SKF Reliability Maintenance Institute

Middle East

Training Courses

SKF - The knowledge engineering company


SKF
Spindle Service

Training Courses

Program Overview

SKF Reliability Maintenance Institute®

Covering every aspect of machine reliability.

Manufacturers today are under tremendous pressure to provide the highest possible quality at the lowest possible cost. Therefore, achieving maximum machine reliability is critical.

The Reliability Maintenance Institute® (RMI) offers comprehensive training courses designed to help plants eliminate machinery problems and achieve maximum reliability and productivity by utilizing the very latest in precision maintenance techniques.

Each course is designed to address a specific machine installation or maintenance problem and help you correct it. Some courses involve the use of highly sophisticated diagnostic equipment, while others are more basic in nature and cover such topics as bearing fundamentals and proper lubrication.

Training for all plant levels that impact machine reliability.

Unlike other maintenance training programs, the Reliability Maintenance Institute offers training to all plant levels that impact machine reliability.

Achieving maximum machine reliability requires more than a highly trained and knowledgeable maintenance staff. Plant managers must also be up to date on the latest maintenance practices and machinery improvement programs.

To that end, SKF offers special programs for senior plant management. These courses cover such topics as how to evaluate current plant maintenance and reliability practices, measuring key benchmarks, and how to determine the best course of action for realizing the greatest financial return on your maintenance investment.

Courses for managers offer the right combination of implementation skills, maintenance procedures and management insights necessary to put together an effective program for eliminating machinery and process problems, thereby increasing profitability.

Everything you need from one reliable source.

Many companies offer training in one or more of these areas. But only SKF offers a comprehensive program that covers every aspect of machine reliability and addresses the technical and managerial needs of everyone in an industrial company – from the shop floor to the president's office. SKF is one of the foremost authorities on rotating machine maintenance and offers a wealth of product knowledge and application experience.

The Reliability Maintenance Institute offers a mix of course types and venues to meet your training needs. RMI courses are held at various SKF sites. On-site training is available at your plant or facility and some classes are held at regional locations, bringing the subject matter closer to your part of the country.

No matter what industry you're in or what type of machinery you use, the Reliability Maintenance Institute can help you maintain and manage your assets more productively.

The Asset Efficiency Optimisation Process

A process for translating asset knowledge

A key aspect of any world-class asset management program is a proactive, efficient work management process, designed to ensure the effective performance of maintenance on critical assets. To achieve maximum return on investment and maintain the greatest degree of productivity, it is pivotal that organizations have a process that effectively translates asset information to knowledge, and ultimately gain value from that knowledge.

To help organizations achieve these goals, SKF offers Asset Efficiency Optimization (AEO), a management process designed to achieve maximum efficiency and effectiveness from work management activities focused on business goals for the facility.

The AEO process encompasses four key elements: Strategy, Identification, Control and Execution. Within each of these elements, the coordination and participation of three essential factors within the organization - process, culture, and technology - is paramount to the overall success of the AEO process.

Maintenance Strategy involves the evaluation of work activities in relationship to a facility's business objectives, a procedure that creates the documented basis for the maintenance program.

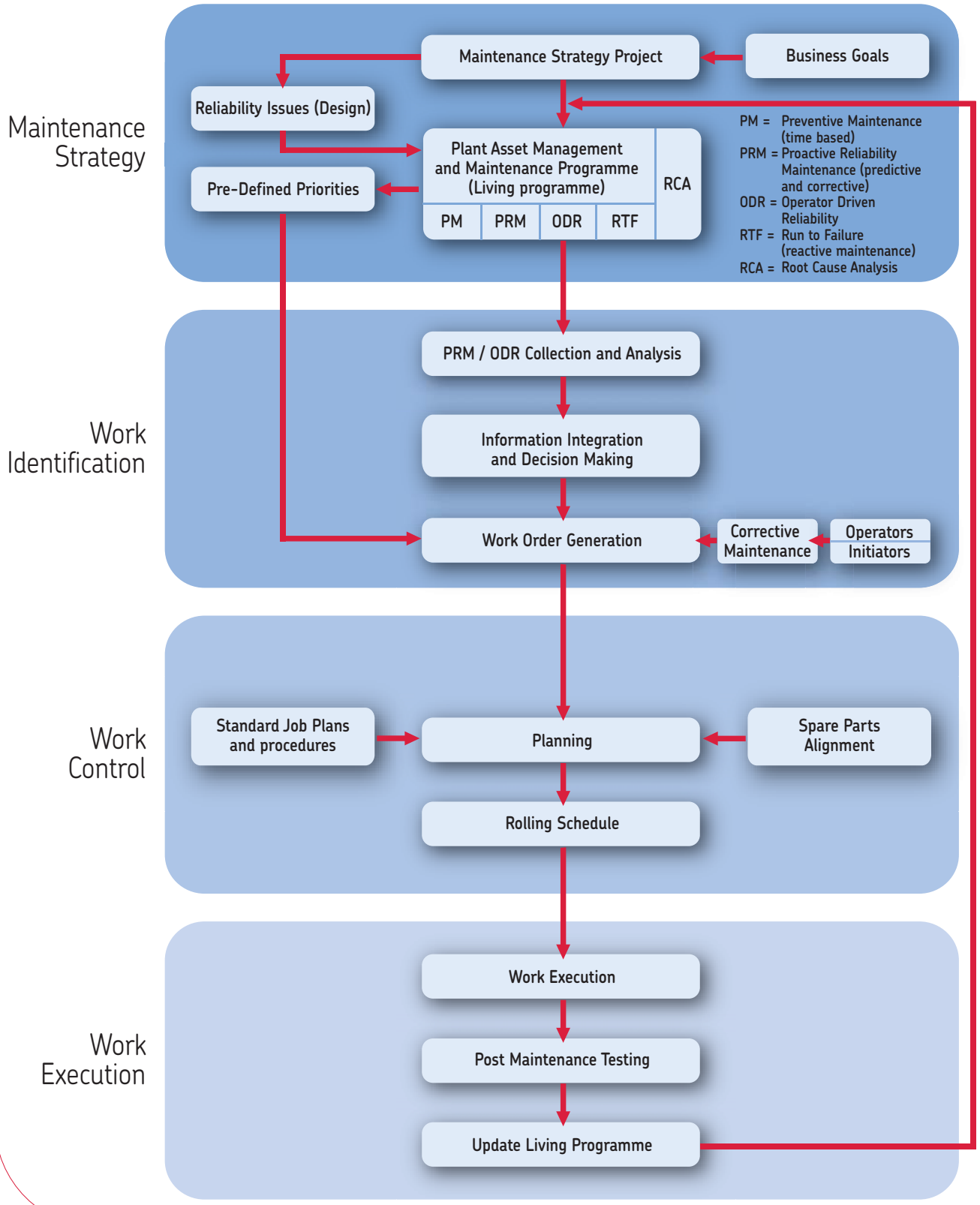
Work Identification is where "work" is identified from the evaluation of a comprehensive flow of data in conjunction with an integrated decision-making process. Key to the success of Identification is a comprehensive CMMS (Computerized Maintenance Management System).

Work Control involves establishing procedures for planning and scheduling the work identified by the CMMS. Tasks are organized based on several parameters, including time and condition; job plans or procedures; man-hours required; data feedback; special requirements; and many other factors.

Work Execution is where identified, planned and scheduled work is performed. Once work is completed, feedback from the field plays a key role in measuring the overall effectiveness of the AEO process and making refinements for even greater efficiency in the future. The AEO process transforms conceptual asset management to tangible competitive edge. SKF can help plan a course of action to align your reliability and risk focused maintenance strategy with your organization's business objectives. Our team will help correct known problems, and will then work with you to assess and identify additional opportunities for improvement in the areas of production, safety and environment.

Asset Efficiency Optimization - Flow Process

Work management Process



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Course Syllabuses

RMI Program Overview

Schools of study

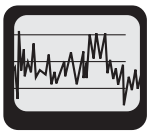
The Reliability Maintenance Institute® (RMI) offers comprehensive training courses designed to help eliminate machinery problems and achieve maximum reliability and productivity. When you attend an RMI class, you will learn from the experts about the latest in precision maintenance techniques, skills and technologies. The following areas of study are available:

School of Bearing Maintenance and Reliability

These courses address every factor that impacts bearing service life. Emphasis is on understanding bearings and improving bearing performance, which in turn improves the reliability of rotating equipment in which they are installed. These courses can be general in nature or specific to an application or industry. Classes are also available in bearing failure analysis to assist in root cause investigations.

School of Proactive Reliability Maintenance Skills

Proactive Reliability Maintenance Skills courses start with precision maintenance fundamentals then move on to recent advances in machine maintenance technology and show how these new tools and techniques can help plants achieve greater machine reliability. Three levels of training are offered: upper-level management, plant managers and supervisors, and maintenance technicians. Courses range from one- and two-day workshops and seminars to five-day, intensive, hands-on training sessions.



School of Condition Monitoring

Condition Monitoring plays a vital role in providing the availability of plant machinery. With the proper skills and equipment, plant maintenance technicians not only detect problems before they result in a major machine malfunction or breakdown, but they also perform root cause failure analysis to prevent problems from recurring.

Highly trained condition monitoring technicians can have a significant impact on a plant's bottom line profitability. The Reliability Maintenance Institute focuses on providing comprehensive training to assist technicians in utilizing the right techniques and technology, obtaining the greatest benefit from product hardware and software, and effectively communicating program results to plant management.

Instructors

Reliability Maintenance Institute instructors are experts in their field. Whether the course you take is on Bearings, Precision Skills or Condition Monitoring; whether the course is public or scheduled on site at your facility; you will find that all RMI instructors are highly experienced in the field they are teaching.

Training Options

The Reliability Maintenance Institute can work with you to arrange a training program that is convenient for you. From asset management to basic maintenance skills, RMI can develop a solution for you and your team. We have a full schedule of training courses held at a variety of locations across the country - or we can bring our classes to you!

RMI Classroom

Traditional RMI classroom courses are offered at the SKF Reliability Maintenance Institute located at:

- Dubai
- Dammam.
- Cairo
- Tehran

On-Site Classroom Courses

All RMI classroom courses can be held on-site in your plant at any time. On-site training brings the instructor and the expertise directly into your plant so you can see applications directly on your equipment.

On-Site Customized Training

If you have a training need that doesn't fit a particular RMI course or program description, the RMI can create a custom training program for you. For employee skills, process or equipment training, RMI specialists will perform job, task and skills analysis to determine training needs, develop course materials and delivery methods and implement the training on your schedule.

e-Learning
The SKF Reliability Maintenance Institute® On-line

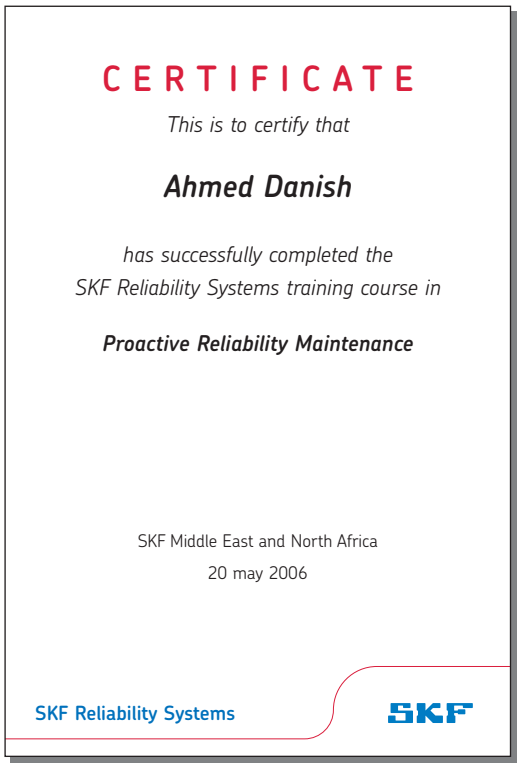
SKF RMI On-line offers a comprehensive range of Introductory level courses. The courses are self-learning on-line modules that you can take at your own pace and whenever it suits you. These courses are designed to introduce you to the subject and are considered the pre-requisites for the Intermediate level classroom courses.

On completion of the course you can take a test and receive a certificate.

Career Path Packages

RMI Career Path Packages are advance purchase programs for a specific set of courses designed to move the student along the path to career goals. Available in Condition Monitoring, Proactive Reliability Maintenance and Operator Reliability packages, each package is designed to be completed in one year, with one course completed each quarter. Courses include all applicable certification, testing and grading. Career Path Package training can be provided on-site or at an SKF facility.

Please reference details of the Career Path Packages beginning on page 30.



CERTIFICATE

This is to certify that

Ahmed Danish

has successfully completed the
SKF Reliability Systems training course in

Proactive Reliability Maintenance

SKF Middle East and North Africa
20 may 2006

SKF Reliability Systems

SKF

Testing and Certification

Several RMI courses offer optional certification testing. Upon achieving a passing grade on an RMI test, the participant will receive a Certificate of Achievement stating that he/she successfully completed the course and passed the test. The test may consist of written, oral and / or hands-on material. Courses offering Certificates of Achievement include:

BMR 601	Comprehensive Bearing Maintenance
BMR 603	Bearing Maintenance and Service
BMR 605	Bearing Reliability in Centrifugal Pumps
BMR 607	Root Cause Bearing Failure Analysis
BMR 608	Bearing Lubrication
PRM 801	Proactive Reliability Maintenance Skills
PRM 802	Proactive Reliability Maintenance for Managers and Supervisors
PRM 804	Precision Shaft Alignment Laser Systems
PRM 805	Field and Shop Balancing
CMTR 201	Introduction to Vibration Analysis
CMTR 301	Machinery Vibration Analysis I
CMTR 401	Machinery Vibration Analysis II

Participants who choose not to take the test, or attend courses that do not offer testing will receive a Certificate of Attendance.

CMTR 201 Introduction to Vibration Analysis

Recommended for

Plant personnel requiring an introduction to vibration analysis techniques and technologies. Engineers and technicians whose responsibility require them to be proficient in the setup of and use of and effective condition monitoring program. Including maintenance supervisors, predictive maintenance technicians and coordinators, reliability engineers, and multi-skilled mechanics.

On-Site Classroom Courses

The course objective is to provide a practical approach to detecting and analyzing common machinery problems using vibration monitoring and analysis.

Course description

Designed for maximum class participation.
A combination of overhead presentations, group exercises, case studies, and written reviews are used to encourage participation and understanding.

Basics of vibration

- Time waveform analysis
- Amplitude vs. frequency
- Vibration – measurable characteristics
- Vibration sensors
- Scale factors
- Measurements and units
- Displacement probe/eddy probe
- Multi-parameter monitoring
- Resonance
- Detection vs. analysis

Setting up the vibration measurement

- Physical and database considerations
- Selecting the machinery
- Sensor location and mounting methods
- Cable attachments
- Setting Fmax

Alarm methods and setting alarms limits

- ISO guidelines
- Assessing overall vibration severity
- Spectral enveloping and bands
- Phase alarms
- Exception criteria

Spectral analysis and phase analysis

- Spectral analysis techniques and pattern recognition
- Sidebands
- Harmonics
- Waterfall plot
- Understanding phase

Vibration signal processing methods

- Enveloping
- SEE™ Technology (Spectral Emitted Energy)
- HFD (High Frequency Detection)

Analyzing typical machinery problems

- Imbalance and misalignment
- Bent shaft
- Mechanical looseness
- Cocked bearing

Monitoring rolling bearings

- Why do bearings fail?
- Bearing failure stages
- Bearing defect frequencies
- Displaying fault frequencies

Course duration

2 to 3 days

A written examination is available for this course.

SEE™ is a trademark of SKF USA Inc

Machinery Vibration Analysis, Level I

CMTR 301

Recommended for

All maintenance and operations personnel accountable for machinery performance and reliability. Those who seek strong practical skills in machinery inspection and correction so machines remain reliable.

Course Objective

To achieve target pay back for predictive maintenance programs by training participants to understand accountability for equipment reliability. Optimize and combine measurements to determine root causes of machinery failures. Use machine history and site observation to corroborate findings.
Implement cost-effective solutions to prevent repetition.

Course Description

The course covers the following key aspects:

Basic principles of vibration

- Vibration characteristics
- Vibration parameters
- Resonance, natural frequencies and critical speeds
- Workshop

Data acquisition

- Signal propagation and attenuation
- Mounting of sensors
- Workshop
- Sensors. types and applications
- Data integrity

Vibration data processing

- Filters
- Fourier series
- Fourier transform
- Data acquisition time
- Resolution
- Workshop

Instrument configuration

- Selection of Fmax
- Selection of dynamic range
- Selection of resolution
- Workshop

Diagnostics

Simple spectrum analysis

- Mass unbalance
- Misalignment
- Looseness
- Gearboxes
- Electric machinery
- Rolling elements defects

Applications on pumps
Application on fans
Workshop

Condition evaluation and procedures for

- Baseline data acquisition
- Acceptance test

Introduction to single plane balancing

- Workshop

Prerequisites

Six months full-time condition monitoring experience- exposure to field vibration analysis.

Course duration

5 days

A written examination is available for this course. Examination cost will be quoted on request

SKF

CMTR 401 Machinery Vibration Analysis, Level II

Recommended for

Experienced machinery vibration analysts with a sound knowledge of data acquisition and analysis principles who desire advanced training on the skills necessary to solve problems of a more complex nature. While the emphasis is on analysis techniques. the subjects covered also provide insight on refined data collection techniques for condition monitoring purposes.

Course Objective

The overall course objective is to enhance the analyst's ability to diagnose and detect machinery vibration problems with improved troubleshooting techniques and a complete utilization of the capabilities of their data collector/analyzer.

Course Description

The course covers the following topics.

Review of Level I

Vibration characteristics

- Modulation and demodulation
- Modes of vibration. poles and zeros
- Phase, physical meaning
- Beats
- Side bands

Instrumentation

- Oscilloscopes
- Tape recorders
- FFT analyzers
- Automatic data acquisition devices
- Data collectors
- Tracking filters

Data acquisition

- Linear averaging
- Time synchronous averaging
- Exponential averaging
- Overlapping
- Data acquisition time
- Aliasing

Dataprocessing and display

- Time waveform
- Orbits
- Nyquist / Bode plots
- Polar plots
- Water fall
- Workshop

Machinery testing

- Impact test
- Start up / Coast down tests
- Workshop

Diagnostics

- Fluid film bearings
- FFT vs TWF
- Orbit analysis
- Application on:
  - Gerboxes
  - AC Motors / DC Motors
  - Centrifugal Pumps and compressors
  - Fans
  - Turbo machinery

Vibration control concept and applications

- Absorbers
- Isolators
- Workshop

Balancing

Set up of predictive maintenance program

- Machine criticality categorization
- Selection of measurement point
- Selection parameters
- Selection of direction
- Tolerance and alarms
- Intervals
- Workshop

Prerequisites

Six to twelve months full-time condition monitoring program experience; SKF course Machinery Vibration Analysis I (CMTR 301) or commensurate field experience.

Course duration

5 days

A written examination is available for this course. Examination cost will be quoted on request

Advanced Machinery Diagnostics

CM 304

Recommended for

Mechanical, maintenance, and machinery engineers involved in design, specification, acceptance, operation, and troubleshooting of industrial process machinery. Plant personnel and others who wish to become experts in diagnosing the behavior of rotating machinery of various types and classifications. Professionals whose primary focus is responsibility for the maintenance of high level performance, reliability, and availability of critical process machinery; including rotating machinery specialists and consultants, advanced mechanics and mechanical engineers, and advanced technicians.

Course Objective

An advanced study of machinery vibration diagnostics and performance enhancement techniques. Topics include statistical analysis, specification of instrumentation, evaluating problems in low-speed and high-speed critical machinery, performing various vibration diagnostic techniques, advanced machinery commissioning, start-up and coast-down testing, and electric motor current analysis. A survey of experimental multi-channel modal analysis is included, as well as various topics on performance enhancement methods. Provides a clearer understanding of how vibration analyzers function, the various FFT windows employed, and the theory of and recommended approaches to analyzing specific complex machine trains, illustrated with real-world case histories.

Course Description

- Review of vibration spectrum diagnostics, using the Illustrated Vibration Diagnostics Chart
- Refining narrow band spectral envelope alarms using statistical analysis
- Vibration analysis techniques and instruments required to effectively evaluate low-speed (30 – 300 r.p.m.) and high-speed machines (600,000 - 3,600,000 r.p.m.)
- Vibration diagnostic techniques
- Impulse natural frequency testing
- Start-up and coast-down testing
- Bode and Nyquist plot generation
- Swept-sine variable frequency shaker testing
  - Operating deflection shape analysis
  - Phase analysis to differentiate several problem sources generating similar vibration symptoms
  - Time waveform analysis applications
  - Synchronous time averaging applications
- Motor current analysis testing and presentation of Motor Current Troubleshooting and Severity Chart
- Experimental modal analysis using multi-channel FFT analyzers.
- Machine performance enhancing techniques
  - Dynamic balancing-discussion of important topics
  - Changing frequencies of rotor and / or support frame
  - Vibration isolation and damping treatments
  - Design and fabricate dynamic vibration absorbers
- What are today's vibration analyzers really doing?
  - Time waveform presentations
  - How far apart must two peaks be for an analyzer to display two separate frequencies
  - Pros and cons of using the various FFT windows
  - Single vs. multiple channel FFT analyzers
  - Overlap processing
  - Diagnosing a bearing, gear, or electrical problem with unknown variables
- Vibration analysis of special machine types
  - theory, recommended approach, and real world case histories
  - Horizontal centrifugal and vertical pumps
  - High-speed centrifugal air compressors
  - Centrifugal chillers and fans
  - Roots-type blowers
  - Piping vibration problems
  - Chemical reactors and agitators
  - Paper machines
  - Turbine-driven machinery
  - Single and multi-stage gearboxes
  - DC motors and induction AC motors
  - Machine tools and rotary screw air compressors

Prerequisites

Six to twelve months full-time condition monitoring program experience; SKF course Machinery Vibration Analysis I (CMTR 301) or commensurate field experience.

Course duration

5 days

SKF

CMTR 502 Introduction to the SKF Microlog™ System

Recommended for

Engineers and technicians whose responsibilities require them to be proficient in the setup and use of the SKF condition monitoring system. Maintenance supervisors, predictive maintenance coordinators, reliability engineers, inspectors, shop supervisors, advanced mechanics, and millwrights who wish to become familiar with the operation of the SKF Microlog portable data collector/analyzer and associated Software (e.g. Machine Analyst) to contribute to building a world-class condition monitoring program in a plant.

Course Objective

This course is designed to introduce the application of the Microlog portable data collector/analyzer to collect and monitor machinery vibration data.

Course Description

This course introduces the Microlog's data collection features and capabilities to the new user. Designed for maximum class participation, this course is divided into sections that are overviewed with presentations, practiced on computers, and reviewed with group exercises and written reviews.

This course's subjects are organized to help the new Microlog user quickly set up his data collector, and to begin utilizing the Microlog for ROUTE and Non-ROUTE data collection purposes.
Specific topics include:

System overview

- Microlog system overview and connections
- Microlog modes of operation
- Microlog main screen, keypad, buttons, and menus, terminology

Setting up the Microlog

- Setup Mode options-settings for various system preferences.
- Global Configuration Options-settings for various global data collection.

Transferring data between Microlog & SKF Software

- Communication mode parameters
- Data transfer – download and upload

Route data collection

- Downloading a ROUTE from the SKF software e.g. PRISM4 or SKF Machine Analyst
- ROUTE hierarchy list
- Collecting ROUTE data
- Dynamic and static ROUTE measurements
- Data collection tips
- Using multi-point automation (MPA)

Collecting NonROUTE data

- NonROUTE upgrade module
- Pre-set NonROUTE measurements
- User defined NonROUTE measurement
  - Dynamic and process measurements

Reviewing collected data in the review module Two-channel analyzer and balancing module Upgrade overviews.

Microlog accessories

- Strobelite
- Laser sensor
- Optical phase sensor

Prerequisites

3 months, full-time condition monitoring experience.

Course duration

1 day

As SKF continues to add new Microlog hardware, the terminology used in this course syllabus may differ slightly from terminology used for your specific Microlog system. However, this course describes the use of all hardware versions offered by SKF.

Introduction to Machine Analyst™

CMTR 504

Recommended for

Engineers and technicians whose responsibilities require them to be proficient in the set-up and use of the condition monitoring system. Maintenance supervisors, predictive maintenance coordinators, reliability engineers, inspectors, shop supervisors, advanced mechanics, and millwrights who wish to become familiar with the operation of the Microlog and Machine Analyst software to contribute to building a world-class condition monitoring program in a plant.

Course Objective

Introduce Machine Analyst's vibration database management and analysis features to the new user. Participants will be able to set up default properties on their Machine Analyst software, create a Machine Analyst database of vibration measurements, download and upload measurements between Machine Analyst and a Microlog data collection device, customize Machine Analyst to automatically perform scheduled events, and generate graphic plots and reports for analyzing measured machinery condition.

In addition, this course discusses the advantages of various vibration signal processing techniques to isolate and detect specific machinery faults, and describes how to set up signal processing measurements in the Machine Analyst database.

Course Description

Designed for maximum class participation, this course is divided into sections that are overviewed with presentations, practiced on computers, and reviewed with group exercises.

Machine Analyst system overview and setup

- Machine Analyst, Microlog, support module, host computer

Getting around in Machine Analyst

- Hierarchy window and menu overview
- Using dialogs and understanding terminology
- Searching and filtering lists; templates
- Alarms and alarm details windows

Bearing fault detection and analysis

- Acceleration enveloping signal processing
- Standard acc. env. and velocity measurement setup

Building your Machine Analyst database

- Creating a new database
- Inserting and setting up hierarchy group items and standard Microlog measurement POINTs
- Setting alarm types and statistical overall alarm wizard
- Using filter keys and setting up scheduled archiving
- Modifying measurements
- Working with multiple POINTs
- Event scheduler wizard
- Applying fault frequency sets
- Speed tagging, templates and filters

Creating a data collection ROUTE and down-load-ing/uploading Machine Analyst measurements

- Creating ROUTEs
- Downloading from a ROUTE, hierarchy or work space list
- Uploading and processing measurements

Displaying and analyzing graphic plots

- Graphic plot formats, overlays, and window overview
- Displaying plots with the toolbar and the view menu
- Manipulating plots using various plot overlays
- Trend, spectrum, and polar vector plots
- Spectral band trends and time waveforms

Generating and printing data reports
Machine Analyst's "monitor" application
Standard Microlog measurement setup
Implementing a portable monitoring system

Course Duration

3 days

SKF

CMTR 507

Introduction to the MARLIN® System Operator Driven Reliability

Recommended for

Plant maintenance and operations personnel whose responsibilities require them to monitor and detect machinery condition problems or to record and analyze plant process data.

Course Objective

This course is designed to familiarize participants with the application of the MARLIN® System to collect and monitor machinery condition data (vibration and temperature) and plant process data.

Course Description

This course introduces the MARLIN System's data collection features and fault detection capabilities to the new user, and the SKF Machine Suite software, database management, data display, and data reporting features.

Designed for maximum class participation, this course is divided into six sections that are overviewed with presentations and practiced with hands-on exercises or written reviews.

Specific topics include:

MARLIN System overview

- MARLIN vs. Microlog™ (detection vs. analysis)
- MARLIN System components
  - MCD probe, MQC studs, MARLIN data manager, PRISM4 Surveyor software

The MCD probe

- Bearing and overall machine fault detection
- Vibration measurements
- MCD probe components
- MCD controls/functions/display
- MCD probe setup/alarms
- MCD operating modes

MARLIN Quick Connect studs (MQC)

- Installation
- Smart MQC set up and using smart MQC studs

The MARLIN data manager (MDM)

- MDM components, connections, LCD display
- MDM Control strip and menu, and battery operations
- Administrator options
- Hierarchy display
- MDM data collection
  - Process data collection
  - Routine process inspections
  - MDM/MCD probe data collection
  - Barcode machine identification
- Trend plot displays
- Attaching notes
- Statistical Process Control rules

System software

- MARLIN POINT setup
  - Screen Cam movies
- Adding ROUTE instructions
- Downloading coded notes
- Data transfer
- Trend plot display
- Generating reports

System implementation

- Site survey
- Using machinery data sheets (MCD probe)
- Sensor mounting methods (MCD probe)
- Determining measurement locations
- Sensor magnetic mounting supports
- Close-out walk through
- Classifying and selecting machinery to monitor
- Assigning priority levels

Course Duration

3 days

As SKF continues to add new MARLIN hardware platforms, the terminology used in this course syllabus may differ slightly from terminology used for your specific MARLIN system. However, this course describes the use of all hardware versions offered by SKF.

Introduction to the M800A Machinery Protection System or Introduction to the VM600 Machinery Protection System

CMTR 508-800
CMTR 508-600

Recommended for

Engineers and technicians whose responsibilities require them to be proficient in the setup and use of the Machinery Protection System. Maintenance supervisors, predictive maintenance coordinators, reliability engineers, inspectors, shop supervisors, advanced mechanics, and millwrights who wish to become familiar with the operation of the on-line machinery protection system to contribute to building a world-class condition monitoring program.

Course Objective

Introduces the Machinery Protection System to new users. The course overviews on-line machinery protection system design and installation concepts and practices (hardware and software).

Course Description

At the completion of this course, participants will be able to design, install, and effectively utilize an SKF on-line machinery protection system. Designed for maximum class participation, this course is divided into sections that are overviewed with presentations, and reviewed with hands-on group exercises and written reviews.

System overview

- Features and configuration
- Monitoring modules and display options

Component ID

- Common transducers
- Monitors and available options
- Hardware/monitoring configurations and connectors

System modules

- Vibration overview and measurements
- Frequencies of interest
- Shaft centerline, thrust position and rotor eccentricity
- Axial shaft position, case and valve measurements
- Differential expansion and dual probe monitoring
- Linear variable differential transformer operation
- Potentiometer operation and system modules

Operator interface

- Operator interface components
- Bar graph display/momentary push buttons

Transducers

- Accelerometers/velocity sensors and installation
- Displacement probe/Eddy probe
- Sensor relationships
- Eddy probe theory and construction
- Calibration curves and gapping
- XY configurations
- Probe installation mounting devices
- Velocity transducers
- Accelerometer mechanical modes of operation
- Cable attachments

Programming

- Software and uploading, downloading and changing rack configuration
- Trending functions and report generation

Testing and maintenance

- Cabinet maintenance
- Test instruments and FW upgrade
- API-670, third edition
- Channel accuracy and System programming
- Installation and response documentation

QuickCal/MPS

- Module setup and QuickCal startup
- Serial port settings
- Installation type and new installation
- Downloading new firmware

Troubleshooting

- Power supply, sensor and module failures
- Relay problems and programming

Communications

- Network termination
- Baud rate and node address
- Analog date format and date format scaling
- Multi-drop setup
- Register packets, addresses and descriptions
- Vibration, thrust and speed programming examples

Course Duration

3 to 4 days

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SKF

CMTR 509 Advanced Microlog™ Skills

Recommended for

Reliability engineers, technicians, inspectors, advanced mechanics and millwrights whose responsibilities require them to be proficient in the setup and use of the SKF Condition Monitoring's Micrologs primarily for route cause failure analysis.

Course Objective

The course objective is to provide real-life practical approaches to solving machinery problems utilizing the Microlog's advanced features and techniques.

At the conclusion of this course, participants will understand:

- Applications for time and frequency domains
- Phase analysis
- Bearing defect detection and analysis
- Slow speed machinery monitoring
- Motor current analysis
- Synchronous time averaging
- How to identify resonant conditions

Course Description

Designed for maximum class participation. A combination of presentations, group exercises, and videos are used to peak participant interest and encourage participation and understanding. We highly encourage you to bring your entire Microlog kit with you for this seminar.

Slow speed machinery applications

- Microlog settings
- Sensor considerations
- Measurement types

Microlog "shortcuts"

- Function keys
- Numeric keys

Application menus (wizards)

- Cyclic Analysis
- Current Analysis
- Bump Test
- Run Up/Coast Down
- Configuration Wizard

Phase collection and analysis

- Laser Tach
- Optical Tach
- Strobelite

Time waveform

- Analysis and collection
- Microlog settings
- Impulses/Impacting
- Clarification of the FFT

Synchronous time averaging

- Applications
- Data collection techniques

Bearing defect detection and analysis

- HFD
- Acceleration enveloping
- Ultrasonic Measurements

Course duration

2 days

Rotating Machinery Vibration Control & Turbine Supervisory

INS 100

Recommended for

Engineers managers and technicians whose responsibilities require them to be proficient in the setup and use of Vibration Control and Protection systems; maintenance supervisors, Plant Managers, Reliability engineers, Instrument & Control Engineers interested in vibration protection and control.

Course Objective

The course objective is to provide a theoretical and practical approach to understanding the theory and functionality of vibration protection and turbine supervisory systems that are widely used in industry.

Course Description

Designed for maximum of 12 class participants. A combination of overhead presentations, group exercises and case studies are used. Participants are encouraged to bring along issues faced in the field. The knowledge gained will enable the participant to improve turbomachinery reliability.

Topics include:

Basics of vibration

- Time waveform analysis
- Amplitude vs. frequency
- Vibration – measurable characteristics
- Vibration sensors
- Scale factors
- Measurements and units
- Displacement probe/eddy probe
- Multi-parameter monitoring

Sensors and Sensor selection & Speed sensors

- Displacement sensors.
- Seismic sensors.
- Turbine supervisory sensors.
- Dynamic pressure sensors
- Air gap sensors
- Ice detection sensors
- Speed sensors

Signal processing & applications to turbomachinery

- Turbomachinery configurations and mechanical behavior for Steam Turbines, Gas Turbines, Aero turbines, gearboxes, fans, pumps, compressors, rolls and crushers.
- BBAB - Broad Band Absolute Bearing Vibration.
- NB - Narrow Band (Tracking) Vibration
- RS - Relative Shaft vibration
- PS - Position
- EC - eccentricity
- HE - Absolute Housing Expansion
- SEP - Relative Shaft Expansion with Pendulum
- BBP - Broad Band Pressure
- NBFS - Narrow Band Fixed Frequency.
- Temperature

Alarms logical Combination

- Basic Logic Combination
- Advance Logic
- Trip Multiplier
- Danger Bypass
- Time delay.

Output and communications

- Analogue outputs
- OPC
- DCS
- Serial interface RS485 - RS232.

Machinery Monitoring System Introduction

- FFT Analysis
- Condition monitoring systems

Prerequisites

Participants should have an understanding of basic plant machinery.

Course duration

3 days

BMR 601 Comprehensive Bearing Maintenance

Recommended for

Service, maintenance, machine repair, or plant/ facility engineering staff of an industrial plant, OEM facility, institution, public utility or commercial building which uses rolling bearings and related equipment. Managers and technicians at industrial plants and OEM facilities responsible for rolling bearing performance and reliability. Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors. Those interested in rolling bearing and rotating equipment performance.

Course Objective

The course objective is to train participants on basic and advanced rolling element bearing maintenance and service techniques used with typical industrial rotating machinery. This knowledge, properly applied, will lead to longer bearing service life, which improves the reliability of rotating equipment.

Course Description

Bearing Maintenance Apprenticeship uses a combination of hands-on training, audio-visual, lectures and discussion opportunities.

Specific topics include:

Slow speed machinery applications

- Learn the fundamentals of rolling bearings
  - -Bearing components
  - -Bearing types
  - -Bearing nomenclature
  - -Friction basics
  - -Loads
  - -Bearing closures (seals and shields)
- Bearing selection, bearing life and fatigue failure of rolling element bearings
- Shaft and housing fits for rolling element bearings
- Shaft and associated component evaluation and repair techniques
- Microlog settings
- Sensor considerations
- Measurement types

Mounting and dismounting

- Force mounting, temperature mounting and hydraulic mounting procedures are explained and demonstrated in detail. Students then perform hands-on mounting and dismounting using expert tools

Fundamentals of lubrication

- Instructor-led exercises will demonstrate general methods for choosing proper lubricant viscosity, correct lubricant quantities, replenishment guidelines, and choosing between oil and grease lubrication
- Learn to maximize bearing life through an improved understanding of proper lubricating principles and functions

Bearing failure causes and analysis

- Identify and interpret actual bearing failures. Bring your own samples for review

Prerequisites

Participants should have an understanding of basic plant machinery. Basic knowledge of maintenance. A fundamental knowledge of and ability to use basic hand tools is required.

Course Duration

4 days

A written examination is available for this course.

Bearing Maintenance and Service

BMR 603

Recommended for

Service, maintenance, machine repair, or plant / facility engineering staff of an industrial plant, OEM facility, institution, public utility or commercial building which uses rolling bearings and related equipment. Managers and technicians at industrial plants and OEM facilities responsible for rolling bearing performance and reliability. Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors. Those interested in rolling bearing and rotating equipment performance and reliability.

Course Objective

The course objective is to provide information to improve the service life of rolling bearings, which influences the reliability of rotating equipment.

Course Description

Bearing Maintenance and Service uses a combination of hands-on training, audio visuals, lectures and discussion opportunities.

Specific topics include:

Bearing basics

- Learn the fundamentals of rolling bearing technology; types, nomenclature, bearing components, terminology, loads, handling and lubrication
- Factors effecting the performance of rolling bearings
  - -Bearing quality
  - -Operating environment
  - -Installation
  - -Maintenance practices

Mounting and dismounting

- Study proper bearing mounting and dismounting procedures, and observe what happens as a result of careless handling, neglected maintenance and poor lubrication
- Participate in hands-on demonstrations using specialized tools to correctly mount and dismount ball and roller bearings

Fundamentals of lubrication

- See the importance of selecting the proper lubricant for an application
- Learn to maximize bearing life through an improved understanding of proper lubricating principles and functions

Bearing failure causes and analysis

- Gain a basic understanding of why bearings fail
- Identify and interpret actual bearing failures

Prerequisite

Participants should have an understanding of plant machinery such as; electric motors, pumps, compressors, gearboxes etc.. A basic knowledge of machinery maintenance. The ability to use basic hand tools is required to participate in practical exercises aimed at mounting and dismounting bearings.

Course Duration

3 days

A written examination is available for this course.

BMR 605 Bearing Reliability in Centrifugal Pumps

Recommended for

Service, maintenance, machine repair, or plant/facility engineering staff of an industrial plant, OEM facility, institution, public utility or commercial building which uses rolling bearings and related equipment. Managers and technicians at industrial plants and OEM facilities responsible for rolling bearing performance and reliability. Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors. Those interested in rolling bearing and rotating equipment performance. Individuals should have direct involvement or responsibility for pump maintenance and installation.

Course Objective

To provide attendees with a thorough knowledge of the design, function and maintenance requirements of a centrifugal pump. Additionally, the course describes the preferred methods for installing, starting up and run-in for new pumps. Troubleshooting and solutions for common pump problems are covered. Knowledge of these areas allows the attendee to be better prepared to maximize the service life and reliability of pumps in their facility.

Course Description

The course curriculum is centered around pump maintenance and includes the theory behind the function of the pump and its components. Topics are addressed in a series of lectures, discussions, and hands-on workshops.

Pump classification and function

- Different styles of pumps are covered
- Basic concepts of pump function
- Theory and design of centrifugal pumping
- Basic information on pump curves, head, specific speed and proper pump operation

Bearing selection and internal dynamics

- Bearing selection for radial and thrust positions
- Behaviors of angular contact bearings under application conditions
- Selections of clearance or preload
- Appropriate contact angle and cage style
- Fundamentals of lubrication of pump bearings

Seal design and function

- Mechanical and lip seal design and application
- Seal selection and troubleshooting

Pump installation and operation

- Proper methods of installing, leveling and grouting a pump
- Start-up procedures including priming
- Alignment, impeller clearance and pipe strain

Maintenance and troubleshooting

- Routine maintenance concerns plus bearing and seal installations
- Lubrication systems
- Hands-on bearing failure
- Indicators of pump malfunction
- Troubleshooting hints and suggestions

Course Duration

2 days

A written examination is available for this course. Test

Root Cause Bearing Failure Analysis

BMR 607

Recommended for

Service, maintenance, machine repair, or plant/facility engineering staff of an industrial plant, OEM facility, institution, public utility or commercial building which uses rolling bearings and related equipment. Managers and technicians at industrial plants and OEM facilities responsible for rolling bearing performance and reliability. Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors. Those interested in rolling bearing and rotating equipment performance.

Course Objective

To provide inspection procedures and instructions for analyzing failed bearings (due to mounting errors, heat, vibration, etc.) and their components. Students will learn to determine the true root causes of bearing failures and its impact on service life. Furthermore key aspects of machine reliability are explored.

Course Description

The Root Cause Bearing Failure Analysis course is taught to the new ISO Standard 15243. The course is complemented with audio-visuals, lectures, hands-on training, and discussion of actual failures. Workshops include failure cause studies, visual damage assessment, failure mode detection and reporting. Participants will analyze actual bearings from various applications to assess the damage and apply the ISO methodology to determine the root cause failure mechanism.

Specific topics include:

Bearing function

- Learn how bearings support loads
- Bearing types and their use

Mounting damage

- Examples of improper installation procedures

Operating environment

- Bearing reaction to moisture, contamination, and other external influences

Maintenance

- Results of poor maintenance practices

Lubrication

Effects of marginal and excessive lubrication

- Contamination and its effects

Vibration / Impact damages

- How to identify this type of damage
- Implement corrective actions to avoid damage

Bearing failures

- Application specific
  - pumps, gearboxes, motors, fans, extruders, compressors etc.
- See and inspect sample bearings that have failed - identify, and interpret actual bearing failures.

Course Duration

2 days

A written examination is available for this course.

BMR 608 Bearing Lubrication

Recommended for

Maintenance personnel and engineers responsible for bearing lubrication, lubricant specification and lubrication system planning and design.

Course Objective

Upon completion, students will be able to evaluate and select appropriate lubricants for a wide variety of rolling element bearing applications.

Course Description

This course covers real-world bearing lubrication in a dynamic, skills-based learning approach. Upon course completion, students will have learned the skills needed to choose, apply and maintain lubricants, and lubricating procedures in bearing applications plant wide. Case histories will be used to demonstrate concepts and stimulate discussion. Students will be guided through examples, then apply the concepts to arrive at practical solutions to their own in-plant situations.

Specific topics includes:

Lubrication fundamentals

- Functions of lubrication
- Basic definitions
- Lubricant additives and their effects
- Avoiding surface damage in bearings

Grease lubrication

- Grease functions and properties
- Grease delivery and metering systems
- Selection of grease type: choosing the right grade, base, stiffness, and oil for your application
- Compute grease intervals and relubrication amounts for a variety of application conditions, such as contamination, high or low temperatures, and vibration

Oil lubrication

- Choosing the right lubricant: oil, quality standards and testing procedures
- Effects of cleanliness and contamination
- Using the new life theory to predict the effects of contamination on bearings
- Effects of water ingress
- Effective use of filtration and choosing the right filter
- Change-out intervals
- Bearing housing design concepts
- Comparison of oil delivery methods: static, wick-feed, lifting rings, circulating oil, mist, air-oil, oil spot
- Determining oil flow rates

Applying lubricants

- Determining lubrication quantities and intervals
- Hands-on lubrication and relubrication procedures for pillow blocks, ball bearings, roller bearings, sealed and shielded bearings
- Machinery lubrication- relubrication requirements; electric motor, pumps, vibrating screens, gearboxes, fans, etc.

Common errors/troubleshooting

- Over-greasing, under-greasing, and mixing greases
- Poor lubrication practices
- Corrective actions

Other topics covered

- Standstill precautions, storing spare bearings, and shelf life considerations, best practices

Course Duration

2 days

A written examination is available for this course. Test

Advanced Lubrication Technology

BMR 655

Recommended for

Engineers and engineering managers who are regularly working with bearing lubrication issues, maintenance engineering managers, reliability managers and staff. Managers and technicians at industrial plants and OEM facilities responsible for rolling bearing lubrication performance and reliability. Rotating equipment engineers, reliability engineers, and maintenance supervisors.

Course Objective

Provide the knowledge and practical skills to select the best lubricant (oil or grease) for rolling element bearings in industrial applications, and apply the best lubrication practice for these applications.

Course Description

Specific topics covered in this course include:

Fundamental lubrication concepts

- Role and function of lubricants
- Discussion of rolling element bearings, including viscosity, oil film thickness, and primary lubrication regimes

Oil and grease

- Selection of grease or oil as the lubricant
- Performance aspects of oils and greases

Oils

- Different oil types and their function in bearing lubrication
- Viscosity calculations, viscosity dependence on temperature and pressure
- Oil additives, their role and function

Oil selection

- Basic oil selection methodology

Greases

Thickener types, base oils and additives, and their effects on grease performance in rolling bearings

- Lubricant compatibility when mixed with each other or when applied to bearing and seal materials

Grease selection

- Methodologies for selecting the best grease for a given application
- Selection methodology will cover both sealed and open bearings
- Three practical methods will be demonstrated and practiced

Grease life

- New and advanced grease life calculation methods which take into account the improved performance of individual modern greases, and the effect of the operating conditions of the application

Grease tests

- Grease tests and how to apply test results for optimal grease selection

Lubrication practice

- Practical guidelines on how best to apply greases and oils
- Relubrication practices
- Lubrication-related bearing failures
- Cleanliness and best practice
- Lubrication practices for common machinery; motors, pumps, compressors, fans, gearboxes, vibrating screens, crushers, etc.

Attendees receive a comprehensive binder with a wealth of information on oils and additives, properties greases, viscosity charts, compatibility charts, etc.

Prerequisites

One to two years of fundamental knowledge or field experience with industrial applications is desirable.

Course Duration

3 days

PRM 801 Proactive Reliability Maintenance™ Skills

Recommended for

Maintenance personnel responsible for machinery repairs; however, all plant personnel can benefit from the information presented in this course. Managers and supervisors who oversee maintenance activities will gain an understanding of the support and tools required to become truly proactive.

Course Objective

Provide information and training that enables plant personnel to increase productivity by improving the performance and reliability of rotating machinery.

Course Description

Profitability and meeting customer quality and delivery demands are top priorities in any company. Improvements in machinery reliability can provide significant contributions to these goals. However, countless maintenance programs and fads have largely failed to impact reliability or maintenance costs because they have not addressed the fundamental way maintenance is being performed.

The best plan cannot meet expectations unless maintenance personnel have the knowledge and tools to perform truly proactive and precision maintenance.

SKF has designed the Proactive Reliability Maintenance Skills course to address real industry needs in a practical format utilizing hands-on exercises to teach and demonstrate the relationships between precision techniques and machine performance.

A seasoned millwright or an apprentice will both benefit from the back-to-basics information presented in this course. From rotor assembly to shaft alignment to the start up of the machine, students will learn to employ world-class practices in a cost and time effective manner. An introduction to machinery vibration and condition monitoring will enable mechanics to take basic readings to check their own work as well as better support current condition monitoring programs.

This course covers most rotating machines in any industry but emphasizes coupled horizontally mounted machines with rolling element bearings and belt-driven machinery.

On-site programs can be designed to address specific machinery or maintenance concerns.

The course includes the following topics, with an emphasis on providing solutions to specific maintenance and reliability problems:

- Overview of proactive and precision maintenance
- Fundamentals of machinery vibration and condition monitoring with an emphasis on basic troubleshooting techniques
- Precision shaft alignment utilizing a variety of tools. Inspection, preparation, and process optimization
- Improving rotor balance through specifications and precision assembly. Techniques to make any machine run more smoothly
- Maximizing rolling element bearing life - installation, handling, lubrication, and inspection
- Belt-driven machinery - assembly, alignment, tensioning to obtain maximum belt and bearing life

Course Duration

5 days

A written examination is available for this course.

Proactive Reliability Maintenance™ for Managers and Supervisors

PRM 802

Recommended for

Corporate and plant management and supervision personnel responsible for plant production and maintenance performance. Plant engineering, planning and scheduling, purchasing, and reliability personnel will also benefit from this comprehensive program.

Course Objective

Provide information and training that enables corporate and plant level management to successfully implement precision and proactive maintenance practices towards a goal of improved reliability and profitability.

Course Description

Improving the reliability of plant machinery is the key to gaining or maintaining a competitive advantage. However, many companies continue to struggle with poor reliability in spite of repeated improvement efforts.

The basis for success is changing the fundamental way maintenance is performed. Few maintenance programs have addressed this important topic. Computerized Maintenance Management Systems and condition-based maintenance programs can provide significant returns, but do little to modify actual hands-on maintenance practices. Repeated premature failures can be detected with condition monitoring and scheduled in the CMMS system at considerable savings over a run-to-failure maintenance mode. A proactive and precision approach, as presented in this course, identifies and corrects the root cause of the repeated failures.

Proactive and precision maintenance goes beyond root cause failure analysis. It affects the way routine maintenance is performed on all machinery, the way machines are operated, the specification and purchase of machinery and replacement parts, and the way maintenance and production are managed.

This course provides a detailed look at reliability and influencing factors and presents a practical approach to improving machinery reliability in any industry.

The course includes the following topics, with an emphasis on solutions over theory:

- Definitions of reliability based on industry and application
- Failure sources
- Beyond root cause - root prevention
- Reliability within the traditional maintenance models
- Overview of condition-based maintenance and common pitfalls
- Implementation of reliability - key steps towards positive change
- Conducting a maintenance practices assessment
- Monitoring performance and improvement - key performance indicators
- Overview of common machinery problems, their correction, and their prevention
- Precision and proactive mechanical maintenance techniques

Course Duration

2 days

A written examination is available for this course. Test Fee - quoted on request.

Proactive Reliability Maintenance™ is a trademark of SKF USA Inc.

PRM 804 Precision Shaft Alignment Laser Systems

Recommended for

This course is designed for maintenance, engineering, technical support, and management personnel whose job functions involve alignment of rotating machinery. The scope is appropriate for those who align machines, those who detect, investigate and resolve premature machinery failure due to misalignment, as well as those who direct activities relative to alignment and machine reliability.

Course Objective

The course objective is to teach students how to align two coupled rotating machinery shafts to specified tolerances using a laser alignment system, including proper planning, rough and precision alignment processes per approved procedures.

Course Description

This course focuses on specific procedures for using today's laser alignment systems and the fundamental concepts and skills required to perform precision alignment.

The unique approach provides not only an understanding of the specific procedures to follow for the laser system being used, but also the foundation to understand why and how the system works the way it does.

Up to 50% of this course consists of guided hands-on activities. It is requested that participants bring their instruments to the course.

Specific topics include:

Introduction and overview

- Review of shaft alignment fundamentals
- Advantages, disadvantages, and sources of error associated with various alignment methods
- Describing and documenting shaft offset and angular misalignment conditions
- Pre-alignment procedures
- Review the three major phases of alignment
- Review of dial indicator alignment methods
- Laser alignment systems overview

Fundamental horizontal machine alignment processes

- Setting up the laser system
- Measuring and entering the dimensions
- Obtaining measurements
- Interpreting results
- Making moves/adjustments
- Alignment completion

Dealing with alignment challenges

- Base-bound and bolt-bound conditions
- Dynamic movement
- Identify general types of soft foot and how to detect and correct soft foot conditions
- Effects of thermal growth on the alignment process and machine operation

Course Duration

3 days

A written examination is available for this course.

Field and Shop Balancing

PRM 805

Recommended for

All condition monitoring specialists, engineers, and supervisors responsible for improving machinery performance and reliability. Those seeking strong practical skills in balancing rotating machinery to precision levels, both in the field and in the shop.

Course Objective

To be able to successfully balance common machinery in the field. This includes proper diagnosis of unbalance, assessment of balancing requirements/ methods, data acquisition and balancing procedures, and special considerations for overhung rotors, unusual configurations, and influences of other machinery.

Course Description

This course emphasizes hands-on balancing exercises using tabletop rotor kits and instruments using optical, laser and strobe light accessories for phase reference. Proper vibration analysis techniques are reviewed to differentiate imbalance from other problems such as misalignment and resonance. Analysis techniques include typical unbalance signatures (FFT) with phase; bump test, run-up and coast-down tests, and time waveform. Precision balancing techniques can be applied to save balancing time in the field or in a shop-balancing machine. Case histories are presented to illustrate single plane (static), two-plane (dynamic), and the static and couple approach to balancing rotors of all types.

Vibration analysis – the first step in field balancing

- Fourteen "votes" that confirm unbalance
- Resonance, misalignment and other problems that might "look like"

Unbalance – what balancing technique will be successful?

- Single plane, two-plane, or static and couple approach
- Use amplitude and phase measurements to determine approach
- L/D ratio & rotor response to trial weight can confirm
- Amount and location of trial weight and balancing in one run
- Rotor response, calibration factor and lag angle

Single plane (static) balancing

- Vector diagram solution to help understand single plane technique
- Balancing without phase - 3 and 4 circle methods
- Instrument and calculator (computer) solutions
- Combining or splitting correction weights. Two-plane (dynamic) balancing

Two-plane (dynamic) balancing

- Cross effect and the concept of "false" couple
- Two plane solutions, instrument and/or calculator

Static and couple balancing

- When to use this approach
- How to compute - calculator and vector diagram
- What type of rotors respond to this approach

Balancing machines

- Hard bearing versus soft bearing
- Overcoming problems - thrusting, windage, and gross initial unbalance
- Key conventions and compensating for tooling errors
- Balancing tolerances - Navy (Mil Std), API, ANSI, ISO for low speed balancing
- Why specify ounce inches or gram inches rather than mils or in/sec
- Prove rotor balance using the traverse test

Prerequisites

Six months experience using any type of vibration / balancing instrumentation and/or a basic vibration analysis or balancing course. Attendees are encouraged to bring their data collector / analyzer / balancer with accessories in order to participate in the extensive hands-on exercises.

Course Duration

3 days

A written examination is available for this course.

SKF

PRM 806 Proactive Maintenance Planning / Scheduling and Work Management

Recommended for

Maintenance planners and schedulers, maintenance supervisors, superintendents, and managers. All personnel who support the work management process (operations/manufacturing, engineering, materials management, PdM, etc.) will gain valuable insight from this training.

Course Objective

Provide information and skills training required for efficient and effective work management (planning, scheduling, parts acquisition, coordination, and measurement).

Course Description

Specific topics covered in this course include:

- Work management and its significance within the overall maintenance strategy
- Roles and responsibilities of work management personnel
- Work Order System – notifications, work orders and activities, priorities
- Importance of planning standards
- Importance of equipment history and documentation
- Applying reliability maintenance to work management
- Planning basics – walkdowns, job hazards analysis, task planning, work packages, estimating, parts
- Scheduling basics – forecasting, coding, work coordination, staging parts and equipment, preparation activities, post-maintenance testing, returning equipment to service
- Computerized Maintenance Management Systems (CMMS)
- Handling emergent work
- Use of "Work-It-Now" (WIN) teams
- Use of minor maintenance
- Identifying, quantifying, and controlling maintenance backlog
- Understanding the overall work flow process
- Planning and scheduling for outages and projects
- Interdependency of bill of materials (BOM) with equipment nameplate data
- Work coordination meetings
- Determining critical path
- Post-execution reviews, closure, and follow-up
- Measuring the effectiveness of work management (critiques and maintenance metrics/performance indicators)

Prerequisites

- Technical competency in chosen field
- Familiarity with CMMS and Scheduling systems

Course Duration

3 days

Career Path Packages

RMI Career Path Packages are advance purchase programs for a specific set of courses designed to move the student along the path to career goals. Available in Condition Monitoring, Proactive Reliability Maintenance and Operator Reliability packages, each module is designed to be completed in one year. Career Path Package training can be provided on-site or at an SKF facility.

Career Path prices are based on classes held at SKF training facility. Contact RMI for On-Site pricing.

Career Path Packages are designated as follows:

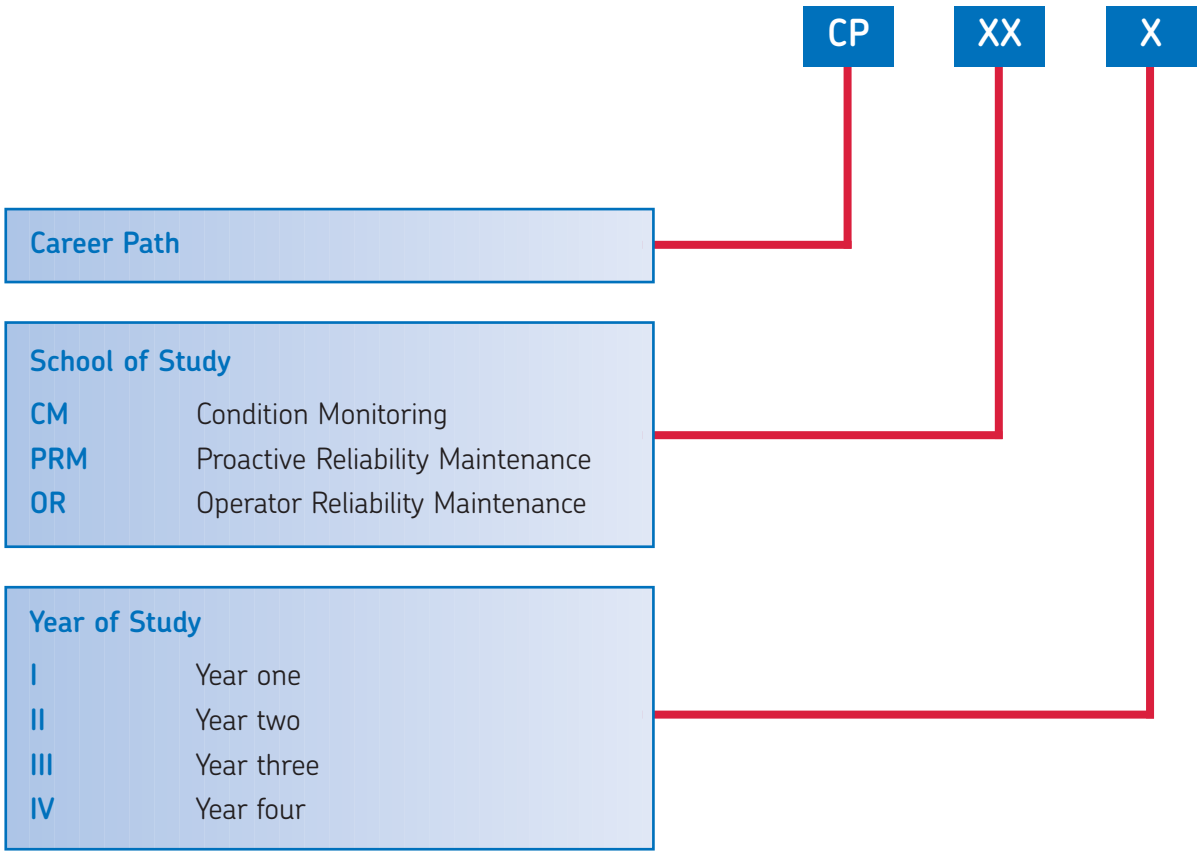
CP – Career Path

CM – Condition Monitoring Careers

PRM – Proactive Reliability Maintenance Careers

OR – Operator Reliability Careers

I / II / III / IV – Represents year one, two, three or four of career path package



Career Path Packages

Career Path - Condition Monitoring

CP-CM I (MENA)	
CMTR 201	Introduction to Vibration Analysis
BMR 603	Bearing Maintenance & Service
CMTR 500*	Microlog and appropriate software
CMTR 301	Machinery Vibration Analysis I

CP-CM II (MENA)	
BMR 608	Bearing Lubrication
PRM 801	Proactive Reliability Maintenance Skills
BMR 603	Bearing Maintenance and Service
CMTR 401	Machinery Vibration Analysis II

CP-CM III (MENA)	
PRM 804	Precision Alignment – Laser Systems
PRM 805	Field and Shop Balancing
BMR 655	Advance Lubrication Technology
CMTR 507	Introduction to the MARLIN® System – Operator Driven Reliability

CP-CM IV (MENA)	
BMR 607	Root Cause Bearing Failure Analysis
PRM 802	Proactive Reliability Maintenance for Managers and Supervisors
CM 304	Advance Machinery Diagnostics
CMTR 508	Introduction to Machinery Protection Systems

** This course is a combination of CMTR 502 and CMTR 504*

Career Path - Proactive Reliability Maintenance

CP-PRM I (MENA)	
BMR 603	Bearing Maintenance and Service
PRM 801	Proactive Reliability Maintenance Skills
BMR 608	Bearing Lubrication
Option A	Choose one from the list below:

CP-PRM II (MENA)	
BMR 607	Root Cause Bearing Failure Analysis
CMTR 201	Introduction to Vibration Analysis
PRM 802	Proactive Reliability Maintenance™ for Managers and Supervisors
Option A	Choose one from the list below:

A-PRM 804 Precision Alignment – Laser Systems
A-PRM 805 Field and Shop Balancing & Certification Testing
A-CMTR 201 Introduction to Vibration Analysis
A-BMR 655 Advance Lubrication Technology

Career Path - Operator Driven Reliability

CP-OR I (MENA)	
CMTR 507	Introduction to the MARLIN® System – Operator Driven Reliability
PRM 801	Proactive Reliability Maintenance Skills
BMR 603	Bearing Maintenance and Service
CMTR 201	Introduction to Vibration Analysis

Note: Modules from the RMI On-line courses could also be considered

How to Register

Simply complete the registration form and send it to:
Reliability Maintenance Institute
Attn: Training Coordinator
See contact list below

Payment Options

Purchase Order:
A copy of a Purchase Order is required. Send P.O. with the registration form.

Course Location

The SKF RMI is located at various centres in the Middle East – Dubai, Dammam, Cairo, Tehran.

Each facility is equipped with computers and relevant training equipment.

Start Times

Classes start at 8:00 am and end at 4:00 pm
Exact timing will be communicated depending on the course. Lunch / Prayer break will be scheduled.

Why Early Enrollment is important

Space – Many classes fill quickly, so early enrolment secures your seat in the classroom.

Course Materials – Course material will be provided. Registering early assures room and adequate materials for all students.

If you need to enrol on short notice – Please contact the RMI Training Coordinator to verify the class you wish to attend is still open before sending in the registration form and payment.

Cancellations

If you cannot attend the class for which you are registered, your registration will be transferred to the next time the course is scheduled.

Disclaimer

While great care was taken to assure brochure content accuracy, SKF is not responsible for any errors or omissions. Information listed in this catalogue is subject to revision without advance notice. Class dates and locations are subject to change.

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Reliability Maintenance Institute® Course Registration Form

Name: _____

Company: _____

Title: _____

Address: _____

City: _____

Telephone Number (work): _____

E-mail Address: _____

Course Title: _____ Date: _____

Course Title: _____ Date: _____

Company PO#: _____

e- learning
SKF Reliability Maintenance Institute® (RMI) On-line

The SKF Reliability Maintenance Institute® On-line offers a comprehensive range of Introductory level courses. The courses are self-learning on-line modules that you can take at your own pace and whenever it suits you. These courses are designed to introduce you to the subject and are considered the pre-requisites for the Intermediate level classroom courses.

Introductory level: e-learning course modules on-line

- Introduction to Asset Efficiency Optimization
- Introduction to Vibration Analysis
- Introduction toThermography
- Introduction to Lubrication Analysis
- Introduction to Bearing Basics
- Introduction to Alignment
- Introduction to Seals

Learn at your own place and pace:

The on-line area of SKF Reliability Maintenance Institute (RMI) offers an expanding range of e-learning courses covering a range of topics. This enables self-paced learning to be enjoyed by the participant at the time and place that best suits their situation.

Tutor Support:

Our "ask the expert" functionality provides the learner with direct access to our extensive network of subject matter experts, ensuring maximum effectiveness of the learning experience.

Certification:

On completion of the course the learner can take a test and receive a certificate in the mail.

Structured learning path:

These e-learning courses are an integral part of RMI's extensive training portfolio. They are designed to complement the higher level courses that are delivered by our specialist training staff. Like RMI's face-to-face training, RMI On-line courses are structured according to the five facets of SKF's Asset Efficiency Optimization (AEO) process.

For more information visit: *www.skf.com*

www.mena.skf.com

SKF - The knowledge engineering company

About @ptitudeXchange

@ptitudeXchange is a web site that provides information to professionals from maintenance technicians to top-level decision makers, enabling efficient and effective decision-making for improved reliability results.

Through @ptitudeXchange, customers gain access not only to SKF's extensive knowledge and experience in rotating equipment, but to a wealth of essential information from SKF's alliance partners as well. These include a range of machinery, component, software, instrumentation manufacturers, and more.

Part of @ptitudeXchange can be accessed for free after registration, while other parts require a subscription.

@ptitudeXchange focuses on three key categories to support your efforts to optimize asset efficiency:

- Asset Management – Achieving the lowest total cost of ownership (TCO) of an asset with maximum availability, performance efficiency and product quality.
- Reliability Engineering – Maintenance strategy, improvement programs, procedures, targets, planning, systems implementation and evaluation, stores and spare parts planning.
- Mechanical Maintenance – Mechanical maintenance functions and tasks such as alignment, balancing, bearing installation, equipment history tracking and more.

www.aptitudexchange.com

SKF – The knowledge engineering company

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