

Machinery Health™ Management, Vibration

Companies today rely on fewer people to do more work. That's why the need for training is more critical than ever to achieve and maintain cost-effective maintenance programs. Emerson helps maximize the return on your investment in technology and people. Every year, more than 1500 individuals receive training from Machinery Health Management classes around the world. Our instructors share their own real-world experiences and guide classes through hands-on exercises that reinforce the lesson. Emerson's Machinery Health Management strategy includes training courses designed to help you start-up and maintain your mechanical equipment. Our goal is to provide you with the knowledge to keep your plant running smoothly.

Paths to Success

Emerson Training is a proven means for acquiring confidence and experience in the technologies associated with industrial maintenance. Our alumni are considered valuable assets to their organizations, and can tell of the recognition and job promotions they've received from plant management. Attending Emerson Training is an investment in your career and the efficient and competitive operation of your facility. More than simply a catalog of courses, Emerson Training is an educational path that leads to full mastery of the knowledge and skills necessary in a Machinery Health program. These "Paths to Success" are outlined for you here. They include both theory and application classes that are required for certification(*) as well as product-specific classes for getting the most out of your existing hardware/software tools. These same hands-on, application-intensive courses offered in our own classroom environment can also be taught in your facility. For a calendar schedule of courses along with course descriptions and registration information, go to:

www.assetweb.com/mhm.

Level I Vibration Analyst Path to Success

- Fundamentals of Vibration Analysis*
- CSI 2130 Machinery Health Analyzer - Taken in the same week as Fundamentals of Vibration Analysis
- Basic Vibration Analysis*
- Intermediate Vibration Analysis*
- Introduction to AMS Machinery Manager
- Level I Vibration Analysis Certification*

Level II Vibration Analyst Path to Success

- Advanced Vibration Analysis*
- Intermediate AMS Machinery Health Manager
- Advanced CSI 2130 with PeakVue®
- Level II Vibration Analysis Certification*

Advanced Vibration Analysis Path to Success

- Root Cause Failure Analysis
- Introduction to Windows Based ODS/Modal Analysis (Requires ODS Software)
- Advanced AMS Machinery Manager
- Taking the Mystery out of PeakVue Technology

Lubrication Analyst Path to Success

- Lubrication Level I & II*
- Lubrication Level I & II Certification *
- Oilview for AMS Machinery Manager
- Wear Debris Analysis-taken after Lubrication I & II

Online Monitoring Path:

- CSI 9210 Machinery Health Transmitter
- CSI 4500 Machinery Health Monitor
- Turbomachinery Diagnostics with CSI 4500 with Transient
- CSI 6000 Machinery Health Transmitter

Adding other Technologies to your Credentials

- Laser Alignment / Vertical Alignment
- Basic Ultrasonic Theory & Techniques
- Infrared Analysis for AMS Machinery Manager
- IR Thermography & Level 1 Certification Exam
- Balancing Theory & Application

*Indicates course is required for certification testing.

Fundamentals of Vibration

Course 2069 CEUs: 1.4

Overview

This 2-day vibration training course is for those with no prior experience in vibration analysis. The class prepares participants for the Basic Vibration Analysis Course. Students learn about causes of vibration and methods of measurement. Although the training course does not provide instruction on Emerson's CSI technologies, the class will use them to demonstrate vibration principles.

Prerequisites

None

Topics

- Introduction to Vibration
- Components of a Predictive Maintenance Program
- Basic Fault Identification
- Vibratory Fault Characteristics and Patterns
- Information to Help Jump Start a Vibration Program

Price \$1,050

Location

Knoxville, TN

San Diego, CA
Austin, TX

Start Dates 2009

1/12, 2/9, 3/9, 4/13, 5/11,
6/22, 8/10, 9/14, 10/26,
12/7
2/16, 8/24
2/23, 9/21

Basic Vibration Analysis

Course 2031 CEUs: 2.8

This class is intended for the student who desires an integrated, hands-on approach to vibration analysis. Students will use CSI technologies for lab exercises.

Overview

This 4-day course combines basic vibration analysis and basic machinery health analyzer operation into one comprehensive approach to vibration problem solving.

Prerequisites

Fundamentals of vibration or up to six months of vibration experience is recommended.

Topics

- Vibration Theory and Background
- Basic Analyzer Functions
- Machine Defect Recognition

Participants will receive a complimentary copy of the Pocket Vibration Analysis Trouble-Shooter Guide.

Price \$1,850

Location

Knoxville, TN

San Diego, CA
Austin, TX

Start Dates 2009

1/12, 2/9, 3/16, 4/20, 5/18,
7/20, 8/24, 10/5, 11/9,
12/14
4/13, 9/21
3/2, 8/17



Intermediate Vibration Analysis

Course 2032 CEUs: 2.8

Overview

This 4-day course introduces waveform data as a powerful additional analysis method and stresses phase analysis in all appropriate applications. It also discusses case histories on machinery faults- the next step in the progression of data collection and analysis abilities. The course features CSI machinery analyzers to support these advanced machinery analysis techniques.

Prerequisites

Basic Vibration Analysis and six months to two years vibration experience is recommended.

Topics

- Analyzer Averaging Techniques
- Slow Speed Applications Using Slow Speed Technology (SST®)
- Sensor Selection Guidelines
- Introduction to PeakVue Methods
- Advanced Waveform Analysis
- Sideband Analysis
- Rolling Element Bearing Failure Modes
- Advanced Electrical Analysis Techniques
- Phase Analysis Using Single and Dual Channel

Students will receive a complimentary copy of the Simplified Handbook of Vibration Analysis, Volume I, by Art Crawford.

Price \$1,850

Location	Start Dates 2009
Knoxville, TN	1/19, 3/23, 4/27, 6/8, 7/27, 8/31, 10/12, 11/16, 12/14
San Diego, CA	5/18, 11/2
Austin, TX	6/22, 11/9

Advanced Vibration Analysis

Course 2033 CEUs: 2.8

Overview

This 4-day course interactively teaches single- and dual-channel vibration measurement and analysis techniques, as well as taking measurements and evaluating data. Resonance testing, phase analysis and operational deflection shape testing are key components. The course also introduces digital signal processing concepts and use of AMS Machinery Manager to set up dual-channel and split-channel route collection.

Prerequisites

Intermediate Vibration and one - three years vibration experience is recommended.

Topics

- Digital Signal Processing
- PeakVue®
- Slow Speed Technology (SST®)
- Zoom Analysis
- Transient Techniques
- Waveform Parameters
- Dual Channel Machinery Analyzer Features
- Triggered Data Capture
- Resonance Detection
- Vibration Analysis Problems

Participants will receive a complimentary copy of the Simplified Handbook of Vibration Analysis, Volume II, by Art Crawford.

Price \$1,850

Location	Start Dates 2009
Knoxville, TN	1/26, 3/30, 6/1, 8/24, 11/9
San Diego, CA	7/20
Austin, TX	10/19

Introduction to Windows - Based ODS/Modal

Course 2039 CEUs: 2.8

Overview

This 4-day course is designed to teach Operating Deflection Shape (ODS) and Modal Analysis software. This course uses the CSI 2130 single- and dual-channel Machinery Health Analyzers to teach the practical concepts of ODS/modal measurement techniques and display options. The modal course is introductory and will not cover theory or mathematical background.

Prerequisites

Knowledge of dual-channel analyzers and at least one year of full-time vibration analysis experience is recommended.

Topics

- Building of the Wireframe Model
- Measurement Considerations
- Collecting ODS Data with and without a Tachometer reference
- Utilizing an Impact Hammer with the CSI 2130 Advanced Dual-Channel DLP
- Interpretation of Results

Price \$1,950

Location **Start Dates 2009**
Call to Schedule

To enroll in Machinery Health Management courses please call 800-675-4726 or 865-675-2400. For additional contact information refer to the appropriate contact on page 119. Updated dates & locations are available on our website at www.emersonprocess.com/education.

Electric Motor Diagnostics and MotorView®

Course 2081 CEUs: 2.8

The MotorView course is designed for students who are experienced in vibration analysis and diagnostics, and focuses on the theoretical concepts of motor diagnostics.

Overview

This 4-day course uses labs and case histories to demonstrate the functionality of the MotorView software in determining rotor bar defects using current and flux data. This course is designed for mechanical and electrical skilled personnel who may not have a background in motor theory, operation and construction.

Topics

- Basic electrical principles
- AC/DC motor theory and design
- Variable frequency drives
- Data collection methods
- Current spectra and waveform analysis
- Flux spectra analysis and data evaluation
- Temperature data
- Shaft current
- Analysis of case histories
- Windows configuration for MotorView Operation

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 3/9, 9/14

Level I Vibration Analyst Certification

Course 2054 Length: 1/2-day

Students must show proficiency in:

- Understanding and Interpreting Basic Vibration Data, Spectrum, Waveform, and Phase
- Understanding Common Vibration Terminology
- Identifying Common Machinery Faults
- Identifying Fault Severity Using Vibration Data

Prerequisites

Basic and Intermediate Vibration Analysis Test Format: Written exam only / Passing Grade: 70

Price \$250

Vibration Analysis Certification Exam

Testing can be scheduled to coincide with your course attendance. Please arrange for testing when you call to register for your course.

Location	Start Dates 2009
Knoxville, TN	1/23, 3/27, 5/1, 6/12, 7/31, 9/4, 10/16, 11/20, 12/18
San Diego, CA	5/22, 11/6
Austin, TX	6/26, 11/13

Level II Vibration Analyst Certification

Course 2055 Length: 1-day

Students must show proficiency in:

- Analyzing Advanced Machinery Faults Found in Rotating Equipment, Including:
 - Airflow Disturbances; - Cavitation;
 - Anti-Friction Bearings; - Sleeve Bearings;
 - Resonance; - Electrical; - Phase Analysis
- Identifying and Performing Advanced Diagnostic Measurement Techniques with a Singlechannel Analyzer
- Evaluating Fault Severity and Making Appropriate Repair Recommendations
- Understanding of Basic uses of Multi-Channel Analysis Techniques Including Orbits and Cross-Channel Phase

Prerequisites

Basic and Intermediate Vibration Analysis Test Format: Written essay and case histories exam only Passing Grade: 70 in each portion.

Price \$450

Vibration Analysis Certification Exam Testing can be scheduled to coincide with your course attendance. Please arrange for testing when you call to register for your course.

Location	Start Dates 2009
Knoxville, TN	1/30, 4/3, 6/5, 8/28, 11/13
San Diego, CA	7/24
Austin, TX	10/23

ISO Category I Vibration Analyst

Course 2021 NEW CEUs: 2.8

Overview

This 4-day course complies with ISO standard 18436-2: Vibration condition monitoring and diagnostics. This course is intended to enable students to operate single channel machinery analyzers, dump and load routes, recognize the difference between good and bad data, and compare vibration measurements against pre-established alert settings. The recommended level of cumulative field experience is six months.

Topics

- Principles of Vibration
- Data Acquisition
- Signal Processing
- Condition Monitoring
- Fault Analysis
- Corrective Action
- Equipment Knowledge
- Acceptance Testing

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 1/26, 3/30, 6/22, 10/26

Category I certification exam for ISO Compliant Training, available at the end of the course

Course 2021EX

Test Format: Written exam Duration: 4 hours Passing Grade: 75

Price \$250

Location Knoxville, TN **Start Dates 2009** 1/30, 4/3, 6/26, 10/30

ISO Category II Vibration Analyst

Course 2022 NEW CEUs: 3.5

Overview

This 5-day course complies with ISO standard 18436-2: Vibration condition monitoring and diagnostics. Category II vibration analysts are expected to be able to select appropriate vibration measurement techniques, set up instruments for basic resolution of amplitude, frequency, and time, perform basic spectrum analysis, maintain a database of results and trends, perform single-channel impact tests, classify, interpret, and evaluate test results in accordance with applicable specifications and standards, recommend minor corrective actions, and understand basic single plane field balancing concepts. The recommended level of cumulative field experience is 18 months.

Topics

- Subjects Along with those in Category I Course
- Equipment Testing and Diagnostics
- Reference Standards
- Reporting and Documentation
- Fault Severity Determination

Price \$2,050

Category II certification exam for ISO Compliant Training, available at the end of the course

Location Knoxville, TN **Start Dates 2009**
2/23, 4/20, 8/3, 11/2

Course 2022EX

Test Format: Written exam
Duration: 4 hours Passing Grade: 75

Price \$250

Location Knoxville, TN **Start Dates 2009**
2/27, 4/24, 8/7, 11/6

ISO Category III Vibration Analyst

Course 2023 NEW CEUs: 3.5

Overview

This 5-day course complies with ISO standard 18436-2: Vibration condition monitoring and diagnostics. This course expands on the subjects covered in the Category II course, especially in the areas of fault analysis and corrective actions. The recommended level of cumulative field experience is 36 months.

Category III vibration analysts are expected to be able to:

- Specify appropriate vibration instrumentation hardware and software for both portable and permanently installed systems
- Perform spectrum and time waveform analysis under both steady-state and unsteady operating conditions
- Establish vibration monitoring programs
- Establish specifications for vibration levels and acceptance criteria for new machinery
- Measure and analyze basic operational deflection shapes (ODS)
- Understand and direct the use of other condition monitoring technologies (such as ultrasonics, infrared thermography, and oil analysis)
- Measure and analyze Peakvue measurements
- Perform basic single-plane field balancing
- Prepare and submit machinery condition reports
- Provide instruction and technical direction to vibration trainees

Category III certification exam for ISO Compliant Training, available at the end of the course.

Price \$2,050

Location Knoxville, TN **Start Dates 2009**
5/11, 12/7

Course 2023EX

Test Format: Written exam
Duration: 4 hours Passing Grade: 75

Price \$250

Location Knoxville, TN **Start Dates 2009**
5/15, 12/11

Fundamentals of CSI 2130 Machinery Health Analyzer

Course 2072 CEUs: 1.4

Overview

This 2-day hands-on course focuses on the basic operation of the CSI 2130 Machinery Health Analyzer. Students will collect data on machines similar to those found in plants. This course is designed for students with little or no experience with CSI analyzers, but who are experienced in the field of vibration data collection and analysis. If you also need to learn analysis skills, we recommend taking the Basic Vibration Analysis course.

Note: You may take with Fundamentals of Vibration as a four day course.

Prerequisites Understanding of vibration analysis.

Topics

- Analyzer/Computer Communication
- Predefined Route Data Collection
- Off-Route Data Collection and Setup
- Monitor Mode Measurements
- Peak and Phase Measurements

Price \$1,050

Location Knoxville, TN **Start Dates 2009**
1/14, 2/11, 3/11, 4/15,
5/13, 6/24, 8/12, 9/16,
10/28, 12/9
San Diego, CA 2/18, 8/26
Austin, TX 2/25, 9/23

Note: Also available: Fundamentals of CSI 2120, Course 2071

To enroll in Machinery Health Management courses please call 800-675-4726 or 865-675-2400. For additional contact information refer to the appropriate contact on page 119. Updated dates & locations are available on our website at www.emersonprocess.com/education.

Machinery Health™ Management, CSI 2130 Machinery Health™ Analyzer / PeakVue®

eLearning: Fundamentals of the CSI 2130 Machinery Health Analyzer

Course E2130 CEUs: .6
3 Months Unlimited Access

Emerson's Machinery Health Management training now includes a Fundamentals of the 2130 eLearning course, designed to provide you with the tools you need to perform data collection using the CSI 2130 Machinery Health Analyzer.

Overview

This course provides guided demonstrations through the processes of installing necessary drivers, uploading updated firmware, and loading updated or newly-purchased programs necessary for data collection. Learn how to load a pre-defined route into the CSI 2130, gather general data as well as specialized data, and then interface the data back with a computer for further diagnostic analysis.

Topics

- Analyzer-Computer Communication
- Predefined Route Data Collection
- Off-Route Data Collection and Setup
- Monitor Mode Measurements
- Peak and Phase Measurements

Online training puts the information in your hands at your convenience.

- Access the eLearning course anytime within three months after registration
- Available at your home, office, anywhere you can access the Internet

Price \$299

To Register

To register call 800-675-4726 or
www.emersonprocess.com/education/elearning_mhm.asp

Advanced CSI 2130 with PeakVue

Course 2091 CEUs: 2.1

Overview

This 3-day course is intended for students with single-channel vibration analysis experience and little or no multi-channel experience. This class covers advanced signal processing using Emerson's patented PeakVue technology for slow-speed analysis, transient capabilities, coherence and cross-channel phase, operating deflection shapes (ODS), modal analysis, and other advanced techniques.

Prerequisites

Single channel vibration analysis experience is required.

Topics

- PeakVue
- Resonance Detection
- Dual Channel Data Collection
- Fundamentals of Cross-Channel Data Collection
- Introduction to Coherence and Cross-Channel Phase
- Orbit Data Collection
- Introduction to Operating Deflection Shape (ODS) Testing Methods
- Introduction to Modal Analysis Testing Methods
- Advanced Two-Channel DLP

Price \$1,400

Location

Knoxville, TN
Austin, TX

Start Dates 2009

1/20, 4/14, 7/7, 10/6
5/5

Taking the Mystery PeakVue Technology

Course 2035 CEUs: 1.4

This 2-day course is taught by expert vibration consultants who draw from personal experience to provide training on the advanced functionality of Emerson's patented PeakVue technology. Learn how the autocorrelation coefficient function works and become familiar with the properties of microscopic vibration stress waves.

Overview

This course uses case studies from real-life examples of common faults and live demonstrations, illustrating specific mounting procedures to reliably detect certain faults. The difference between PeakVue techniques and demodulation will also be demonstrated.

Prerequisites

Students should be familiar with vibration data collection and analysis techniques and have used AMS Machinery Manager.

Topics

- Proper PeakVue Set-Ups for all Speeds (as Low as 1 rpm)
- Sensor Selection and Sensor Mounting
- Setting Alarm Levels
- Choosing Trend Parameters
- Analyzing PeakVue Spectra and Waveforms
- Using and Understanding the Auto Correlation Coefficient Function
- Uses of the Circular Waveform Plot

Price \$1,050

Location

Knoxville, TN

Start Dates 2009

2/17, 6/16, 10/20

Autocorrelation as an Advanced Diagnostic Tool

Course 2075 NEW CEUs: .7

Overview

This 1-day course will teach the power of the autocorrelation coefficient function for the analysis of vibration induced time wave form data. The autocorrelation function data generally are computed from the same time wave form data used to compute the spectrum. The strengths of the autocorrelation data are complementary to the strengths of the spectral data.

This class will be instructed by experts in PeakVue and vibration analysis.

Topics

- Introduce the autocorrelation coefficient
- Demonstrate the computation of the autocorrelation coefficient data from the time wave form data
- Highlight the strengths of the autocorrelation coefficient function data relative to spectra data
- Demonstrate the use of the autocorrelation coefficient data as a diagnostic tool to support the spectra data for vibration analysis through several case studies.
- Identify unique patterns of the autocorrelation function data for certain classes of bearing faults, gearing faults, etc.

The class is an excellent companion to course 2035 Taking the Mystery Out of PeakVue Technology

Price \$600

Location Knoxville, TN **Start Dates 2009** 2/19, 6/18, 10/22

Introduction to AMS™ Suite: Machinery Health Manager

Course 2068 CEUs: 2.8

Overview

This 4-day course was designed for the new users of AMS Machinery Manager. Students learn methods of database creation and vital features of route creation such as collecting reference data, analyzer/computer communication, and the basic concepts of Analysis Parameter Sets, Alarm Limit Sets, and Fault Frequency Sets. A CSI 2130 Analyzer will be used to load routes and collect data on lab machinery for basic vibration analysis using Export and Diagnostic Plotting.

Prerequisites

Computer experience with the Windows operating system and Basic Vibration are recommended.

Topics

- Navigation
- Database Creation
- Data Collection
- Basic Analysis and Reporting
- Link to RBMview®
- Data Locker Management (Lite)

This course is based on the current release of the AMS Machinery Manager software. Students can call to verify if the course is appropriate to the version they are using. Advanced Vibration Analysis, Infrared Analysis, Motorview, CSI 4500 Machinery Health Monitor and Oilview modules are covered in other course offerings and are not part of this course.

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 1/5, 2/23, 3/30, 5/18, 7/13, 8/10, 9/21, 11/9, 12/7
San Diego, CA 3/2, 9/14
Austin, TX 4/20, 9/14, 12/7

Intermediate AMS™ Suite: Machinery Health Manager

Course 2074 CEUs: 2.8

Overview

This 4-day course was designed for students who have a basic understanding of AMS Machinery Manager. Students expand their knowledge of machinery analysis techniques, focusing on analysis and reporting using PlotData, Diagnostic Analysis, Export, PeakVue and the full version of RBMview®.

Prerequisites

Introduction to AMS Machinery Health Manager Course

Topics

- PlotData
- Diagnostic Analysis
- Exporting
- PeaVue Technology
- RBMview

This course is based on the current release of the AMS Machinery Manager software. Students can call to verify if the course is appropriate to the version they are using. Infrared Analysis, Motorview, CSI 4500 Machinery Health Monitor and Oilview modules are covered in other course offerings and are not part of this course.

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 1/12, 3/2, 4/20, 6/1, 7/20, 8/17, 11/16
San Diego, CA 5/11, 10/19
Austin, TX 4/27, 10/12

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**Machinery Health™ Management,
AMS™ Suite: Machinery Health™ Manager / CSI Online Technologies**

Advanced AMS™ Suite: Machinery Health Manager

Course 2070 CEUs: 2.8

Overview

This 4-day course is the third in our series of AMS Machinery Manager courses. Gain hands-on experience through the creation of a class database with example machines and collecting vibration data for problem analysis and reporting. Students learn to use the advanced analysis and reporting functions of AMS Machinery Manager.

Prerequisites

Intermediate AMS Machinery Health Manager Course. Intermediate Vibration or one year vibration analysis experience. Experience with the Windows operating system is recommended.

Topics

- Advanced Analysis Features in Diagnostic Plots
- Problem Reporting
- Status-at-a-Glance Operation and Reporting
- Nspectr®
- Wizard - Reporting Techniques and Modification/Addition of Setup Information
- Austostat
- DButly
- DBZip
- NetAdmin
- Data Locker Management

This course is based on the current release of the AMS Machinery Manager software. Students can call to verify if the course is appropriate to the version they are using. Infrared Analysis, Motorview, CSI 4500 Machinery Health Monitor and Oilview modules are covered in other course offerings and are not part of this course.

Price \$1,850

Location	Start Dates 2009
Knoxville, TN	2/2, 5/4, 8/3, 11/2
San Diego, CA	7/27
Austin, TX	7/20, 12/14

CSI 4500 Machinery Health Monitor

Course 2088 CEUs: 2.8

Overview

This course is best suited for those who have a CSI 4500 system installed and operational prior to attending the course. The course is designed for:

- system operators or analysts
- operations personnel using the CSI 4500 daily
- those responsible for configuring databases and analyzing data

Prerequisites

Knowledge of vibration and industrial machinery is helpful, but not necessary.

Topics

- Vibration Basics and Terminology Relating to the CSI 4500
- System Overview: Functionality and System Components
- Online Watch - Used to Monitor the System Daily
- Online Config - Adding a New Machine to an Existing Database
- Plotdata - Spectrums, Waveforms and Trend Data
- PeakVue Processing
- Review of Customer Databases

Price \$1,900

Location	Start Dates 2009
Knoxville, TN	2/16, 5/18, 8/17, 11/16
Austin, TX	7/13

Turbo Machinery Diagnosis with the CSI 4500 with Transient

Course 2089 CEUs: 3.5

Overview

This 5-day course details the operation, maintenance, management, diagnostics and design of rotating machinery using vibration information. Emphasis is placed on interpreting start-up/shutdown and steady state vibration data plots, understanding the sources of rotating machinery vibration and recognizing common machinery malfunctions. This seminar makes extensive use of full featured field diagnostic equipment to reinforce lecture topics. This class is designed for engineers, supervisors, managers, and rotating equipment support professionals responsible for design, operation, and maintenance of rotating equipment

Students receive a copy of Fundamentals of Rotating Machinery Diagnostics, written by vibration monitoring pioneer and rotor dynamics researcher Donald E. Bently.

Price \$2,100

Location	Start Dates 2009
Knoxville, TN	8/24

CSI 9210 Machinery Health Transmitter

Course 2090 CEUs: 1.4

Overview

This 2-day is available at our Austin Training Center, and is meant for companies with FOUNDATION™ fieldbus and installed CSI 9210 systems. The CSI 9210 monitors horizontal motor-pump applications with roller bearing elements and has embedded analysis expertise. Learn how this enabling technology can be used to improve both maintenance and operations work processes.

Topics

- Introduction to the CSI 9210 and Understanding Vibration Analysis
- Commissioning
- Configuring within the DeltaV™ System
- Parameter Trending.

Price \$1,050

Location	Start Dates 2009
Call to Schedule	

CSI 6000 Machinery Health Monitor

Course 2080 CEUs: 1.4

Overview

This 2-day hands-on training course is for students who operate and maintain a CSI 6000 Monitoring System.

Workshops include practice with “live” monitors and racks.

Topics

- Overview of Hardware Components
- Rack Configuration
- Operator Display Software
- Data Acquisition Software
- Interface with CSI 4500 / CSI 4500 Transient
- System Troubleshooting and Maintenance

Price \$1,050

Location Knoxville, TN **Start Dates 2009**
4/7, 10/20

Level I Lubrication with Certification

Course 2082A CEUs: 1.4

Overview

This 2-day course is designed for individuals who have limited or no oil analysis experience. Guidelines and instruction for starting an oil analysis program will be provided. The course focuses on the basic properties of lubricants and lubricant specifications including additive packages. An overview of laboratory testing methods and interpretation of test data is taught. In addition, instruction is provided on proper storage and handling of new, unused lubricants, as well as sample point identification and best practices for collecting samples from machinery. Basic contamination control and wear debris analysis and identification is covered.

Prerequisites

None.

Topics

- Starting a Productive Lubricant Analysis Program
- Analyzing Oil Data
- Identifying Common Types of Wear Debris, their Origins, and Corrective Actions
- The Importance of Contamination Control
- Designing Sampling, Storage and Handling Procedures

Optional Level I Lubrication Certification is available at no charge

Note: May be taken with Level II Lubrication as a 4-day course.

Price \$1,050

Location Knoxville, TN **Start Dates 2009**
San Diego, CA 1/26, 7/27
Austin, TX 6/22
 8/10

Level II Lubrication with Certification

Course 2082B CEUs: 1.4

Overview

Learn the use of oil analysis with other predictive technologies to enhance your machinery health program. Machine life extension and reduction of unscheduled downtime will be covered in depth. Training includes introductions to lubricant engineering, failure concepts, and failure prevention. Information will be provided on greases and synthetic lubricants, including advantages and applications. Guidelines and step-by-step procedures will be offered for consolidating lubricants, setting alarm limits, as well as managing and enhancing existing lubrication programs.

Prerequisites

Basic understanding of lubrication.

Topics

- The Components of RBM Lubrication Program
- Methods for Extending Machine Life
- The Importance of Wear Debris Analysis and Contamination Control
- Lubricant Consolidation
- Establishing Alarms

Optional CSI Level II Lubrication Certification-no charge

Note: May be taken with Level I Lubrication as a 4-day course.

Price \$1,050

Location Knoxville, TN **Start Dates 2009**
San Diego, CA 1/28, 7/29
Austin, TX 6/24
 8/12

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Machinery Health™ Management, Lubrication / Thermography

Oilview® for AMS Machinery Manager

Course 2083 CEUs: 2.8

Overview

This 4-day course is designed for those who are new to CSI onsite oil analysis instruments and experienced users who wish to use advanced OilView features in AMS Machinery Manager. Students learn database creation and modification, creation and modification, Analysis Parameter and Alarm Limit Sets.

The course demonstrates how to set up and configure the OilView software module, discusses calibration and use of OilView instruments (including the CSI 5200 Trivector Analyzer) for analyzing oil samples onsite, and explains data interpretation and basic reporting.

Prerequisites

None.

Topics

- Introduction to Oil Analysis
- Onsite Analysis
- Reference Oil Database Management
- Database Construction and Modification
- Analysis Parameter Sets
- Alarm Limit Sets
- Best Practices for Onsite Analysis Using OilView
- Importing Laboratory Data
- Basic Wear Debris Analysis
- Data Analysis and Reporting

Price \$1,850

Location Knoxville, TN
Start Dates 2009 2/2, 5/4, 8/3, 11/2

Wear Debris Analysis

Course 2084 CEUs: 1.4

Overview

Wear debris analysis (WDA) is often referred to as the most important form of oil analysis. This course teaches how to apply environmental conditions and other outside factors to make an accurate root cause analysis. Attendees will gain a basic understanding of wear particle generation, sample preparation techniques and identification of wear particles.

Topics

- Theory Presentation
- Wear Particle Generation
- Tribology, Friction, and Wear
- Lubrication Fundamentals
- Sample Screening: Discussion of how to use preliminary data and equipment type to select WDA candidates and sample preparation techniques.
- Interpretation of Oil Analysis Results Related to WDA such as OilView Indices and Commercial Oil Laboratory Data
- Sample Preparation Techniques: Discussion of Sample Preparation for Grease, Oil, Hydraulic Fluid, and Synthetics
- Disciplined and Systematic Approach to WDA: Overview of the OilView WDA Module
- Particle Identification and Characterization Exercise
- Identification and Characterization of Wear Debris Using Photographs and/or Live Samples

Price \$1,050

Location Knoxville, TN
Start Dates 2009 4/7, 10/20

Infrared Analysis Software for AMS Machinery Health™ Manager

Course 2018 CEUs: 2.1

Overview

This 3-day course is designed for maintenance personnel who want to learn how to incorporate infrared-related data into AMS Machinery Manager. Infrared analysis establishes the foundation and provides the tools required for a sound thermography inspection program. It identifies the equipment to be scanned, the monitoring schedule, and other information needed to construct a database that defines the monitoring procedures for your program.

Prerequisites

Computer experience with the Windows operating system is recommended.

Topics

- Overview of AMS Machinery Manager
- Thermographic Database Setup Management
- Thermographic Route Management
- File Transfer to/from IR Imager
- IR Event cCollection
- Image Viewing and Event Reporting
- IR Analysis Tools
- IR Reporting
- Case History Compilation

Price \$1,400

Location Knoxville, TN
Start Dates 2009 3/23, 9/28

IR Thermography Level I with Certification

Course 2019 CEUs: 2.8

Overview

This 4-day course is intended for students who have limited or no experience in infrared thermography analysis and diagnostics. Emerson thermography courses meet or exceed Level 1 ASNTTC- 1A recommended practices. Successful completion of the courses and passing of optional examinations may lead to a Level I certification.

Prerequisites

None.

Topics

- Physics of Infrared Energy
- Components of Infrared Light
- System Components and Data Collection
- Setting Acceptance Criteria for Electrical and Mechanical Components
- Data Storage, Trending, and Reports
- System Coordination with Other PdM Technologies
- Built-Up Roofs

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 3/16, 9/21

Basic Ultrasonic Theory and Techniques - Level 1

Course 2067 CEUs: 2.1

Overview

This 3-day level I course is a comprehensive course for individuals with little or no experience in ultrasonic testing. Although introductory, the course offers in-depth coverage of ultrasonic theory and instrument operation. Through lecture and lab exercises, students gain an understanding of technical principles and test procedures.

Topics

- Introduction to Ultrasonics
- Basic Principles of Acoustics
- Measurement Techniques
- Testing Methods

Also Available: Ultrasonics Level I Certification Exam.

Price \$1,400

Location Knoxville, TN **Start Dates 2009** 3/17, 7/7, 10/27

Balance Theory and Application

Course 2015 CEUs: 2.8

Overview

This 4-day teaches how to perform single- and dual-plane balancing using both graphical and analyzer-based balancing methods. The class uses the CSI 2130 Machinery Health Analyzer.

Topics

- Imbalance Identification
- Use of Vectors
- Calculating Influence Coefficients
- Use of the Auxiliary Analyzer Balance Functions
- Use of UltraMgr Module
- Calculating a System Lag
- Estimate Trial Weights
- Balancing Flexible Rotor Systems
- Balancing Overhung Rotors
- Applying Balancing Reqniques in an Industrial Setting

Also Available: Training for CSI 2120 & UltraSpec Products.

Note: May be taken as two 2-day classes

Price \$1,850

Location Knoxville, TN **Start Dates 2009** 2/9, 6/15, 10/12

Laser Alignment for CSI 2130

Course 2092 CEUs: 1.8

Overview

This 2-1/2 day class is intended for students who have limited or no alignment experience. It provides training on shaft alignment using CSI technologies focusing on the CSI 2130 Machinery Health Analyzer. This course includes hands-on training with horizontal alignment and vertical alignment demonstrators and covers management of an alignment program using the AMS Machinery Health Manager software.

Topics

- Alignment
- Required Pre-Shutdown Checks
- Pre-alignment Checks and Corrections
- The Science and Art of Alignment
- Tools & Techniques for Moving Equipment
- Time-Savers
- Alignment Information Management
- Management Systems: Methods and Advantages

Price \$1,200

Location Knoxville, TN **Start Dates 2009** 2/17, 6/23, 10/6

To enroll in Machinery Health Management courses please call 800-675-4726 or 865-675-2400. For additional contact information refer to the appropriate contact on page 119. Updated dates & locations are available on our website at www.emersonprocess.com/education.

Machinery Health™ Management, Alignment / Maintenance Optimization

Laser Alignment (for Model 2120 or UltraSpec Users)

Course 2043 NEW CEUs: 1.8

Overview

This 2.5-day class is intended for personnel who have limited or no alignment experience. The course provides training on shaft alignment using technology from the CSI Model 2120 or UltraSpec laser alignment product line. The course includes hands-on training with horizontal alignment demonstration, and covers management of an alignment management program with UltraMgr module of AMS Machinery Manager.

Topics

- Alignment: What is it? Why do it?
- Required Pre-Shutdown Checks
- Pre-alignment Checks and Corrections
- The Science and Art of Alignment
- Tools and Techniques for Moving Equipment
- Time-Savers
- Use of CSI Laser Alignment Product Line
- Alignment Information Management

Price \$1,200

Location
Knoxville, TN

Start Dates 2009
6/8

Vertical Alignment (for UltraSpec Users Only)

Course 2061 CEUs: .7

Overview

This 1-day course is intended for students who have alignment experience. The course provides training on shaft alignment using technology from the CSI laser alignment product line. The course includes hands-on training with vertical alignment demonstrators.

Prerequisites

Alignment experience is recommended.

Topics

- The Science and Art of Alignment
- Tools and Techniques for Moving Equipment
- Time-Savers
- Use of Emerson Laser Alignment Product

Price \$700

Location
Knoxville, TN

Start Dates 2009
6/11

Maintenance Best Practice

Course 2093 NEW CEUs: 1.4

Overview

In today's maintenance programs proper installation and maintenance are essential. This 2-day Maintenance Best Practices course will give the maintenance technician the knowledge to correctly identify various types of components, proper installation and their location on various machines. The course will also discuss safe work practices and safe lock out and tag out.

Topics

- Bearing Identification and Installation
- Component Lubrication
- Mechanical Seal Identification and Installation
- Couplings
- Thread Pitch
- Pumps (Centrifugal, Positive Displacement.)
- Compressors
- Turbines
- Gear Boxes
- Belt and Chain Drives (Sprockets, Sheaves)
- Conveyors
- Lubrication

Price \$1,050

Location
Knoxville, TN

Start Dates 2009
3/3, 3/5, 6/2, 6/4, 9/1, 9/3,
12/1, 12/3

Tools for Optimizing Maintenance Performance

Course 2085 CEUs: 2.1

Overview This 3-day course is designed for managers, engineers and technicians looking to develop the future stages of their maintenance management strategy. This course provides participants with an incisive understanding of maintenance best practice and the role of organizational and new technology policies. During the course, students gain a new vision of asset management and maintenance performance and knowledge of essential elements of a proactive maintenance and inspection organization. Students also acquire the knowledge and skills to align asset management for dramatic effect on the capabilities of the maintenance function.

Topics

- Defining Maintenance Objectives and Introduction to Key Tools
- Developing a Proactive Maintenance Plan
- Asset Reliability Process and Program Implementation
- Managing and Measuring the Impact of Maintenance Optimization

Price \$1,950

Location
Knoxville, TN

Start Dates 2009
4/28, 9/22

Root Cause Failure Analysis

Course 2053 CEUs: 2.1

Overview This 3-day course provides participants with the tools they need to begin the process of identifying Root Cause Failure Analysis (RCFA). This course was designed for managers, engineers and technicians who want to establish a RCFA program as a way of enhancing an existing predictive/ preventive maintenance program. The course introduces the various facets of benchmark RCFA programs.

Prerequisites One to two years of experience with a predictive maintenance program is recommended. No specific knowledge of predictive technologies is required.

Topics

- Failure Definitions and Types of Failure
- Establishing a RCFA Program
- When to Initiate Investigation
- RCFA Investigation Methodology
- Cost/Benefit Evaluation and Performance Metrics
- Review of Machinery and Component Failure Modes
- Case Histories

Price \$1,400

Location
Knoxville, TN

Start Dates 2009
5/27, 12/15