bearing Faults, Gear Mesh Problems, Belts Issues, Vane Pass
19. Introduction to Dynamic Motor *Electrical* Faults, understanding & correcting motor system failures
 - Static Eccentricity, Dynamic Eccentricity, Stator Electrical, Stator Mechanical, Power Analysis, Loose / Broken Rotor Bars, DC & VFD Controller Issues
20. Understanding & Implementing Electrical Signature Analysis
 - The FFT, High & Low Fz Spectrum, Modulation & Demodulation, Resolution, Linear vs. Log Displays
21. Class Exercises – hands-on testing to identify Dynamic Motor Faults using ESA
 - Using ATPOL On-line Software
 - Automatic Analysis & Reporting
22. Develop an On-line motor diagnostic program
23. Wrap up, bring it all together.



