

SKF Training Solutions[®]

Training Portfolio 2019



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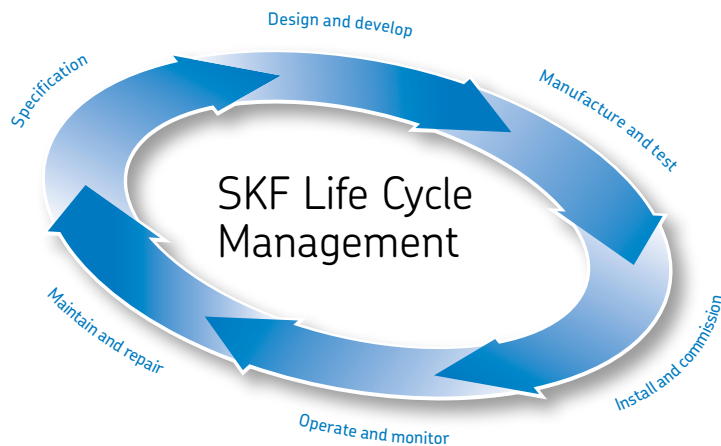


* In the course index indicates SMRP approved courses.

SKF USA Inc. is recognized by the Society for Maintenance and Reliability Professionals (SMRP) as an approved provider of continuing education and training aligned with key subject areas related to reliability and physical asset management.

SKF Training Solutions®

Program overview



SKF Training Solutions® offers a comprehensive range of training courses touching every stage of Life Cycle Management designed to help increase equipment reliability and reduce waste.

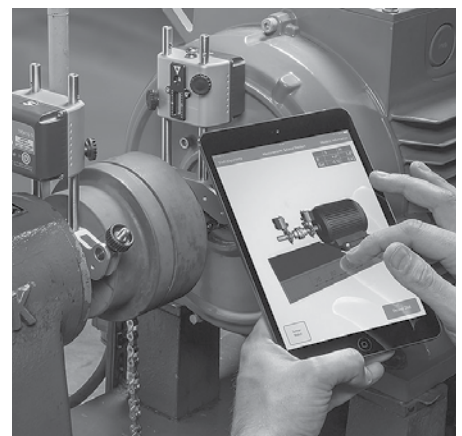
Industry today is under immense pressure to provide the highest possible quality at the lowest possible cost. Achieving maximum machine reliability is critical.

Our training courses have been developed with over 100 years of experience and knowledge of rotating equipment reliability that is unmatched in the world.

Our close working relationships with equipment owners and designers have given us an intimate understanding of the processes and challenges specific to every major industry within the continuously evolving global community.

SKF has more than 250 instructors in over 70 locations around the world working together to develop and deliver consistent high quality product and technology courses. Our complete 2019 training portfolio encompasses e-learning, classroom training, hands-on workshops, on-site mentoring, instrument and software specific training and complete overall training needs analysis.

Through public and on-site training options, our instructors share their knowledge and passions with you and your team and set the rhythm for you to apply new skills in real life situations. You will be encouraged to share your acquired knowledge at your facility and reap the benefits of working with the principles of best practices.



SKF Training Solutions®

Program overview

SKF Training Solutions offers different types of courses which are denoted by course numbers, such as WE201. WE201 denotes a Work Execution Course. Details are listed below.

Maintenance Strategy (MS)

Courses focus on methods and technologies used in developing a technically and financially sound maintenance strategy developed to match business goals.

Work Identification (WI)

Courses focus on methods, technologies and instruments used in identifying maintenance work requirements and integrating the results into a maintenance management system.

Work Control (WC)

Courses focus on methods and technologies used in establishing standard procedures for planning and scheduling the work identified.

Work Execution (WE)

Courses focus on methods and technologies used in executing the work tasks and developing the skills needed to perform maintenance effectively and efficiently.

Living Program (LP)

Cooperative on site programs designed as an extension to the classroom environment used to evaluate maintenance practices and strategies, making maintenance a continuous improvement process.

Benefits of training

- Achieve higher levels of personnel and machine efficiency
- Eliminate machinery problems and increase reliability and productivity
- Enhance plant safety
- Reduce unplanned downtime and under-utilization of equipment
- Develop skills of less experienced personnel to handle the loss of “expert” personnel
- Stop problems before they happen by addressing the root causes

If you don't know where to start, we can help. SKF has developed programs to assess the maintenance skills of your team and identify individual strengths and weaknesses. Together we then create a program that fits your needs and gives the best return on your investment in your people.

Blended learning

SKF Training Solutions offers blended learning materials with selected public courses. Our established classroom training approach is now complemented with a package of pre and post self-study materials of selected online courses and reference materials. These materials are accessed upon course registration via The Knowledge Centre at www.skf.com and may include: online learning modules and/or technical papers and application reports. Pre-study material is made available to help prepare the student for the upcoming course. Post-study material is made available to reinforce and extend the classroom learning experience.

Visit skfusa.com/elearning for more information.

Testing and qualification

SKF Training Solutions offers qualification testing for most courses offered. Qualification testing allows the individual to be recognized for the achievement of a specific skill. Qualification is given to individuals who pass with a specific minimum grade. Participants who choose not to take the test or who do not pass will receive a certificate of attendance. Some testing is at an extra charge; please consult the individual course syllabus for qualification testing details.

Vibration courses are certified by [Technical Associates of Charlotte](#) (this certification exam can take up to four hours).

Lubrication courses offer an exam for International Council for Machinery Lubrication (ICML) certification.

SKF Training Solutions®

Client Needs Analysis-Training

Shifting to a fully integrated, reliability and risk based asset management strategy starts with a good initial understanding of where your staff is today and where your staff needs to be to attain optimum plant performance.

Drawing on years of SKF productivity experience, we can help you identify improvement opportunities that can yield positive bottom-line results, and then suggest a strategy for implementing a program to achieve them. The SKF Client Needs Analysis (CNA) is a performance bench marking process with proven success in many industries.

The SKF Client Needs Analysis program for training enables this crucial understanding, combining our experience in training and knowledge of maintenance and reliability. The goal is to prove useful and meaningful information to help you focus on improvements for plant performance

The CNA-Training is conducted individually or as a group from any of the following work areas: maintenance, reliability, engineering and planning. The program targets eight areas of competency for improvement:

- Bearing and seal technology
- Power transmission
- Lubrication
- Oil analysis
- Vibration analysis
- RCA/RCFA
- Thermography
- Maintenance strategy

The SKF CNA-Training allows us to identify improvements in specific work categories that can help you achieve optimum results. You obtain a clearer perspective of personnel competencies and skill levels.

Once the analysis is complete, you will receive a comprehensive report that includes:

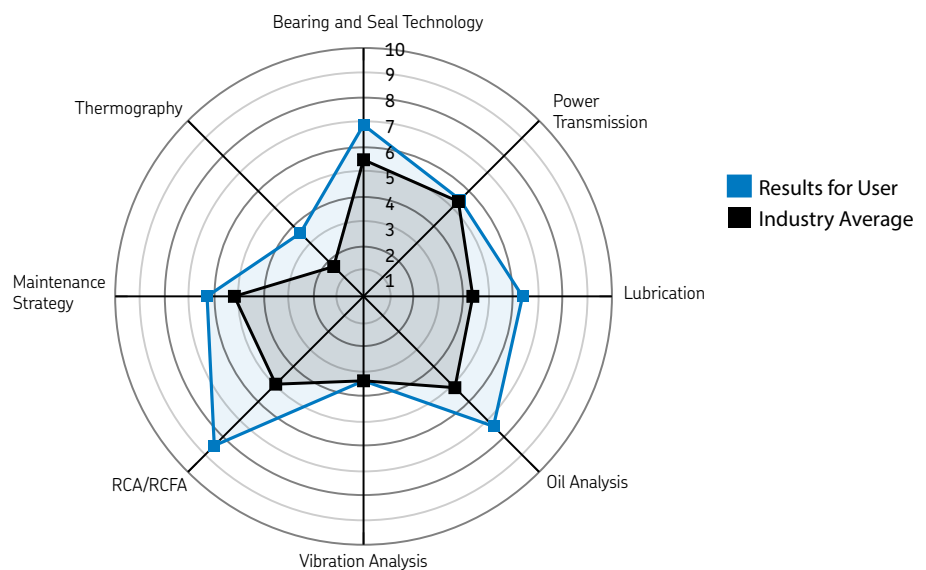
- A summary of initial set-up details
- A maturity summary matrix showing a macro-level assessment of your group's overall competency level.
- Spider charts bench marking current individual skill levels.
- A roadmap of recommendations for improving competency through skills training

The SKF CNA-Training program can be used at regular intervals to reassess the improvements made in the different work categories. This allows customers to identify new improvement opportunities, thereby closing the reassessment loop and making this part of a continuous improvement plan.

Contact your local SKF Representative to get started.

For more information visit skf.com/us/knowledge-centre/engineering-tools/skfcnaam.html

Competency and skill analysis



SKF Training Solutions e-learning

SKF offers a personal approach to learning in an online environment. Our online e-learning courses are designed to introduce you to the subject. They are designed to complement the portfolio of face-to-face courses from SKF Training Solutions.

Learn at your own place and pace

SKF Training Solutions online offers a wide range of e-learning courses in diverse areas of study. Self-paced learning can be accessed by the student at the time and place that best suits their learning needs.

Certificate

On completion of a course, the learner is offered an exam. Upon successful completion of the exam the learner will receive an electronic certificate which can be printed out locally.

Structured learning path

These e-learning courses are an integral part of the SKF Training Solutions' comprehensive training portfolio. The courses are designed to complement the higher level classroom courses delivered by our training staff. Like SKF Training Solutions' face-to-face training, the Online courses are structured according to course type:

- Maintenance Strategy
- Work Identification
- Work Control
- Work Execution and Living Program

Maintenance Strategy courses

- MS 101 Assessment basics
- MS 113 Proactive reliability maintenance
- MS 120 Operator driven reliability
- MS 130 Maintenance strategy review

Work Identification courses

- WI 100 Vibration basics
- WI 130 Thermography basics
- WI 140 Lubrication analysis basics

Work Control course

- WC 130 Spare parts management

Technical Reference courses

- GRB 001 Bearing basics
- GRB 003 Angular contact ball bearings
- GRB 005 Taper roller bearings
- GRB 006 Deep groove ball bearings
- GRL 001 Lubrication basics

SKF Training Solutions e-learning can be found at: skfusa.com/elearning

Select "Courses from SKF Training Solutions." From there, you can login/register. If you are a new user, follow the prompt to register, and you will be given access to the e-learning content.

The SKF Training Solutions Online service is currently available in English. Additional languages are in development.

Basic system requirements

SKF Training Solutions e-learning is powered by a market leading Learning Content Management System. This allows fast and efficient delivery of sophisticated training materials to make your learning experience more interesting, enjoyable and effective. All that is required is your valued partner code and a computer with an internet connection.

Work Execution courses

- WE 104 Bearing damage analysis
- WE 140 Shaft alignment basics
- WE 150 Balancing basics



The online e-learning courses are free of charge and can be found at: skfusa.com/elearning

Specialty Classes

We are offering 5 specialty classes that focus on the unique challenges to equipment reliability in these capital-intensive production environments. Industry technicians and professionals will gather for a two-day workshop to tackle machinery care and reliability improvement issues through laboratory time, classroom workshops, and hands-on training. The goal of this workshop will be to share and learn best practices in reliability-based lubrication and lubricant analysis techniques, with the goal of delivering cost-saving solutions to the attendees and their companies. These workshops usually include a tour of an industry specific facility or maybe even a visit to the Harley Davidson® Production Facility.

2019 Tuition

Public Classes	\$995
On-site classes	See page 60

2019 Course Schedule

Pulp and Paper	July 17–18	York, PA
Metals Industry	Sep 25–26	York, PA
Food Industry	Oct 31–Nov 1	York, PA
Power Gen	June 12–13	York, PA
Cement & Mining	Mar 13–14	York, PA

Register online

<http://us.promo.skf.com/acton/media/22336/specialty>



SKF Training Solutions courses by state/city

Full course details, including training locations by listed by date, city and state are provided in the course description pages. Registrants will be notified of the specific location prior to the course.

Please note, course locations are subject to change or cancellation. Registrants will be notified of any changes.

Alabama

Birmingham area –
Moody, AL
WI241

Arizona

Phoenix, AZ
WI332

California

San Diego, CA
WE201
WI210
WI211
WI212
WI231

Colorado

Denver, CO
WI210
WI211

Florida

Jacksonville, FL
WI231
Orlando, FL
WI210
WI211
Tampa, FL
WI231
WI232EM
WI332

Georgia

Atlanta area -
Flowery Branch, GA
WI205
WI241
WI321

Buford/Oakwood, GA
WI221

Illinois

Chicago area – Elgin, IL
BSD301
VB120
WE204

Indianapolis

Indianapolis, IN
WI231
WI332

Louisiana

Baton Rouge, LA
VB120
New Orleans, LA
WI210
WI211

Michigan

Detroit, MI
VB120

Minnesota

Minneapolis, MN
WI231
WI332

Missouri

Kansas City, MO
WI231
WI333
St. Louis, MO
WE201
WI210
WI211
WI212
WI221
WI231

Nebraska

Omaha, NE
WI332

New York

New York, NY
WI221

North Carolina

Charlotte, NC

WE250
WI210
WI211
WI212
WI213
WI221
WI231
WI304
WI305
WI313
WI321
WI332

Ohio

Cincinnati, OH

WI231
WI332

Cleveland, OH

WE240
WI231
WI241

Columbus, OH

WI221

Oregon

Portland, OR

VB120
WE204
WI221

Pennsylvania

Allentown, PA

WI221

Philadelphia area – Lansdale, PA

VB120
WE201
WE202
WE204
WI210
WI211

Pittsburgh, PA

WI231

South Carolina

Charleston, SC

BSD301
WI221
WI231
WI232EM
WI321
WI332

Myrtle Beach, SC

WE250
WI210
WI211
WI212
WI213

Tennessee

Chattanooga, TN

WI332

Knoxville, TN

WI221

Memphis, TN

WI231

New Smyrna, TN

WI221

Texas

Dallas, TX

WE250
WI210
WI211
WI212
WI213
WI221
WI231
WI332

Houston, TX

VB120
WE204
WI210
WI211
WI212
WI221
WI231
WI241

San Antonio, TX

WI211
WI231
WI232EM
WI332

Utah

Salt Lake City, UT

VB120
WE201
WE240
WI205
WI221

Vermont

Barre, VT

WI231
WI332
WI333

Washington

Seattle, WA

WI210
WI211
WI212
WI231
WI332

BSD301

Bearing System Design

Recommended for:

Design engineers directly responsible for rolling element bearing system design. Reliability and maintenance engineers responsible for optimizing the performance and improving the reliability of existing machinery.

Course objectives:

Students should gain a thorough understanding of bearing system designs used in typical industrial applications. Includes bearing life, lubrication life, seal life and other factors affecting performance and reliability of rotating equipment.

2019 Tuition

Class duration	4 days
Public classes	\$1,495
On-site classes	See page 60
Per class	\$14,995
# of people	10
11+ people	\$395 per person

2019 Course schedule

June 11–14	Elgin, IL
October 8–11	Charleston, SC

Register online

<http://us.promo.skf.com/acton/media/22336/bsd301>

Course description

Bearing System Design uses a combination of lectures, open discussions and guided exercises. Specific topics include:

Review of bearing history and design

Selection of bearing type

- Available space
- Loads
- Misalignment
- Precision
- Speed
- Stiffness
- Axial displacement
- Mounting and dismounting
- Integral seals

Selection of bearing size

- Bearing reliability – system life
- Dynamic load ratings and life
- Dynamic and static bearing loads
- Static load ratings and capacity

Calculation tools

Friction, speed and vibration

- Friction models
- Reference speeds
- Limiting speeds
- Influence of vibration

Bearing data

- Dimensions
- Tolerances
- Internal clearance
- Materials
- Cages
- Designations

Application of bearings

- Bearing arrangements
- Radial location of bearings
- Axial location of bearings

- Designing associated components
 - Bearing preload
 - Sealing arrangements
- Lubrication of bearings
- Grease lubrication
 - Relubrication
 - Oil lubrication

Pre-study

GRB001 Bearing basics

EVOL01_no1_p25 The SKF formula for rolling bearing life

EVOLV06_no2_p27 Using a friction model as an engineering tool

Post-study

SKF_5230 Rolling Bearings in Electrical Motors and Generators

SKF100955_1 Rolling Bearings in Centrifugal Pumps



SMRP approved course

LP300

SiteMentor

Recommended for:

If you or your staff have attended one of our on-site or public courses, and want more hands-on activity directly related to your equipment, technology, or systems, this program is for you.

Course objectives:

Training is brought directly to you, at your site through the SiteMentor program. A solid foundation in proactive maintenance practices is critical to achieve maximum machine reliability and performance. SiteMentor helps you discover gaps in skills and practices and implement improvement methods. Each SiteMentor training session is custom tailored to your industry and working environment and requires from three-to-five days on site.

2019 Tuition

Class duration	3–5 days
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On-site classes	See page 60
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Customized as needed

Course description

Designed as an extension of the typical classroom instruction offered by the SKF Training Solutions, SiteMentor programs place an SKF Training Solutions instructor and/or technical expert side-by-side with your employees to provide customized training programs on bearings, precision skills, condition monitoring, vibration troubleshooting and/or lubrication.

All SKF Training solutions catalog courses consist of individual modules/topics. Based on assessed training needs and scheduling constraints, SKF can produce customer-specific training to best meet the requirements of both the site and staff.

These programs typically range from highly specialized one-on-one mentoring sessions to specific targeted training of smaller groups through the selection of appropriate modules from the SKF training portfolio. For classroom type training, class size is typically limited to no more than five participants to allow maximum participation for all students.

This hands-on approach of matching customer needs with the appropriate training modules is the most practical and effective training program available. These programs are designed in advance with the assistance of the SKF Training Solutions staff by defining training requirements and selecting the topics that will provide the highest training impact.

An SKF Training Solutions specialist can also work with your employees to interview key personnel, review work processes, and observe maintenance practices to create a robust training event. An action plan can be developed in a Detailed Analysis Findings report which offers comprehensive recommendations for improvement. SKF can also provide your plant with the means to implement the recommendations provided.

Leverage your classroom training investment to reap the largest returns by putting what's taught in the classroom into practice in the field. SKF Training Solutions SiteMentor programs need to be scheduled in advance and typically require some preparation time preceding the on-site session. Arrangements can be made for the use or rental of SKF tools and equipment during the training. Skills, training and equipment assessment reports can also be developed as part of an overall precision and proactive maintenance strategy.

MS212

Proactive Reliability Maintenance™ for Managers and Supervisors

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 objectives:

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.

2019 Tuition

Class duration 2 days

On-site classes See page 60

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

Pre-study

MS100 Proactive reliability maintenance

MB03014 Reactive maintenance

MB03033 Maintaining a competitive edge

Post-study

GS02010 Asset efficiency optimization work management process

MS120 Operator driven reliability

BBONN_FWD Benchmarking for best practices in maintenance management

MS230

Maintenance Strategy Review (MSR) Awareness

Recommended for:

Maintenance, plant/facility engineering staff, rotating equipment engineers and maintenance supervisors. Managers at industrial plants, reliability engineers and those interested in rotating equipment performance and reliability.

Course objectives:

By the end of this course students should:

- Know if a review of strategy is required and why
- Recognize the importance of data structure and content before performing any kind of strategy work
- Understand the importance of identifying and categorizing assets
- Understand that there are differing types of criticality at different levels for different purposes
- Understand what will likely be involved to conduct the right analysis, and what the implications are of making the strategy work
- Recognize the commonalities and difference in possible strategies
- Understand the important implications to spares
- Understand that certain classes of equipment require specialized approaches to strategy review (i.e., SCS > via SIL/IPF, etc.)

Course description

Before we explore the technical details of strategy, we must understand each organization, what their issues are, which issues matter to whom, and how the issues can be incorporated into a plan.

There must be a documented need to look at an existing maintenance strategy or create a new one for the right business reasons.

Having the right maintenance, performed on the right equipment, by the right person, at the right time, for the right reasons is what we all want. Maintenance strategy is the key to asset reliability and availability, thus achieving overall organizational goals. How do you know if a review of your maintenance strategy is required and why?

Data structure, content and categorization is paramount before any kind of strategy work begins. There are many different methods to determine asset criticality, at different levels for different purposes. Having good, solid data, and using the appropriate criticality techniques will allow an organization to conduct the most appropriate asset rank/prioritization analysis. Then the implications of making the maintenance strategy work can be understood.

2019 Tuition

Class duration	3 days
On-site classes	See page 60

A written examination is included with this course and is conducted on the afternoon of the final day of class.

The purpose of this course is to make users aware of Maintenance Strategy Review and how they can apply it. Specific topics include:

- Conceptual models and business context
- Obtain a common understanding of terminology
- Standards, models, and excellence
- Understanding the current situation
- The essential link – failure and strategy
- What is strategy?
- Mutual understanding and readiness
- Can we conduct MSR? Now we know we need to
- A blend of MSR types
- How to implement well
- Performance management and measurement
- How MSR forms the basis for PdM and Proactive Reliability Maintenance (PRM) programs

Pre-study

MS100 AEO basics
MS130 Maintenance strategy review
MB03006 Maintenance Strategy Review Methods

Post-study

MB03011 Asset register
MB03032 Managing asset integrity
GS03011 Business process improvement

MS300

Asset Reliability Improvement

Recommended for:

Anyone responsible for managing and improving the reliability of rotating equipment, managing plant assets and/or reliability programs, as well as all reliability managers and supervisors, maintenance managers and supervisors, operation managers, purchasing managers, plant managers, reliability engineers, rotating equipment engineers, schedulers and senior maintenance staff.

Course objectives:

By the end of this course students should have the knowledge to:

- Understand if and when an assessment is necessary
- Describe what type of data is required for various analysis purposes
- Recognize when root cause analysis is necessary

2019 Tuition

Class duration 3 days

On-site classes See page 60

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

The arena of Asset Management encompasses a variety of maintenance approaches, techniques and technologies. This course explores Asset Management best practices and helps you select the most appropriate combination to optimize asset management in your organization.

The concept of asset improvement emerged in recent years as the total organization of a physical asset's life cycle to achieve the lowest cost with maximum return. As such, it spans an entire organization, beyond maintenance or operations functions. Asset management demands continuous, prioritized improvement through design and procedural change. Success is measured by the contribution to a company's results and shareholder value.

This is an advanced course for individuals who have experience in maintenance processes, tasks and results analysis. The course relates to methods, technologies and best practices used to develop, implement and sustain your optimized maintenance strategy and guides you to benefit from the living program for continuous improvement.

This course explores the justification for your maintenance strategy; examines various strategies and helps you to optimize your current maintenance strategy or transition to a more appropriate strategy.

Benefits of implementing the correct maintenance strategy include improved asset reliability, increased uptime and moving your organization from a reactive culture to a reliability-focused culture.

This course helps you establish your road map for why specific maintenance should be done; what maintenance should be done, on what equipment and how frequently it should be performed. You can leverage this knowledge and use the information gained to refine your maintenance program and enable continuous improvement.

You will learn techniques to recognize when a change is needed, charting that change and then measuring the impact of the change.

Pre-study

MS100 Proactive reliability maintenance
MS120 Operator driven reliability
GS02006 Asset Management

Post-study

MS130 Maintenance strategy review
MB03011 Asset register
GS02012 Asset Efficiency Optimization
Work Management Process

MS331

SKF Reliability Centered Maintenance (SRCM)

Recommended for:

Maintenance, plant/facility engineering staff, rotating equipment engineers, maintenance supervisors, managers at industrial plants, reliability engineers and those interested in rotating equipment performance.

Course objectives:

By the end of this course students should have the knowledge to:

- Describe the SRCM process flow
- Recognize the importance of data structure and content before performing any kind of strategy work
- Understand the importance of identifying and categorizing assets.
- Understand criticality and the Failure Modes and Effects Analysis (FMEA) approach in SRCM
- Develop a SRCM analysis, as well as the implications of making the strategy work
- Conduct a task comparison
- Understand methods needed for SRCM implementation
- Recognize what a living program is

2019 Tuition

Class duration 3 days

On-site classes See page 60

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

To provide participants the necessary knowledge of the SKF maintenance strategy review to understand the basics of SKF Reliability Centered Maintenance (SRCM).

Setting the scene for SRCM

- Asset Management Support Tool (AMST) module structure

Conceptual models and business context

- Understand where SRCM came from
- Discuss the difference between SRCM and RCM
- Understand the RCM standard
- Discuss SRCM compliance with the RCM standard

SRCM methodology

- Effectively discuss the SRCM process model
- Determine what data is required prior to SRCM

Identify what is important

- How to select which system to analyze
- Determine system boundaries
- Understand the importance of the functional failure analysis (FFA)

Define what should be done

- Know what dominant failure causes are
- How to prescribe maintenance to critical assets
- How to decide run-to-failure (RTF) maintenance
- Know when design changes are required

Change the existing program

- Understand the importance of task comparison
- How to implement well
- What feedback is

Project steps

- Understand typical SRCM project steps
- Understand what takes place during a SRCM review meeting

Pre-study

MB03017 Methodology SRCM

MS130 Maintenance strategy review

MB05004 Redefining Your Maintenance Strategy Using the SRCM Process

Post-study

MB02029 Criticality analysis in perspective

MB07005 TPM with SRCM

MB03016 RCM That Works–SRCM



SMRP approved course

MS332

Reliability Centered Maintenance (RCM)

Recommended for:

Maintenance, plant/facility engineering staff, rotating equipment engineers, maintenance supervisors, managers at industrial plants, reliability engineers and those interested in rotating equipment performance.

Course objectives:

By the end of this course students should:

- Describe RCM process flow
- Understand the differences in RCM approach
- Recognize the importance of data structure and content before performing any kind of strategy work
- Understand the importance of identifying and categorizing assets
- Understand criticality and the FMECA approach in RCM
- Develop an RCM analysis and know the implications of making the strategy work
- Conduct a task comparison
- Understand what work packaging is
- Understand methods needed for RCM implementation
- Recognize what a living program is.
- Know the content of a RCM project plan
- Understand Risk Based Inspection (RBI) within the asset management support tool AMST

2019 Tuition

Class duration 3 days

On-site classes See page 60

Course description

To provide participants the necessary knowledge of the SKF maintenance strategy review Reliability Centered Maintenance Methodology (RCM).

Introduction

- Discuss RCM terminology

RCM overview and business context

- Understand the evolution of RCM
- Understand the business context of RCM
- Know RCM standards

RCM phase “what is important?”

- Know what a criticality matrix is
- How to select which system to analyze
- Determine system boundaries
- Understand what failure modes, failure causes and failure effects are

RCM phase “what should be done?”

- Know what important failure characteristics are
- Understand when Run To Failure (RTF) maintenance is appropriate
- Know when design changes are required
- How to prescribe maintenance to critical assets

RCM customization and requirements

- Understand RCM customization
- Understand the use of RCM template data
- Determine what data is required for RCM
- Become aware of the Asset Management Support Tool (AMST)

Implementation and improvement

- Understand what a job plan is
- Understand how to allocate tasks
- Understand how to implement RCM well
- Understand what feedback is

RCM project

- Know the steps in a RCM project
- Understand the evolution of Risk Based Inspection (RBI)
- Understand variations of RBI
- Understand the requirements for RBI

Pre-study

MB02008 Reliability centered maintenance

MB02024 Using an RCM Approach for Process Hazard Analysis Revalidation

MB04002 Risk based inspection

Post-study

NC_0520 How to Implement Reliability Centered Maintenance at Your Facility

MB07005 TPM with SRCM

MB05004 Redefining your maintenance strategy using the SRCM process



SMRP approved course

VB120

Detecting bearing failure with vibration data

Recommended for:

For all plant/facility personnel involved with rotating equipment, machine reliability, and predictive maintenance.

Course description:

Many plants use condition monitoring programs to detect impending bearing failure. The vibration data collected can indicate that a bearing is failing. But detection is only the first step. Without understanding the true root cause of the failure, you run the risk of repeating the same mistakes. If that's the case, the replacement bearing you install will likely meet the same fate.

This course examines real-world case studies of detected bearing failures. Presentations will highlight everything from the initial data reports to the final damage analysis. The damaged/ failed bearings – right out of the machines – are available for hands-on inspection.

Register online

<http://us.promo.skf.com/acton/media/22336/vb120>

Topics include:

- Case studies linking historical vibration data to damaged bearings
- Hands-on exercises to begin the damage analysis process
- Connecting the disciplines: Vibration & Bearing Damage Analysis
- Compare suspected faults vs. initial damage analysis and the final fault determination
- Aligning corrective actions to the true root cause.

2019 Tuition

Class duration	1 day
Public classes	\$249
On-site classes	See page 60

2019 Course schedule

March 28	Lansdale, PA
May 14	Salt Lake City, UT
May 16	Portland, OR
June 4	Elgin, IL
June 6	Detroit, MI
November 12	Houston, TX
November 14	Baton Rouge, LA

WC200

Maintenance Planning and Scheduling

Recommended for:

Personnel from production, operations and maintenance areas. Planners and schedulers. Personnel responsible for spare parts. Other personnel involved with the planning and scheduling process.

Course objectives:

To teach the basic principles for planning and scheduling of maintenance work. The participants should have an understanding of the necessity of planned work and its effect on interest groups and on maintenance measurements.

2019 Tuition

Class duration	2 days
On-site classes	See page 60

Course description

Planning and scheduling is one of the most important activities to increase the efficiency in a maintenance organization and to reach world class maintenance.

Surveys show that planning increases the productivity of work performance by as much as 77%. However, during recent years, planning and scheduling have been cut and are becoming a lost competence. Now, service technicians are often responsible for both preparation and execution of their work tasks.

To make it work well, service technicians need to communicate and cooperate in the right way with schedulers, work management, production, and operations. This requires a clear and well communicated work process among the personnel involved, and in addition, the knowledge and skills necessary for planning and scheduling of maintenance job plans.

Specific topics include:

- Roles and responsibilities
- Work flow
- Error notification
- Prioritizing of work orders
- Planning
 - Theory
 - The process
 - Standard work
 - Planning and reservation of material
- Scheduling
 - Theory
 - The process
 - Handling of backlog

- Efficient planning and scheduling of meetings
- Shutdown planning
- Improvements
- Follow up and key performance indicators (KPI)

Key learning outcomes after completing the course:

- Understand the importance and impact of planning and scheduling
- Learn and apply planning and scheduling principles and methodology
- Derive planning and scheduling work flow models
- Understand planning roles and relationships
- Understand the benefits of performance measurement
- Understand the components of a data driven maintenance job plan
- Understand when to create a maintenance job plan
- Demonstrate and skills necessary to write a data driven maintenance job plan

Pre-study

WC130 Spare parts management
RB02028 Spare Parts Management
GS03005 Inventory Management

Post-study

MB04021 Calculating Wrench Time
JPG_RB04012 Maintenance Planning and Scheduling Fundamentals
MB03013 Planning, Scheduling, and Work Orders

Recommended for:

Engineers, supervisors and managers involved with industrial maintenance inventory control, planning, scheduling purchasing, reliability and maintenance engineering, logistic support, quality, production and warehouse management.

Course objectives:

To provide participants with a sound knowledge and understanding of spares and inventory management in the maintenance repair and operations (MRO) environment. Included are those activities in an organization that ensure the optimal and timely availability of spare parts in order to meet maintenance timely demands.

In today's competitive environment, it's important that management and optimization of spare inventory is considered in the context of supporting the maintenance function to meet its operational and business goals.

Simply reducing inventory is not enough. The goal must be to maintain sufficient inventory and no more, such that production is never impacted by stock-outs while keeping inventory costs to a minimum. In this way, inventory management and optimization add real value to any business.

Course description

Spare parts management and inventory optimization training has been developed to support industrial end-users by improving their bottom line results.

Specific topics include:

- Spare parts and inventory management processes and principles
- Basic spare part and inventory management terminology
- The importance and relations of spare part and inventory management with respect to business goals
- Identifying, structure, and classifying spare parts on their criticality, order and re-order parameters, along with other spare parts characteristics
- Applying basic analysis techniques to optimize the availability of spares and cost-effectively handle obsolete spares
- Key institutes and reference material on spare parts and inventory management

2019 Tuition

Class duration	3 days
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On-site classes	See page 60
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The course includes the following modules:

- Spare parts management (SPM)
- Maintenance and spare parts strategy
- MRO inventory management
 - Basics
 - Work processes and CMMS
- Obsolete management

Case studies

The purpose of the case studies is to provide participants with an opportunity to apply and practice course knowledge.

Pre-study

WC130 Spare parts management
RB02028 Spare Parts Management
GS03005 Inventory Management

Post-study

MB03013 Planning, scheduling and work orders
RB01005 Tools management
RB01004 Supply chain management

WE201

Bearing Maintenance and Technology

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 objectives:

To teach the attendee how to improve the service life of rolling bearings, which improves the reliability of rotating equipment.

2019 Tuition

Class duration	3 days
Public classes	\$1,395
On-site classes	See page 60
Per class	\$12,995
# of people	10
11+ people	\$395 per person

2019 Course schedule

February 26–28	San Diego, CA
May 7–9	Salt Lake City, UT
September 10–12	Philadelphia, PA
November 5–7	St Louis, MO

Register online

<http://us.promo.skf.com/acton/media/22336/we201>

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

Bearing Maintenance and Technology is a foundational course that uses a combination of hands-on training, audio visuals, lectures and discussion opportunities to deliver critical information on installing and maintaining rolling element bearings in rotating machinery. Specific topics include:

Bearing basics

- Learn the fundamentals of rolling element bearing technology:
 - Differences between plain and rolling element bearings
 - Bearing types
 - Bearing components
 - Bearing terminology
 - ISO bearing nomenclature system
 - Bearing loads, calculated life and service life
- Factors effecting the performance of rolling bearings
 - Bearing quality
 - Operating environment
 - Installation
 - Maintenance practices
- Troubleshooting
- Inspection of bearing condition

Mounting and dismounting

- Shaft and housing conformance:
 - Selection of shaft and housing fits
 - Shaft and housing measurement guidelines
- Practice proper bearing mounting and dismounting procedures:
 - Selecting the right tool for bearing dismounting and mounting
 - Consequences of careless handling, neglected maintenance and poor lubrication

- Participate in hands-on exercises using specialized tools to correctly mount and dismount ball and roller bearings

Fundamentals of lubrication

- Primary function of lubrication
- How bearing lubrication works
- Oil versus grease lubrication
- Fundamental lubricant selection guidelines for rolling element bearings in industrial applications
- Learn to maximize bearing life through an improved understanding of proper lubricating principles and functions
- How much and how often to lubricate rolling element bearings
- Bearing failure causes and analysis
- How to diagnose bearing load zones
- Identify bearing damages using the ISO 15243 standard

Participants should have an understanding of industrial safety. A fundamental knowledge of, and ability to use, basic hand tools is required.

Pre-study

GRB001 Bearing basics
GRB006 Deep Groove Ball Bearings
RB02002 Bearing Basics

Post-study

GS04012 Bearing Dismounting Methods
RB02017 Tips for Bearing Mounting
RMI03003 Proper bearing handling



SMRP approved course

WE202

Bearings in Rotating Machinery Applications

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 objectives:

To teach the attendee how to improve the service life of machinery with rotating equipment systems.

2019 Tuition

Class duration	3 days
Public classes	\$1,395
On-site classes	See page 60
Per class	\$12,995
# of people	10
11+ people	\$395 per person

2019 Course schedule

April 9–11 Philadelphia, PA

Register online

<http://us.promo.skf.com/acton/media/22336/we202>

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

Bearings in Rotating Machinery Applications focuses on the four most common types of rotating equipment: motors, fans, pumps and gearboxes. Using a systems approach to machinery life extension. Familiar machinery is used as starting point to teach learn world-class techniques for installation, maintenance, troubleshooting and repair that can be carried over to all types rotating machines.

Instruction is accomplished using a combination of hands-on training, audio visuals, lectures and discussion opportunities. Specific topics include:

Industrial motors

- Learn advanced concepts related to rolling bearings:
- Factors effecting the performance of rolling bearings
- Troubleshooting and preventing common motor problems:
- Motor condition monitoring: methods and practice

Industrial fans

- Bearing mounting and dismounting procedures on tapered adapters and tapered shafts using the accurate drive-up method
- Locating and non-locating bearings: controlling heat expansion
- Lubrication of open bearings in pillow blocks and split housings
- Detecting and correcting unbalance
- Rebuilding fan applications for peak performance

Industrial pumps

- Controlling thrust loads in applications
- ANSI vs. API pumps: design overview
- Fluid machinery: common problems and corrections
 - Cavitation, off-BEP operation, low bearing service life
 - Case studies of typical failures

Industrial gearboxes

- Coupling machinery: alignment overview
- Selecting the proper lubricant: oil lubricated machinery
- Gearbox monitoring and inspection

Participants should have an understanding of industrial safety. A fundamental knowledge of, and ability to use, basic hand tools is recommended to participate in hands-on activities.

Pre-study

GRB002 Spherical roller bearings
GRB003 Angular contact ball bearings
GRB006 Deep groove ball bearings

Post-study

SKF_5230 Rolling Bearings in Electrical Motors and Generators
SKF100955_1 Rolling Bearings in Centrifugal Pumps
SKF_3213_E Bearings for fans



SMRP approved course

WE203

Lubrication of Rolling Element Bearings

Recommended for:

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

Course objectives:

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

2019 Tuition

Class duration 3 days

On-site classes See page 60

A written examination is included with this course and is conducted on the afternoon of the final day of class.

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 expressions
- 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 and grease quality standards and testing
- 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
- Electric motor relubrication

Common errors/troubleshooting

- Over-greasing, under-greasing, and mixing greases
- Corrective actions

Other topics covered

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

Pre-study

GRL001 Lubrication basics

WI140 Lubrication Analysis

RB04001 Lubrication management

Post-study

JM02016 Lubricant Monitoring and Analysis

EVOL04_no2_p26 Grease life in lubricated-for-life deep groove ball bearings

WE204

Root Cause Bearing Damage Analysis

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 objectives:

To provide background and methodology for analyzing failed and damaged bearings (due to noise, heat, vibration, etc.) and their components. Students will learn to uncover the true root causes of bearing damage and failures, and reduced service life.

2019 Tuition

Class duration	3 days
Public classes	\$1,395
On-site classes	See page 60
Per class	\$12,995
# of people	10
11+ people	\$395 per person

2019 Course schedule

March 12–14	Elgin, IL
July 9–11	Portland, OR
August 6–8	Houston, TX
October 22–24	Philadelphia, PA

Register online

<http://us.promo.skf.com/acton/media/22336/we204>

Course description

The Root Cause Bearing Damage Analysis course is taught to ISO Standard 15243:2004. We use audio-visuals, lectures, extensive hands-on training, and discussion opportunities during this course.

Discussions include initial damage and failure causes, failure streams and visible conditions at the time of bearing removal. You will analyze complete examples of damaged bearings with a variety of distress, damage, and failure conditions. The student will be expected to use a standardized methodology to observe the visual condition of damaged bearings, organize the data, identify the primary damage types and discover and discuss potential root causes of the failure mechanisms. Specific topics include:

Bearing fundamentals

- Review of common rolling element bearing types
- Bearing materials and properties
- Lubrication
- Application of bearings, including:
 - Location of bearings
 - Clearance and precision
 - Shaft and housing fits
 - Bearing life: calculated life vs. service life

Bearing function

- Learn how bearings support loads

Mounting damage

- Examples of improper installation procedures

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Operating environment

- Bearing reaction to moisture, contamination, and other environmental effects on the bearing components

Maintenance

- Results of poor maintenance practices

Lubrication

- Effects of marginal and excessive lubrication
- Contamination and its effect

Vibration/impact damages

- How to find and correct

Bearing failures

- See examples, identify, and interpret actual bearing failures

Pre-study

GRB001 Bearing basics

WE104 Bearing Damage Analysis

EVOL12_no4_p21–29 Damage mechanisms

Post-study

PUB 14218EN Bearing Damage and Failure Analysis

EVOL11_no3_p28 Golden opportunities

GS02003 Root Cause Analysis

Recommended for:

Plant engineers, maintenance managers, engineering managers, rotating equipment managers and engineers, reliability managers and engineers, maintenance supervisors, foreman and team leaders, general maintenance and mechanical foreman, lubrication engineers and technicians, plant and maintenance planners, mechanical shop managers, foreman and technicians, mechanical repair services providers, maintenance services contractors and technicians, maintenance operations coordinators, millwrights, maintenance administrators and technical maintenance trainers.

Course objectives:

Participants will learn about real solutions to real problems related to bearing reliability and maintenance in machinery used in the aggregate and cement industry.

2019 Tuition

Class duration 3 days

On-site classes See page 60

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

Bearing Reliability in Aggregate and Cement Machinery uses a combination of lecture, video, discussion and hands-on activities. Specific topics include:

- Aggregate and cement industry overview
- Mounted and unmounted rolling element bearings
- Bearings in aggregate and cement making machinery
- Crushers, conveyors, vibrating screens
- Kilns, coolers, roller presses
- Auxiliary equipment: pumps, gear-boxes and motors
- Bearing installation and maintenance
- Mounting and dismounting of rolling element bearings
- Fault detection
- Bearing damage examples
- Hands on exercises
- Impact of safety in the industry

Pre-study

GRB002 Spherical roller bearings

GRB005 Taper roller bearings

RB04001 Cement Industry

Post-study

RB04005 Bearing Arrangements for Cement Industry Fans

RB04007 Drive Shafts for Grinding Mills

RB04008 Hammer Mills and Impact Crushers

WE214

Bearing Reliability in Paper Machines

Recommended for:

Service, maintenance, machine repair, roll shop or plant/facility engineering staff of a paper machine. Managers and technicians of paper machines and OEM facilities responsible for rolling bearing performance and reliability. Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors. Those interested in rolling element bearing and rotating equipment performance in paper machines.

Course objectives:

To provide information to improve the service life of rolling element bearings in paper machines.

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$12,995
# of people	10
11+ people	\$395 per person

Course description

Hands-on training, audio-visuals, lectures and discussion opportunities. Specific topics include:

Review of bearing basics

- Learn the specifics of rolling bearing technology, care, nomenclature, bearing components, terminology, loads and lubrication in paper machines
- Review the specific types of bearings typically found in paper machine applications
- Gain a basic understanding of why and how bearings fail in paper machines
- The importance of proper storage, care and handling

Shaft and journal preparation

- Learn how to measure cylindrical and tapered shafts and journals. Participate in hands-on activities using a sine bar gauge
- Study the methods to determine proper shaft and housing fits in a variety of paper applications and how this effects internal radial clearances

Mounting and dismounting

- Study proper bearing mounting and dismounting procedures including, measuring the internal radial clearance of large bore spherical roller bearings and the axial drive up method
- Participate in hands-on demonstrations using specialized tools and techniques to correctly mount and dismount spherical roller bearings

Special housings

- Study the different types of housings used in the felt and dryer sections and what requirements are needed for these applications

Fundamentals of lubrication

- See how important it is to select the proper lubricant and lubrication method for an application
- Learn to maximize bearing life through an improved understanding of proper lubricating principles and functions
- Review circulating oil systems

Bearing damage causes and analysis

- Identify and interpret actual bearing failures from paper machines

Pre-study

GRB002 Spherical roller bearings
EVOL03_no4_p25 High-speed bearing system for future generations of paper machines

Post-study

EVOL07_no4_p24 Improved lubrication in paper machines
GS04004 Lubrication Practices in Pulp and Paper Mills
SKF_4814 The better bearing solution for drying and yankee cylinders

WE240

Precision Shaft Alignment – Laser Systems

Recommended 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 objectives:

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.

2019 Tuition

Public classes	\$1,395
Class duration	3 days
On-site only – See page 60	
per class	\$12,995
# of people	10
11+ people	\$395 per person

2019 Course schedule

April 9–11	Salt Lake City, UT
October 1–3	Cleveland, OH

Register online

<http://us.promo.skf.com/acton/media/22336/we240>

Course description

This course focuses on the fundamental concepts and skills required to perform precision alignment with today's laser alignment systems. Proper machine inspections and preparation are essential to identify underlying machinery and foundation issues that may impact machinery operation and reliability. These pre-alignment steps ultimately ensure that the final alignment can be conducted efficiently and effectively—optimum precision in a timely fashion. Solutions are provided for alignment challenges such as base-bound and bolt-bound and thermal growth. An overview of various alignment methods is provided with an emphasis on laser systems.

While not required, students are encouraged to bring their own laser tools to use in hands-on sessions. The training is not instrument specific as the focus is on the alignment processes that are common to all laser alignment systems. Specific topics include:

Introduction and overview

- Review of shaft alignment fundamentals—definitions of alignment and misalignment
- Recognizing symptoms/indicators of misalignment—history, component damage, and basic vibration symptoms
- Advantages, disadvantages, and sources of errors associated with various alignment methods
- Describing and documenting shaft offset and angular misalignment conditions—as-found and final results
- Pre-alignment procedures—inspections, preparations, road blocks
- Review of alignment methods with dial indicators
- Laser alignment systems overview

Fundamental horizontal machine alignment processes

- Setting up the laser system
- Measuring and entering dimensions
- Soft foot checks of both machine components
- Obtaining measurements—validity, repeatability, and challenges
- Interpreting results of as-found and final measurements
- Making moves/adjustments
- Alignment completion—recording, documentation, future inspections
- Recognizing unresolved alignment problems

Dealing with alignment challenges

- Base-bound and bolt-bound conditions
- Dynamic movement—static deflection and vibration movement that changes the non-running alignment condition
- Identify general types of soft foot and how to detect and correct soft foot conditions
- Effects of thermal growth and corrective measures for thermal compensation

Pre-study

WE140 Shaft alignment basics
GS02011 Machinery mounting
GS04007 Belt Alignment

Post-study

AF04005_fan_WE Fans - work execution
EVOL04_no2_p21 Providing a good foundation for machines
RB02008 Shaft couplings

WE241

Precision Maintenance Skills – Principles of Proactive Maintenance

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 objectives:

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

2019 tuition

On-site only - See page 60

Class duration 3 days

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 Principles of Proactive Maintenance course to address this very real industry need 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. 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 machine installation and shaft alignment utilizing a variety of tools. Inspection, preparation, and process optimization

SKF has designed the Precision Maintenance Skills courses in a modular format which allows customized training to address immediate and long-term training needs and accommodate staffing schedules.

Pre-study

WI100 Vibration basics
WE140 Shaft alignment basics
RB02008 Shaft couplings

Post-study

MS100 Proactive reliability maintenance
GS04007 Best alignment
RB02023 Roller chain drives

WE242

Precision Maintenance Skills – Rotor Components and Power Transmission

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 objectives:

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

2019 Tuition

Class duration 3 days

On-site classes See page 60

Course description

SKF has designed the Rotor Components and Power Transmission course to address precision and proactive maintenance practices to provide optimum performance of the rotating systems in common machinery. As part of the SKF Precision Maintenance Skills course portfolio, the subjects covered in this course are presented in a practical format utilizing hands-on exercises to teach and demonstrate the relationships between precision techniques and machine performance.

The WE242 course adheres to the format Principles of Proactive Maintenance course—component/system overview, troubleshooting, problem identification, correction, precision assembly, and post-maintenance inspection. From rotor assembly to proper belt installation, students will learn to employ world-class practices in a cost- and time effective manner. Concepts of machinery vibration and condition monitoring are reinforced as tools to evaluate the condition of existing machinery and the effectiveness of repairs.

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:

- Review of proactive and precision maintenance
- 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
- Lip and mechanical seals: maximizing life, controlling and positioning of shafts

Pre-study

WE150 Balancing basics

WE170 Basics of Seals for Rotating Motion

GS02011 Machine mounting

Post-study

MS100 AEO basics

MS101 Assessment basics

MS130 Maintenance strategy review

WE245

TKSA Series Laser Alignment

Course objectives:

To familiarize participants with the use and application of the SKF TKSA Laser Shaft Alignment System on horizontally mounted machines. Precision shaft alignment requires much more than the use of a laser alignment tool. It is a process that begins with an inspection of the machine and its foundation and then continues through to final soft foot corrections. This course demonstrates how to use the TKSA as part of this process—from installation and setup to the printout of the alignment results.

2019 Tuition

Class duration	2 days
On-site classes	See page 60
Per class	\$6,495
# of people	5
6+ people	\$295 per person

Course description

Course topics are organized according to the steps necessary to operate the product.

- Understand the importance of precision alignment including the adverse affects of misalignment
- Shaft offset and angular misalignment conditions
- The three phases of the alignment process
- General types of soft foot and how to correct soft foot conditions
- Advantages and disadvantages of several alignment methods
- Basic operations and components of the TKSA Laser Shaft Alignment System
- Setup of the TKSA to obtain the highest quality readings
- How to interpret the results, make precision machinery moves, and document results

WE250

Practical Field Balancing

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 objectives:

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.

2019 Tuition

Class duration	3 days
Public classes	\$1,195
On-site classes	See page 60
Per class	\$8,495
# of people	5
6+ people	\$295 per person

2019 Course schedule

March 19–21	Dallas, TX
April 9–11	Charlotte, NC
July 23–25	Myrtle Beach, SC
October 29–31	Charlotte, NC

Register online

<http://us.promo.skf.com/acton/media/22336/we250>

A written examination is available for this course. Test fee – \$225 per person. Successful completion of the written exam results in Precision Field Balancing Certification.

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 and 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

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.

Pre-study

GRB001 Bearing basics
WE150 Balancing basics
MB02004 Balancing

Post-study

AM2005—Courtney precision balancing
GS02011—Machinery mounting
WE140—Shaft alignment basics

WE255

Balancing with an SKF Microlog®

Course objectives:

To understand and practice how to successfully balance common rotating machinery in the field to precision levels using any SKF Microlog® data collector/analyzer.

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$9,995
# of people	5
6+ people	\$295 per person

Course description

Course topics are organized according to the steps necessary to operate the product.

- Understand the three common types of unbalance (static, couple and dynamic)
- Differentiate field and shop balancing tolerances
- Identify the correct approach to use based on the machine's L/D ratio, amplitude and phase readings, and response to the trial weight
- Perform single- and two-plane balancing
- Combine and split correction weights
- Understand lag angle and influence coefficients

Appropriate real-world case histories will be used to illustrate balancing techniques for applications such as: fans, overhung and between bearings, paper rolls, flails, augers and hammermills, cooling tower fans, fin fans and turboprop, and multi-stage pumps.



WE291

Aeroengine Bearing Inspection

Level 1

Recommended for:

Bearing room inspectors, bearing removal and installation personnel, and engineering staff responsible for engine reliability of commercial or military flight hardware, and land and marine engine and gearbox equipment. Rotating equipment engineers, reliability engineers, mechanics, and maintenance supervisors. Anyone interested in rotating equipment performance.

Course objectives:

To equip students with the knowledge to identify and recognize characteristics that render bearings unserviceable and/or unacceptable upon engine operation. Student will learn the basics of failure analysis identification and the probable causes of failures. Students will also be informed of the cleanliness requirements for the oil lubrication system and will be taught proper handling and installation techniques, methods, and practices to minimize the opportunity for premature bearing failures.

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$13,995
# of people	5
6+ people	\$395 per person

Course description

Level 1 inspection for serviceability:

- Demagnetization and cleaning
- Visual inspection
- Dimensional inspection
- Minor repair—blending/stoning of high material
- Marking
- Lubrication, preservation and packaging

Bearings are among the most important components in aeroengine and land and marine engine and gearbox applications; therefore, exacting demands are made on their carrying capacity and reliability. Unfortunately, not all bearings reach their intended design life. Reasons for such premature failures will be discussed during failure analysis.

- Disassembly and cleaning for inspection
- Types of bearing damage and failure modes may include:
 - Wear
 - Indentation
 - Smearing
 - Surface distress
 - Corrosion
 - Electrical current
 - Flaking
 - Cracks
 - Cage damage
- Classroom participation in analysis

Lubrication system cleanliness:

- Purpose of lubrication in bearings
- Bearing preservation
- Types of oils recommended for aeroengine, gearbox, and land and marine engines

A written examination is included with this course and is conducted on the afternoon of the final day of class.

- Lubrication checks – methods and frequencies
- Flushing of oil system to remove debris

Bearing installation:

- The importance of cleanliness
- Mounting and installation of bearings including methods
- Inspecting and correcting fits and clearances
- Classroom participation

Key learning outcomes

- Students will understand the importance of bearing lubrication and installation in achieving calculated bearing life
- Students will become confident in performing level 1 inspection and bearing serviceability
- Students will be equipped with tools to assist them in resolving complex problems and in thinking laterally to fully explore possible causes of a problem

Pre-study

GRB001 Bearing basics
GRB006 Deep groove ball bearings
RB02002 Bearing Basics

Post-study

Evol12_No4_p21-29 Damage mechanisms
EVOL11_no4_p26 Preventing surface distress
EVOL12_No2_03 The benefits of remanufacturing rolling bearings

WI201

Fundamentals of Machine Condition

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 vibration monitoring and analysis.

Course objectives:

To provide a practical approach to detecting and analyzing common machinery problems using vibration monitoring and analysis.

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$9,995
# of people	5
6+ people	\$395 per person

Course description

Designed for maximum class participation. A combination of presentations, group exercises, video, and written reviews are used to peak participant interest and 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 F_{\max}

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

Vibration diagnostic tables

- ISO 2372 Vibration Diagnostic Table

Pre-study

WI100 Vibration basics

WE140 Shaft alignment basics

JM02001 Introduction Guide to Vibration Monitoring

Post-study

JM02007 Vibration Principles

WI130 Thermography basics

CM3068 Recommended initial alarm criteria for bearing condition assessment

WI205

Vibration Troubleshooting – Practical Methods/Advanced Results

Recommended for:

All maintenance and operations personnel interested in improving machinery reliability through identification, correction, and the prevention of failures. Although a basic understanding of vibration is helpful, the practical nature of the material allows all participants to gain a new understanding of their machinery and how they can positively impact reliability.

Course objectives:

To understand the cause and effect relationship between maintenance practices and the resulting vibration and reliability performance of industrial machinery utilizing sound and practical inspection and troubleshooting practices. Elevate basic condition monitoring programs beyond problem detection to provide true corrections and solutions to problems.

2019 Tuition

Class duration	3 days
Public classes	\$1,495
On-site classes	See page 60
Per class	\$9,995
# of people	5
6+ people	\$445 per person

2019 Course schedule

March 12–14	Salt Lake City, UT
September 24–26	Atlanta, GA

Register online

<http://us.promo.skf.com/acton/media/22336/wi205>

Course description

This course focuses on troubleshooting strategies that lead to the true sources of the most common maintenance-related vibration problems. Techniques aimed at the future prevention of the root causes of these problems solve not only existing machinery problems but provide a foundation for a fundamental change in maintenance practices. Relevant case histories and discussions of machinery problems that attendees are currently experiencing enhance the learning experience.

Review of machinery vibration fundamentals

- Cause and effect relationship sources
- Vibration terminology
- Relationships between time, frequency, amplitude and phase

Optimizing vibration detection and analysis for routine condition monitoring route data collection

- Transducer selection and placement –low frequency, high frequency, and issues that affect enveloped/demodulated readings
- Data collection parameter optimization—resolution, waveforms, matching readings to faults
- Proper application of advanced detection methods
- Practical approach to vibration alarm limits—overall, spectrum, phase

Identifying and solving the most common vibration problems

- Resonance—recognition, identification with multiple methods/technologies, correction techniques, prevention
- Unbalance—sources, identification, prevention, and correction

- Misalignment—sources, identification, correction, recognizing common assembly errors

Extending the life of rolling element bearings

- Most common causes of premature failure
- Detection strategies
- Troubleshooting and prevention
- Overview of proactive installation and lubrication
- Understanding and establishing practical acceptance testing limits for bearing related vibration

Amplitude, spectrum, time waveform, and phase characteristics of machinery problems

- Beats, sidebands, harmonics
- Causes and effects of shaft motion on machine components
- Understanding bent shaft, gear, electrical, and bearing symptoms and how symptoms may mask root causes

Pre-study

WI100 Vibration basics

JM03001 A Balanced Approach to Acceleration and Velocity Monitoring

JM02014 Vibration monitoring of bearings

Post-study

MB01001 Low speed bearing monitoring

MB04034 PdM and RCFA: A powerful combination

MB02006 Predictive maintenance

WI210

Vibration Analysis – ISO Category I Entry Level

Recommended for:

Plant personnel requiring an introduction to vibration analysis in a condition predictive maintenance program. Including maintenance supervisors, rotating machinery engineers, predictive maintenance techs/coordinators, reliability engineers, and multi-skilled mechanics.

Course objectives:

Introduce a novice to basic vibration analysis by using a variety of PdM instrumentation and software. Hands on demonstration of vibration analysis and related technologies. Teach vibration terminology and measurement conventions needed via seminar text material and “button pushing” demonstration to maximize the learning experience.

2019 Tuition

Class duration	3.5 days
Public classes	\$1,495
On-site classes	See page 60
Per class	\$12,950
# of people	5
6+ people	\$250 per person

Register online

<http://us.promo.skf.com/acton/media/22336/wi210>

A written examination is available with this course. Test fee – \$275 per person. Successful completion of the written exam results in ISO Category I Certification.

Course description

The basics of performing vibration analysis to get started within a condition monitoring program. Various techniques used to understand machinery condition are introduced.

- Introduction to predictive maintenance and machine vibration, industry definitions, comparison of PdM to other maintenance systems, and the critical role of vibration analysis in PdM.
- Machine vibration basic theory and analysis, including characteristics of vibration (frequency and period), RMS peak and peak-to-peak conversations, frequency, phase, and basics of a time waveform versus a spectrum
- Preparation for data collection, types of vibration transducers, optimum transducer location, effects of transducer mounting on performance, and FFT data collector selection.

- Introduction to data collection systems, setting up a PdM database, choosing the proper parameter, setting up PdM routes/schedules, reports.
- Introduction to problem recognition including how to recognize abnormal conditions, identify hardware versus software faults, identify good versus bad data and detect common machine problems.

Basic machine maintenance skills and experience. General computer and calculating skills are helpful. Little or no previous vibrating experience required.

Pre-study

WI100 Vibration basics

JM02001 Introduction Guide to Vibration Monitoring

JM02007 Vibration Principles

Post-study

MB02006 Predictive maintenance

MB02005 SKF Condition Monitoring

KBA00276 Measuring with different SKF devices

2019 Course schedule

January 22–25	Charlotte, NC
February 5–8	Orlando, FL
February 19–22	Dallas, TX
March 5–8	Charlotte, NC
March 26–29	Seattle, WA
April 23–26	New Orleans, LA
June 4–7	Myrtle Beach, SC
June 11–14	St Louis, MO
July 9–12	Denver, CO
July 30–August 2	Myrtle Beach, SC
September 10–13	Charlotte, NC
September 24–27	Dallas, TX
October 8–11	Philadelphia, PA
October 22–25	San Diego, CA
November 5–8	Charlotte, NC
December 3–6	Houston, TX

WI211

Vibration Analysis – ISO Category II Level 1

Recommended for:

Plant personnel requiring a basic understanding of analytical methodologies used to determine machinery conditions for improvement of predictive maintenance program results; including maintenance supervisors, rotating machinery engineers, predictive maintenance coordinators, reliability engineers, and advanced mechanics and technicians.

Course objectives:

Participants will learn how to select appropriate sensors and techniques to diagnose typical machinery malfunctions. They will be taught to read vibration signatures and evaluate machinery condition from vibration data and how to isolate the affected machinery components, recognize various common problems, and make recommendations for continued operation or scheduled repairs.

2019 Tuition

Class duration	3.5 days
Public classes	\$1,695
On-site classes	See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi211>

A written examination is available with this course. Test fee – \$300 per person. Successful completion of the written exam results in ISO Category II Certification.

Course description

An introduction to performing vibration analysis within a condition monitoring program. Various techniques used to diagnose machinery condition are reviewed, including time waveforms, spectral analysis, phase measurements, and amplitude measurement methods.

Applies sensor fundamentals to vibration analysis, including an overview of sensor strengths and weaknesses in applications. Common machinery malfunctions are discussed, including basic guidelines for the best detection tools for each machinery problem, and key signs to be aware of.

Malfunctions and common pitfalls are demonstrated and real-world vibration analysis case histories are shared.

- What is vibration and how can it be used to evaluate machinery condition:

- High frequency detection (HFD) and alarm levels at various speeds
- Vibration analysis and how it is used to evaluate machine operating condition
- Vibration alarms, spectral band alarms, and optimum frequency ranges
- Common pitfalls in vibration measurements, the effect on detection and diagnosis of machinery problems
- Time waveform and converting to an FFT spectrum
- Predictive maintenance programs
- Real-world case histories for problems found within the Illustrated Vibration Diagnostic Chart

Up to six months full-time condition monitoring program experience; knowledge of basic sensor and monitoring instrumentation.

Pre-study

WE150 Balancing basics
MB04034 PdM and RCFA:
A powerful combination
JM02002 Spectrum Analysis

Post-study

CM5003 Vibration diagnostic guide
TB02003 Integration of Vibration Signals
CM3013 FAQs about enveloping

2019 Course schedule

Jan 29–Feb 1	Charlotte, NC
February 12–15	Orlando, FL
Feb 26–Mar 1	Dallas, TX
March 12–15	Charlotte, NC
April 2–5	Seattle, WA
April 30–May 30	New Orleans, LA
May 7–10	San Antonio, TX
June 11–14	Myrtle Beach, SC
June 18–21	St Louis, MO
July 16–19	Denver, CO
August 6–9	Myrtle Beach, SC
September 17–20	Charlotte, NC
October 1–4	Dallas, TX
October 15–18	Philadelphia, PA
Oct 29– Nov 1	San Diego, CA
November 12–15	Charlotte, NC
December 10–13	Houston, TX

WI212

Vibration Analysis – ISO Category III Level 2

Recommended for:

Plant personnel requiring a comprehensive understanding of vibration FFT and diagnostic techniques used to perform rotor dynamics analysis for increased performance of rotating machinery; including machinery specialists, predictive maintenance technicians, reliability engineers, and advanced mechanics.

Course objectives:

At the end of this course, participants should understand how to refine a condition monitoring program with diagnostic techniques that improve the performance of rotating machinery with rolling element or sleeve bearings. Participants will be taught to diagnose several malfunctions, from common to moderately severe, and to make recommendations for corrective action. In addition, participants will be taught to enhance condition monitoring programs with advanced measurement techniques, such as high frequency enveloping and time waveforms.

2019 Tuition

Class duration	3.5 days
Public classes	\$1,895
On-site classes	See page 60

2019 Course schedule

March 5–8	Dallas, TX
March 19–22	Charlotte, NC
April 9–12	Seattle, WA
June 18–21	Myrtle Beach, SC
June 25–28	St Louis, MO
August 13–16	Myrtle Beach, SC
September 24–27	Charlotte, SC
November 5–8	San Diego, CA
November 19–22	Charlotte, NC
December 17–20	Houston, TX

Register online

<http://us.promo.skf.com/acton/media/22336/wi212>

Course description

A comprehensive survey and in-depth study of vibration spectrum analysis and related condition monitoring techniques used to analyze rotating machinery, and to detect and correct machinery malfunctions. An overview of rotor dynamics is presented, along with the study of severe, but less common, machinery problems that frequently lead to catastrophic failure. An overview of acceleration enveloping and SEE™ Technology is also presented.

- Brief review of Vibration Analysis I course topics
 - Vibration instruments and sensors
 - Evaluating machinery condition with vibration analysis
 - Analog vs. digital overall vibration measurements
 - Spike energy, high frequency demodulation (HFD), and shock pulse techniques
 - Common pitfalls in vibration measurements
 - Time waveform and conversion to FFT spectrum
- Proper use of vibration severity charts
- Phase analysis techniques
- Concentrated vibration spectrum analysis for detecting 40 machinery problems
 - Mass unbalance, eccentric rotors, and bent shafts
 - Misalignment and coupling problems
 - Mechanical looseness
 - Balance resonance problems
 - Rotor radial rubs and sleeve bearing problems
 - Track rolling bearing condition using spectrum analysis
 - Flow-induced vibration (cavitation, surge, starvation)

- Gear problems (wear, excessive backlash, eccentricity, tooth misalignment, cracked/broken teeth, hunting tooth, assembly phase problems)
- Monitoring problems in AC and DC motors
- Belt-drive and beat vibration problems
- Soft foot and distorted frame problems
- Proven analysis procedure, including examples
- High frequency enveloping and demodulation spectral analysis. What is SEE Technology? How are these techniques used to detect problems with rolling element bearings, gears, lubrication, and contamination
- Real-world case histories are presented

Six to 12 months full-time condition monitoring program experience; SKF course Vibration Analysis–ISO Category II–Level 1 (WI211) or commensurate field experience; knowledge of basic sensor and monitoring instrumentation.

Pre-study

JM02012 Time domain analysis of vibration data
CM3068 Recommended initial alarm criteria for bearing condition assessment
JM03001 A balanced approach to acceleration and velocity monitoring

Post-study

JM02019 Vibration analysis feature extraction techniques
MB01001 Low speed bearing monitoring
WI130 Thermography basics

A written exam is available for this course. Test fee – \$325 per person. Successful completion of the written exam results in ISO Category III Certification.

WI213

Vibration Analysis – ISO Category IV Level 3 – Part 1

Recommended for:

Plant personnel requiring a comprehensive understanding of intensive analytical methodologies for determining the condition of machinery and to correct malfunctions (allowing them to obtain optimum performance, availability, and product and process quality); including rotating machinery specialists and consultants, advanced mechanics, engineers, and advanced technicians.

Course objectives:

At the end of this course, participants should have learned to perform effective diagnostics and make appropriate recommendations for fault corrections for many problem machines, bearings, gears, and electric motors. Participants will be taught to isolate and identify causes of excessive vibration and help predict bearing and gearbox failures for efficient scheduling of maintenance at appropriate times.

In addition, participants will be taught to evaluate machinery condition for acceptance, expected level of continued operation, or overhaul maintenance. This course also covers the first half of the training requirements for ISO Category IV as per the ISO 18436-2 document.

2019 Tuition

Class duration 3.5 days

Public classes \$1,995

On-site classes See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi213>

Course description

An intensive study of special vibration analysis techniques used to diagnose critical machinery and problem machines. Study of how to generate meaningful

narrow band spectral enveloping needed to isolate, identify, and correct a wide range of machinery problems, including those with unknown component description, variable operating speeds, and multiple harmonic frequencies. Effective monitoring techniques for electric motor problems are presented. Includes do's and don'ts of meaningful enveloping, effective management reporting for success, and real-world case histories.

- Brief review of Vibration Analysis II topics including:
 - Review of Illustrated Vibration Diagnostic Chart
 - Overall alarm and spectral band alarm level specification
 - Phase measurement and analysis techniques
 - Signal processing parameters
 - Introduction to natural frequency testing
- How to create meaningful narrowband spectral alarm envelopes
- Detection of cracked or broken rotor bars on induction motors using both vibration and motor current analysis

2019 Course schedule

March 12–15	Dallas, TX
March 26–29	Charlotte, NC
June 25–28	Myrtle Beach, SC
October 1–4	Charlotte, NC

- DC motor and electronic control problem detection using vibration analysis
- High frequency enveloping and amplitude demodulation techniques
- Time waveform analysis and synchronous time averaging to detect a variety of mechanical and electrical problems
- Introduction to operating deflection shape analysis
- Low speed machine vibration analysis techniques and instrumentation (10–300 rpm)
- How to analyze high speed machines generating frequencies of 600,000–3,600,000 cpm (10,000–60,000 Hz)
- How to analyze variable speed machines
- Presentation of a tabulated chart tracking the advancement through vibration analysis and rotor dynamic fields

36 to 48 months full-time condition monitoring program experience, Vibration Analysis–ISO Category II–Level 1 (WI211), Vibration Analysis–ISO Category III –Level 2 (WI212)

Pre-study

MB09003 Multiparameter vibration analysis

TB02003 Integration of vibration signals

JM02014 Vibration monitoring of bearings

Post-study

JM02025 Low speed analysis

MB03001 Investing in Reliability

GS03012 Wireless condition monitoring

A written exam is available for this course. Test fee – \$350 per person. Successful completion of the written exam results in Level 3 ISO Vibration Analysis Certification.

WI221

Airborne Ultrasound

Level 1

Recommended for:

Inspectors seeking to advance their knowledge in Airborne Ultrasound inspections. Supervisors, energy auditors, and service company personnel who perform PDM, energy audits, or leak detection for their clients. Service personnel who desire to demonstrate technical and inspection proficiency to their clients.

Course objectives:

At the end of this course, participants should have a better understanding of the theory, principles, and practices of Airborne Ultrasound Technology. This course fulfills training and testing requirements of Level 1 Certification.

2019 Tuition

Class duration	3 days
Public classes	\$1,495
On-site classes	See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi221>

A written examination is included with this course and is conducted on the afternoon of the final day of class.

Course description

Participants are introduced to the basics of Airborne Ultrasound, leak detection, electrical inspection, and mechanical inspection. General, specific, and practical tests are given at the end of the course. Students are expected to pass with a composite score of 80% or higher. Specific topics include:

- Theory of sound
- Basic physics of ultrasound
- Concepts of amplitude
- Wave modes
- Ultrasound wave transmission and effects
- Effectiveness of Airborne Ultrasound
- Technology integration

2019 Course schedule

January 14–18	Charlotte, NC
February 4–8	TBD
March 4–8	Buford/Oakwood, GA
March 11–15	Dallas, TX
March 18–22	New Smyrna, TN
April 1–5	Charleston, SC
May 6–10	Salt Lake City, UT
June 3–7	Columbus, OH
June 3–7	St Louis, MO
June 10–14	New York, NY
June 10–14	Knoxville, TN
July 15–19	Portland, OR
July 22–26	Cedar Rapids, IA
August 5–9	Kalamazoo, MI
August 12–16	Allentown, PA
September 16–20	Houston, TX
October 7–11	Grottoes, VA
October 14–18	TBD
October 21–25	TBD
November 4–8	San Jose, VA
November 11–15	New Orleans, LA
December 9–13	TBD

- Equipment/instrument overview
- ASTM standard test methods
- Leak detection
 - Fluids defined
 - Leak rates
 - Acoustic properties of leaks
 - Leak types
 - Leak strategies
 - Leak detection methods
- Electrical inspection
 - Safety considerations
 - Overview of types of electrical equipment
 - Voltages defined
 - Detection methods
 - Confirmation methods
 - Substation inspection
 - Low voltage inspection techniques
 - Inspection of motor control centers
- Mechanical inspection
 - Considerations of ultrasonic generation
 - Troubleshooting methods
 - Trending methods
 - Inspection methods
 - Monitoring and recording information
- General overview of Airborne Ultrasound technology
- Review of technology
- Practical experience review
- General, specific, and practical examination

WI231

Thermographic Applications

Level 1

Recommended for:

Personnel seeking to advance their knowledge in thermographic and infrared inspections. This includes supervisors, maintenance and reliability engineers, electricians, mechanics, equipment operators, energy auditors, and service company personnel who perform PDM, energy audits, or thermographic and infrared services for their clients. Although a basic understanding of infrared technology is helpful, this is an entry level course and no prerequisites are required

Course objectives:

Participants will learn the principles of how to Think Thermally®, basic heat transfer theory, electrical applications, mechanical equipment applications, building system inspections, roof inspections, proper use of thermal imaging equipment, accurate image acquisition and diagnostic skills. This course includes the Snell Certification Standard. Objectives are measured through daily quizzes, a hands-on practical exam, an application specific written exam, and a general written exam.

2019 Tuition

Class duration	4.5 days
Public classes	\$1895
On-site classes	See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi231>

This course fully meets the educational requirements for certification in accordance with Recommended Practice No. SNT-TC-1A, as defined by the American Society for Non-Destructive Testing.

The course is open to everyone regardless of whether or not they own a thermal imager. Attendees that do have equipment are encouraged to bring their systems as there are a number of hands-on learning opportunities available during the week.

Course description

This course covers the theory and applications of infrared thermography in the preventive maintenance, quality assurance, condition monitoring and non-destructive testing of materials fields. This class focuses on qualitative thermography and how to collect data and follow proven and published inspection procedures. Upon completion students will be able to capture clear thermograms and make basic inferences and diagnosis.

Level 1 material includes infrared theory, heat transfer concepts, operation of thermal imaging equipment and specific recommendations on how to make quality thermal images that are clear, concise and

2019 Course schedule

Jan 28–Feb 1	Jacksonville, FL
February 11–15	Houston, TX
February 11–15	San Diego, CA
March 4–8	Memphis, TN
March 18–22	Louisville, KY
March 25–29	Chicago, IL
April 15–19	Pittsburgh, PA
April 29–May 3	Kansas City, MO
May 6–10	Charleston, SC
May 20–24	Chicago, IL
June 3–7	Minneapolis, MN
June 24–28	Barre, VT
August 19–23	Seattle, WA
September 9–13	Cleveland, OH
September 9–13	Chicago, IL
September 16–20	Dallas, TX
September 23–27	Indianapolis, IN
October 7–11	Charlotte, NC
November 4–8	San Antonio, TX
November 4–8	St Louis, MO
November 11–15	Cincinnati, OH
November 11–15	Tampa, FL
November 18–22	Chicago, IL

easy to interpret. Students are challenged daily with hands-on demonstrations, experiments and inspection situations similar to those they will experience in their work. Students leave the class ready to put this amazing technology to work.

An overview of the most common applications include:

- Electrical distribution systems
- Mechanical systems
- Steam systems
- Refractories
- Underground piping
- Active thermography
- Building envelopes
- Low-slope roofs
- Nondestructive testing of materials

Students learn the basic inspection techniques based on accepted industry and international inspection procedures.

Pre-study

WI130 Thermography basics

Webinar–Mechanical inspections using infrared

Webinar–Emissivity and its impact on thermographers

Post-study

JM02008 Introduction to thermographic analysis

Webinar–Successful electrical inspections using infrared

White Paper–Locating levels in tanks, vessels and silos

WI235

SKF TKTI Series Thermal Camera

Course objectives:

To introduce basic infrared theory as well as technical applications and provide detailed explanation of the operation of the SKF TKTI Series Thermal Camera. Participants will also be provided with practical exercises to gain hands-on experience and start up assistance on analysis/reporting software.

2019 Tuition

Class duration	2 days
On-site classes	See page 60
Per class	\$5,595
# of people	5
6+ people	\$395 per person

Course description

- Introduction to basic infrared theory
- Provide an understanding on how emissivity, transmittance, reflected temperature, atmospheric/ambient conditions and distance and angle to target can effect temperature measurements
- Explanation of technical applications–electrical, mechanical, refractory/insulation, building (envelope, roof moisture)
- Detailed explanation and hands on demonstration of SKF TKTI Series system–specifications, function and capabilities
- Explanation and review of the analysis/reporting software
- Review of available temperature limits/standards–ASNT, N.E.T.A.,
- Military, Experienced Based, ANSI, IEEE and NEMA
- Implementation of an Infrared Inspection Program–What to inspect, frequency of inspections, follow up inspections after repair and document savings/avoided costs
- Safety–Importance of following NFPA 70E as well as other site specific safety procedures when performing infrared inspections



WI241

Machine Lubrication Technician/Machine Lubricant Analyst Level 1

Course description:

AMRRI offers a unique 4.5 day class that covers MLT and MLA Body of Knowledge in accordance to ISO 18436-4. It provides the foundational training for reliability-centered machine lubrication work practices AND oil-sample based condition assessment. Understand the positive impact that high quality lubrication practices can have on your machine's health and your plant's productivity. Learn how to transform an existing lubrication process from modest and reactive to thorough, accurate and proactive.

2019 Tuition

Class duration	4 days
Public classes	\$1,295
On-site classes	See page 60
Per class	\$13,995
# of people	10
11+ people	\$445 per person

Register online

<http://us.promo.skf.com/acton/media/22336/wi241>

Course topics

- Maintenance Strategies and the Role of Machine Lubrication
- Industrial Tribology: The Science behind Precision Machine Lubrication
- Lubricant Construction
- Lubricant Performance Properties
- Lubricant Selection Practices
- Lubricant Application – Grease
- Lubricant Application – Oil
- Lubricant Contamination Control
- Lubricant Storage and Handling

Pre-study

GRL001 Lubrication basics
WE170 Basics of Seals for Rotating Motion
RB03008 Lubrication management

2019 Course schedule

March 11–14	Atlanta, GA
May 13–16	Houston, TX
September 23–26	Cleveland, OH
November 4–7	Birmingham, AL

Post-study

EVOL04_no2_p26 Grease life in lubricated-for-life deep groove ball bearings

GC6000-2-5 Principles of bearing selection and application-selecting lubricant viscosity

GS02001 LubeSelect

An optional certification exam is offered on day five of the class. Test fee – \$250 per person. The exam is for Machine Lubrication Technician/Machine Lubricant Analyst Level 1 certification. Only one certification exam is allowed per course. The exam and certification is offered through the International Council for Machinery Lubrication (ICML). To take the certification exam you must go to the ICML website to register and pay for the exam at least two weeks before the class. The website is lubecouncil.org or call 918-259-2950

WI241E Online Course

Machine Lubrication Technician/Machine Lubricant Analyst Level 1

2019 Tuition

Online only	\$995
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Register online

us.promo.skf.com/acton/media/22336/wi241e

An optional certification exam is offered. See WI341 above.

Course description

Our online course is designed for the person who would prefer not to be away from their responsibilities but wants to achieve training or certification. It covers the exact same content as the traditional classes but is formatted so the participant can cover the material at his or her own pace.

There are 20 video segments that range in length from 35-50 minutes and cover the entire MLT and MLA body of knowledge. The student will watch as they follow along in the training manual. There is a suggested review of each segment in questions/answer format that will reinforce the concepts taught during the video.

WI252E Online Course

Machine Lubrication Technician

Level 2

2019 Tuition

Online only	\$995
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Register online

us.promo.skf.com/acton/media/
22336/wi252e

*An optional certification exam is offered.
See WI341 on page 42.*

Course description

This online course was developed to help program managers, lubrication engineers and first line technicians develop their ability to articulate machine specifications and technically accurate lubrication practices. Content includes practical case studies and problem-solving activities to help students retain and recall methods that tackle real world challenges.

The course is formatted so the participant can cover the material at his or her

own pace. There are 20 video segments that range in length from 35-50 minutes and cover the entire MLT Level II body of knowledge. The student will watch as they follow along in the training manual. There is a suggested review of each segment in questions/answer format that will reinforce the concepts taught during the video.

WI253E Online Course

Machine Lubricant Analyst

Level 2

2019 Tuition

Online only	\$995
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Register online

us.promo.skf.com/acton/media/
22336/wi253e

*An optional certification exam is offered.
See WI341 on page 42.*

Course description

Our online course is designed for the person who would prefer not to be away from their responsibilities but wants to achieve training or certification. It covers the exact same content as the traditional classes but is formatted so the participant can cover the material at his or her own pace.

There are 10 video segments that range in length from 60-75 minutes and cover the entire MLA Level 2 body of knowledge. The student will watch as they follow along in the training manual. There is a suggested review of each segment in questions/answer format that will

reinforce the concepts taught during the video.

Course topics

- Oil Analysis and Maintenance Strategies
- Lubricant Roles & Functions
- Oil Sample Options
- Oil Health Measurement
- Oil Contamination Control & Measurement
- Wear Debris Analysis

WI304

Advanced Vibration Analysis – ISO Category IV Level 3 – Part 2

Recommended for:

Mechanical, maintenance, and machinery engineers and analysts involved in design, specification, acceptance, operation, and troubleshooting of industrial process and utility 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 responsibility is the maintenance of high level performance, reliability, and availability of critical process machinery; including rotating machinery specialists and consultants, advanced mechanics, engineers, and advanced technicians.

Course objectives:

An advanced study of machinery vibration diagnostics to identify optimum required corrective actions. An introduction to experimental modal and operating deflection shape analysis is included. Covers special analytical techniques needed to evaluate complex machine trains. Covers vibration reduction techniques such as resonance correction, vibration isolation, damping treatments, design of dynamic vibration absorbers, and more. This course also covers the second half of the training requirements for ISO Category IV as per the ISO 18436-2 document.

2019 Tuition

Class duration	5 days
Public classes	\$2,095
On-site classes	See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi304>

Course description

- Advanced vibration principles, including phase, resonance, instabilities, non-linear systems and forced response
- Advanced data acquisition, including multi-channel analysis, dynamic range, signal-to-noise ratio and special test setups
- Specialized vibration diagnostic techniques
- Signal processing, including rms/peak detection, analog and digital sampling, FFT computation, overlap processing, time windows (including uniform, Hanning, flat-top, and more), anti-aliasing, bandwidth, resolution, waterfall and cascade plotting
- Condition monitoring program design and implementation, including vibration and alternative PdM technologies
- Fault detection and analysis, including time waveform analysis, synchronous time averaging applications, and non-synchronous cross channel phase analysis, transient analysis, orbit analysis, shaft centerline analysis, enveloping, gearbox analysis and order tracking
- Corrective actions, including vibration isolation and damping, resonance control, flexible rotor balancing, and more
- Equipment testing and diagnostics, including impact natural frequency testing, transient analysis (start-up and coast-down testing, Bode' and Nyquist plot generation, and more), cross channel phase, coherence, operating deflection shapes, modal analysis, and torsional vibration analysis
- Reference vibration standards: ISO, IEC and relevant national standards
- Condition monitoring and diagnostic reports and documentation
- Fault severity determination, including spectral analysis, time waveform analysis, orbit analysis and applicable severity charts, graphs and formulas
- Rotor/bearing dynamics
 - Sleeve bearing types and applications, rotor characteristics and rotor balancing
 - Lissajous orbit analysis, shaft centerline analysis, etc.
- 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 and fans
 - High-speed centrifugal air compressors
 - Rotary screw air compressors
 - Single and multi-stage gearboxes
 - DC motors and induction AC motors

Prerequisite

5 to 8 years full-time condition monitoring program experience, Vibration Analysis–ISO Category II–Level 1 (WI211), Vibration Analysis–ISO Category III–Level 2 (WI212), Vibration Analysis–ISO Category IV–Part 1–Level 3 (WI213)

Pre-study

MB04034 PdM and RCFA:

A powerful combination

MB02029 Criticality analysis in perspective

GS02005 Reliability and life

Post-study

MB07004 Use of reliability, availability and maintainability

DTD08002 Reliability: What do you have a right to expect?

GS03001 Risk analysis

A written examination is available for this course. Test fee – \$400 per person. Successful completion of the written exam results in ISO Category IV Certification. Optional certification exam on day 5

Recommended for:

Plant personnel that need a basic understanding of Modal and Operating Deflection Shape Analysis techniques on machinery and structures, as well as a practical understanding of ME'scope VES modal/ODS software. Professionals whose primary responsibility is the maintenance of high level performance, reliability, and availability of critical process machinery, including rotating machinery specialists and consultants, advanced mechanics, engineers, and advanced technicians.

Course objectives:

To provide students with a working knowledge of Experimental Modal Analysis and Operating Deflection Shape Analysis (ODS) from a field vibration analyst perspective. Upon completion of this course, students learn how to:

- Create computer models of plant machinery and structures
- Acquire meaningful Modal and ODS measurements
- Generate and import Modal and Operating Deflection Shape analysis measurements
- Generate meaningful machinery computer animations needed to detect and resolve noteworthy problems such as resonance, structural weakness, foot related problems, design inadequacies, sources of excessive vibration.

2019 Tuition

Class duration 5 days

Public classes \$2,145

On-site classes See page 60

2019 Course schedule

August 19–23 Charlotte, NC

Register online

<http://us.promo.skf.com/acton/media/22336/wi305>

Course description**Introductory analysis lecture**

This portion of the course provides background information on Experimental Modal and Operating Deflection Shape (ODS) Analysis topics with extensive case histories and instructor experience.

- Advanced analysis without complex mathematics
- Understanding modes of simplified animation shapes (beams, columns, plates, and shells)
- How to construct meaningful computer models of machines and structures
- Choosing required numbers of points and directions for ODS and Modal analysis
- Recommended measurement setups for ODS and Modal analysis field testing
- How to accurately interpret computer model animations (leading to problem resolution)
- How to confirm what specific component is resonant on a complex machine, support frame, foundation and attached piping, ductwork, and more
- How to identify optimum corrective actions
- Presentation of numerous demonstrations and class exercises
- ODS and Modal real-world case studies

Hands-On ME'scopeVES Software Training

The hands-on training utilizes the ME'scopeVES Handbook. This is a continually updated practical step-by-step software guide and reference source that can be consulted over and over again. Complex methodologies are completely

Class starts Monday at 8:00 AM and ends Friday at 12:00 PM.

worked out for the student helping to ensure accurate analysis and repeatable results. Multiple hands-on projects that include real-world data cover all major ME'scopeVES software applications.

- Establish a project
- Create a computer model of a machine or structure
- Import data from the data acquisition instrument
- ODS and ODS FRF data interpretation
- Modal data interpretation
- Modal analysis curve fitting and generation of computer animations
- Structural dynamics modification (SDM)

Students are required to bring a laptop (Notebook) PC computer with Windows 7, 8 or 10 (32 or 64 bit) is recommended. A computer is required for installation of the ME'scopeVES Demo Software Package. Vibrant Technology ME'scopeVES software and extensive training manuals will be provided.

Prerequisite

5 to 8 years full-time vibration analysis experience. Vibration Analysis–ISO Category IV–Part 1–Level 3 (WI213) and Advanced Vibration Analysis–ISO Category IV–Part 2 (WI304) or commensurate field experience. Knowledge of vibration sensors and vibration instruments.

Pre-study

JM02024 Operating deflection shape analysis

MS120 Operator driven reliability

PE1102 MEScope Import

Post-study

MS100 AEO basics

MS101 Assessment basics

AF04005_fan_WE Fans - Work Execution

Time Waveform Analysis on Rotating Machinery

Recommended for:

Mechanical, maintenance, and machinery engineers and analysts involved in design, specification, acceptance, operation, and troubleshooting of industrial process and utility 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 responsibility is the maintenance of high level performance, reliability, and availability of critical process machinery; including rotating machinery specialists and consultants, advanced mechanics, engineers, and advanced technicians.

Course objectives:

This course provides in-depth coverage of Time Waveforms and how they can be used to detect a wide variety of faults, plus how they can be used to assess the severity of such faults. While the focus of the class is on vibration time waveforms, it likewise clearly shows how a different approach should be taken when acquiring and evaluating High Frequency Envelope (HFE) waveforms versus classic vibration waveforms (including a difference in setup parameters for HFE waveforms).

2019 Tuition

Class duration	3 days
Public classes	\$1,545
On-site classes	See page 60

2019 Course schedule

June 4–6	Charlotte, NC
October 8–10	Charlotte, NC

Register online

<http://us.promo.skf.com/acton/media/22336/wi313>

Course description

This course shows how to detect faults using waveform “pattern recognition” and provides real insight on evaluating fault severity, proves how waveforms often are a much better indicator of fault severity – particularly those caused by bearing, gear, lubrication, rotor rub and impact-type problems and includes a series of real-world case studies to clearly demonstrate how time waveforms should best be used to evaluate rotating machinery.

- Introductory Time Waveform Concepts
- Recommended Measurement Setups for Time Waveform Analysis
- Displacement vs. Velocity vs. Acceleration Waveforms
- Problems Detectable Only by Time Waveform Analysis
- Problems for which Time Waveform Analysis Adds Confirming Evidence to Spectral Analysis

How to Detect Specific Faults using Time Waveform Analysis:

- Cracked or Broken Gear Teeth
- Worn Gear Teeth
- Eccentric Gears
- Rolling Element Bearing Faults
- Rolling Element Bearing Turning on a Shaft
- Fluid Film Bearing Wear
- Misalignment vs. Mechanical Looseness
- Rotor Rub
- Lubrication problems
- Periodic vs. Nonperiodic Time Waveforms—Why is This Important?
- Effect of Impacting on Time Waveforms and Spectra
- Crest Factor used to Assess Amount of Impacting Present in a Waveform

- Autocorrelation and Circular Time Waveform Diagnostics
- How to Detect Inadequate Lubrication Using TWA and Autocorrelation
- How to Specify and Interpret Time Waveforms for High Frequency Envelope (HFE) Measurements
- Special Time Waveforms: When to and When not to use a Special TWF for Both Normal Vibration and for HFE Measurements
- Synchronous Time Averaging—What is it and When Should it be Used?
- Real-World Time Waveform Analysis Case Studies

Prerequisite

Recommended Minimum Vibration Analysis Experience = 2 years.

Prior Experience with Spectral Analysis of Vibration data is recommended.

Pre-study

JM02025_Low Speed Analysis_tcm_12-107707

JM02007_Vibration Principles_tcm_12-101083

JM02015_Vibration Monitoring Case Study_tcm_12-111251

Post-study

JM02012_Time Domain Analysis_tcm_12-111210

JM02020_Envelope signal processing_tcm_12-158813

SKF-SDG-DS01_tcm_12-72344

WI321

Airborne Ultrasound

Level 2

Recommended for:

Inspectors seeking to advance their knowledge in Airborne Ultrasound inspections. Supervisors, energy auditors, and service company personnel who perform PDM, energy audits, or leak detection for their clients. Service personnel who desire to demonstrate technical and inspection proficiency to their clients.

Course objectives:

Students successfully completing this course should be familiar with the scope and limitations of Airborne/Structure Borne Ultrasonic Inspection. They should be able to set up and calibrate equipment, interpret and evaluate results with respect to applicable codes, standards, specifications, and organize and report inspection results.

2019 Tuition

Class duration	5 days
Public classes	\$1,495
On-site classes	See page 60

2019 Course schedule

April 8–12	Charlotte, NC
September 9–13	Charleston, SC
November 4–8	Atlanta, GA

Register online

<http://us.promo.skf.com/acton/media/22336/wi321>

Course description

Course content consists of advanced theory, data collection, inspection techniques, and reporting.

This course fulfills training and testing requirements of Level 2 Certification.

General, specific, and practical tests are given at the end of the course. Students are expected to pass with a composite score of 80% or higher. Specific topics include:

- Physical principles of sound
- Frequency, velocity, wavelength of sound, reflection, and scattering of sound waves
- Equipment construction, characteristics, and signal presentations
- Testing techniques, scanning method, contact method, and tone method
- Sensitivity adjustment of equipment
- Types of indications found in leaks
- Electrical and mechanical troubleshooting
- Properties of leaks
- Testing techniques considering the conditions of the test specimen
- Performance testing according to testing instructions
- Test specifications
- Recording test results
- Documentation and interpretation of test results

A written examination is included with this course and is conducted on the afternoon of the final day of class.

WI332

Thermographic Applications

Level 2

Recommended for:

Personnel seeking to advance their knowledge in thermographic and infrared technology and inspections. This includes supervisors, maintenance and reliability engineers, electricians, mechanics, equipment operators, program managers, energy auditors, and service company personnel who perform PDM, energy audits, or thermographic and infrared services for their clients. This is an advanced course and completion of Thermographic Applications–Level 1 is a prerequisite.

Course objectives:

Participants will learn advanced heat transfer theory, calculation and determination of IR camera resolutions, non-destructive testing techniques, advanced camera settings and uses, obtaining reliable radiometric temperatures, and applications of quantitative thermography for maintenance and reliability. Objectives are measured through quizzes, homework assignments, a hands-on practical exam, an application specific written exam, and a general written exam.

2019 Tuition

Class duration	4.5 days
Public classes	\$1,995
On-site classes	See page 60

Register online

<http://us.promo.skf.com/acton/media/22336/wi332>

Course description

This quantitative thermography course is designed for practicing thermographers interested in advancing their knowledge and capabilities. This class covers advanced theory and applications of infrared thermography in the preventive maintenance, quality assurance, condition monitoring and nondestructive testing of materials fields.

Level 2 focuses on radiometric temperature measurement and how taking accurate temperatures improves the diagnosis and interpretation of thermal situations. The course delves deeply into the concepts of emissivity, reflected temperature compensation as well as spatial and measurement resolution. Other topics include: inspecting through transmissive films and windows and the use and limitations of IR mirrors.

2019 Course schedule

February 18–22	Charleston, SC
March 18–22	Tampa, FL
April 8–12	Cincinnati, OH
May 6–10	Phoenix, AZ
May 13–17	Charlotte, NC
May 20–24	Chicago, IL
June 3–7	Minneapolis, MN
July 15–19	Barre, VT
September 9–13	Chattanooga, TN
September 16–20	Seattle, WA
Sept 30–Oct 4	Dallas, TX
October 14–18	Indianapolis, IN
November 11–15	San Antonio, TX
December 9–13	Omaha, NE

The Level 2 course extends the knowledge gained in Level 1 on infrared theory and heat transfer concepts. Students leave aware of the full operational capabilities of their radiometric thermal imaging equipment and are challenged daily with hands on demonstrations, experiments and inspection situations similar to those they will experience in the field.

This course fully meets the educational requirements for certification in accordance with Recommended Practice No. SNT-TC-1A, as defined by the American Society for Non-Destructive Testing.

The class is open to everyone regardless of whether or not they own a thermal imager. Attendees that do have equipment are encouraged to bring their systems as there are a number of hands-on learning opportunities available during the week.

Prerequisite

Thermographic Applications–Level 1

Pre-study

MS101 Assessment basics

White Paper–10 reasons why a temperature rise should be reported as “at least”

White Paper–Improving radiometric accuracy

Post-study

WE104 Bearing damage classification

WI333

Thermographic Applications Best Practices

Level 3

Recommended for:

Personnel who have in-plant responsibility for thermographic programs and infrared consultants that offer inspection services. Prerequisite for this course is successful completion of Level 2 training and at least two years experience behind a camera.

Course objectives:

Attendees will learn about all aspects of successful infrared programs by reviewing industry best practices. They will also learn about both national and international standards and how to set up personnel certifications.

2019 Tuition

Class duration	5 days
Public classes	\$1,995
On-site classes	See page 60

2019 Course schedule

May 13–17	Kansas City, MO
September 16–20	Barre, VT

Register online

<http://us.promo.skf.com/acton/media/22336/wi333>

Course description

This course is the final but essential educational step for professional infrared thermographers. It is intended for those who manage thermography programs, have completed Level 2 training and have at least two years of practical experience behind a camera.

Level 3 is a highly interactive training class focused on professional growth and is relevant to both in-plant personnel responsible for thermographic programs and infrared consultants that offer inspection services. Attendees will learn about all aspects of successful infrared programs, including:

- Reviewing industry best practices
- Learning national and international standards
- Establishing written practices and procedures
- Setting up personnel certification

An in-depth review of IR theory and heat transfer along with a presentation and discussion of all available methods of temperature measurement will provide students with the knowledge to match the right tool to the job at hand.

This course will also help prepare students who intend to take the ASNT Level 3 T/IRT exam. If you intend to use this class as part of your preparation for the ASNT Level 3 exam, we recommend

you obtain several reference books prior to this course. Please contact The Snell Group for a list of these recommended titles.

Prerequisite

Thermographic Applications–Level 2

Pre-study

WI130 Thermography basics

Webinar–Mechanical inspections using infrared

Webinar–Emissivity and its impact on thermographers

Post-study

JM02008 Introduction to thermographic analysis

Webinar–Successful electrical inspections using infrared

White Paper–Locating levels in tanks, vessels and silos

WICM Series: SmartStart™

On-site product start-up training

SmartStart™ is an on-site product start-up training service that focuses on a specific product or system. It is designed to get that product up and running, your employees trained, and your program implemented quickly and effectively.

The training takes the form of mentoring and classroom instruction, and the site instructor will offer guidance in applicable product and/or database optimization and functionality.

Benefits of SmartStart training include:

- Small class size
- Individual instruction
- Field exercises on your plant's machinery
- Standardized plant-wide procedures

SmartStart training is available for the following SKF products and software:

- Machine Inspector and SKF@ptitude Analyst Inspector
- AX Series Microlog and SKF @ptitude Analyst
- GX Series Microlog and SKF @ptitude Analyst
- TKSA Series Laser Shaft Alignment
- Balancing with an SKF Microlog
- TKTI Series SKF Thermal Camera

Where is SmartStart training conducted?

Training is conducted at your site, in your training facility, using your computers and SKF purchased hardware and/or software. SmartStart training packages are currently available in the continental U.S. and do not include holiday or overtime labor. A minimum of twenty-one days notice is required to schedule a SmartStart training program at your site to arrange instructor and travel schedules.



How is SmartStart training conducted?

SmartStart instructors will provide you with real world application expertise by using your actual plant applications and requirements. The training is designed to take the form of mentoring rather than traditional classroom instruction. The site

instructor will offer guidance in applicable product and/or database optimization and functionality. Furthermore, the instructor will offer insightful, pragmatic information that will provide you with powerful tools for predictive maintenance requirements.

What's included in SmartStart training?

SmartStart training packages include a qualified SKF instructor, all travel and living expenses for the instructor, up to five training kits, and on-site consulting. SmartStart is priced to include up to five participants (there is an extra charge for more participants).

What equipment do I need for this course?

Clients need to provide a suitable training room with an LCD data projector, projection screen, and white board or flip chart. Clients are also required to have all course related SKF products and equipment (hardware and software) available to the participants at the time of training.

Requirements for SKF Microlog® series of analyzers with SKF@ptitude Analyst™ and SKF Microlog Inspector™ system with SKF @ptitude Inspector™

With SKF Microlog series of analyzers and portable maintenance instruments, and SKF @ptitude Monitoring Suite software, we highly recommend that you fill out the Asset Information Pages prior to the start of training. Asset Information Pages (AIP-32010400-SL) and the SKF publication on how to use Asset Information Pages (AIP-QRG-32010700-SL) are included in the new SKF Microlog Kits.

WICM255

Introduction to SKF Microlog® Series Analyzers and SKF @ptitude Analyst™

Course objectives:

To introduce the SKF @ptitude Analyst™ vibration database management and analysis software, as well as the features of the SKF Microlog® series analyzers, to the new user. In addition, this course instructs the user on the basics of setting up an effective portable machinery monitoring system.

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$8,595
# of people	5
6+ people	\$395 per person

Note: For on-site classes see WICM264 and WICM265 SmartStart training on pages 52–53.

Course description

Course topics are organized into the steps necessary to set up a portable monitoring system.

Condition monitoring training topics:

- Condition Based Maintenance program overview
- Guidelines for implementing a Portable Condition Monitoring Program
- The advantages of various vibration signal processing techniques to isolate and detect specific machinery faults (acceleration enveloping signal processing for early detection of bearing faults)

SKF product training topics:

- Set up default properties on the SKF @ptitude Analyst software and SKF Microlog series analyzers
- Learn to navigate the software using its menus, dialogs, windows, hierarchy, terminology, workspaces, etc.
- Create a database of vibration measurements
- Download and upload measurements between SKF software and SKF series Microlog series data collection device
- How to operate the Microlog series analyzers data collector

- Generate graphic plots and reports for analyzing measured machinery condition (both software and hardware)
- Advanced analyzer application modules, multiple channel measurements, FRF measurements, balancing, etc.

Pre-study

WI100 Vibration basics

JM02001 Introduction Guide to Vibration Monitoring

PE1101 Microlog best practices

Post-study

MB09003 Multiparameter vibration analysis

JM02007 Vibration Principles

MB02005 Microlog Case Story

WICM264

AX Series SKF Microlog® SmartStart™ and SKF @ptitude Analyst™

Course objectives:

To introduce the @ptitude Analyst™ vibration database management and analysis software as well as the features of the AX Series – Microlog® to the new user. In addition, this course instructs the user on the basics of setting up an effective portable machinery monitoring system.

2019 Tuition

Class duration	3.5 days
On-site classes	See page 60
Per class	\$8,995
# of people	5
6+ people	\$395 per person

Course description

Course topics are organized into the steps necessary to set up a portable monitoring system and to operate the SKF Microlog AX/SKF @ptitude Analyst software product.

Condition monitoring training topics

- Condition based Maintenance Program Overview
- Guidelines for Implementing a Portable Condition Monitoring Program –practical guidelines for implementing a portable condition monitoring program
- Introduction to Vibration Analysis – Discuss the advantages of various vibration signal processing techniques to isolate and detect specific machinery faults (e.g., acceleration enveloping signal processing for early detection of bearing faults)

SKF product training topics

- Set up default properties on the SKF @ptitude Analyst software
- Learn to navigate the software using its menus, dialogs, windows, hierarchy, terminology, workspaces, etc.
- How to create a database of vibration measurements
- Download and upload measurements between SKF software and the Microlog AX data collection device
- How to set up default properties in the Microlog AX
- How to operate the Microlog AX data collector/analyzer to collect both route and off-route measurements
- Generate graphic plots and reports for analyzing measured machinery condition (both software and Microlog AX)
- Advanced Microlog AX application modules, multiple channel measurements, FRF measurements, balancing, etc.

WICM265

GX Series SKF Microlog® SmartStart™ and SKF @ptitude Analyst

Course objectives:

To introduce the @ptitude Analyst vibration database management and analysis software along with the features of the GX Series SKF Microlog to the new user. In addition, this course provides instruction on the basics of setting up an effective portable machinery monitoring system.

2019 Tuition

Class duration	3.5 days
On-site classes	See page 60
Per class	\$8,995
# of people	5
6+ people	\$395 per person

Course description

Course topics are organized according to the steps necessary to set up a portable monitoring system and to operate the SKF Microlog GX and SKF @ptitude Analyst products.

Condition monitoring training topics

- Condition based maintenance program overview
- Guidelines for setting up a portable monitoring system
- Introduction to vibration analysis – discuss the advantages of various vibration signal processing techniques to isolate and detect specific machinery faults (i.e., acceleration enveloping signal processing for early detection of bearing faults)

SKF product training topics

- Set up default properties on the SKF @ptitude Analyst software
- Learn how to get around in the software using its menus, dialogs, windows, hierarchy, terminology, workspaces, etc.
- Create a database of vibration measurements
- Download and upload measurements with the Microlog GX
- Set up properties in the Microlog GX
- Operate the Microlog GX data collector/analyzer to collect route and off-route measurements
- Generate graphic plots and reports to analyze machine condition
- Overview of the advanced Microlog GX application modules – two-channel measurements, balancing, bump test, FRF measurements and the data recorder

WICM350

Advanced SKF @ptitude Analyst™ and SKF Microlog® Applications

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 @ptitude Analyst™ software and Microlog® data collectors for accurate condition detection, efficient program operation, and root cause failure analysis. While the focus of this course is on the most current SKF instruments and software, users of earlier versions will also benefit.

Course objectives:

To provide real-life practical approaches to solving machinery problems utilizing the advanced features and techniques of SKF Reliability Systems products.

This course teaches participants:

- Applications for time and frequency domains
- Phase analysis using a variety of techniques
- Bearing fault detection and analysis
- Time domain analysis
- Identify natural frequencies/resonance
- Alarm optimization
- Editing techniques to enhance database and measurements
- Reports and scheduled activities

2019 Tuition

Class duration	3 days
On-site classes	See page 60
Per class	\$9,995
# of people	5
5+ people	\$445 per person

Course description

SKF Microlog setup

Route and non-route configurations and their influence on collection

Memory and setup considerations to optimize data storage

Cables and transducer configurations for route and analysis acquisition

Microlog Modules

- Bump Test
- Run Up/Coast Down (RUCD) Module
- FRF Module
- Recorder Module
- Balancing Module
- ARM software

Phase collection and analysis

- Phase with a tachometer for route and non-route collection
- Cross-channel phase for machine investigations
- Phase from FRF transmissibility data
- Strobe lights for phase analysis and machinery troubleshooting

Time waveform analysis

- SKF Microlog and @ptitude Analyst settings based rotor rotation and fault frequency content
- Impulses/impacting and fault frequency identification using the reciprocal relationship between frequency and period
- Synchronous time averaging to isolate machinery from other external vibration and nearby machines.

Bearing fault detection and analysis

- Acceleration Enveloping—optimizing spectra and time waveforms for fault detection
- HFD Readings—advantages and precautions

- Ultrasonic technologies and demodulation as alternative to investigate high-speed gearboxes
- Spectrum and time waveform fault identification from acceleration and envelope waveforms

@ptitude Analyst Optimization

- Filters, workspaces, and editing for rapid database development and improvement
- Improved measurement parameters
- Taking full advantages of hierarchies, sharing, and storing data

Effective Condition Monitoring Alarms

- Overall alarms—manual and statistical methods for baselines and optimization
- Spectrum alarming techniques using envelope and band alarms
- Using derived points for specialized alarms and trending

Report Generation

- Creating and scheduling reports
- Importing reports into MS Office and other applications
- One year or more of practical vibration experience and a comprehensive understanding of your current SKF software and Microlog instrument.

Pre-study

KBA00276 Measuring with different SKF devices
PE1109 Microlog Run up / Coast down Module
CM5003 Vibration diagnostic guide

Post-study

PE1203 Setting up a Conformance test
JM02002 Spectrum Analysis
MB01001 Low speed bearing monitoring

SKF Training Solutions team profiles



Joe Bruno

Joseph.M.Bruno@skf.com

Joe is the Director of Training and Development for SKF USA Inc. He has been with SKF for 34 years and has 37 years of experience in the bearing and rotating equipment industry. Joe is responsible for the portfolio of SKF Training Solutions courses and for coordinating course development and delivery in the US. Previously, Joe spent 15 years in the field for the SKF Service Division as a Sr. Account Manager, responsible for the sale and service of SKF products to industrial distributors and bearing users in the northern New England states. Joe has experience in bearing maintenance in a variety of applications and industries.

He sits on the SKF Training Solutions global Core Team which provides oversight to SKF Training Solutions programs and processes around the world. The Core Team assures training is provided consistently and at a high level to users with multiple locations around the globe. Joe graduated from Kean University of New Jersey with a BS in Industrial Education and currently teaches several bearing technology courses both internally and to clients throughout North America.



Joe Conyers

Joe.B.Conyers@skf.com

Joe is a Senior Consulting Engineer, Training and Development for SKF Training Solutions. He has taught bearing maintenance, installation, technology and analysis practices to thousands of maintenance personnel throughout North America for the last 17 years.

His experience as a Field Representative for SKF has provided him with exposure to nearly every type of industrial end-user and application, including mineral extractors, food processors, petrochemical producers, and pulp and paper makers.

Joe is ICML, MLT Level 1 certified and has been published by Plant Engineering Magazine and online at www.skf.com. Joe also designs and develops courses for SKF Training Solutions Online.

Joe holds a BS in Engineering from the United States Naval Academy and has served in the U.S. Navy as an Instructor Pilot and Mission Commander in the P-3B/C Aircraft. He is in his 29th year with SKF.



Gary Patrick

Gary.B.Patrick@skf.com

Gary is a Senior Consulting Engineer, Training and Development for the SKF Training Solutions. He develops and teaches courses on vibration analysis, precision maintenance and reliability to clients throughout North America and the world.

Gary has an extensive background in training, maintenance, machinery vibration, root cause analysis and troubleshooting. Prior to SKF, Gary was the Technical Director at Update International, overseeing the technical staff and training development.

Gary's background includes experience as a Technical Product Manager for condition monitoring software at Entek. He has been instrumental in the development and presentation of large-scale corporate-wide training programs targeted at improved maintenance performance and reliability. Gary has extensive troubleshooting experience on a range of machinery and structural problems dating back to his work at Structural Dynamics Research Corporation.

He has a BS in Mechanical Engineering from the University of Cincinnati, is certified in ASNT PdM Level III vibration analysis, has written numerous technical articles for publication in trade journals, and has presented at reliability conferences around the world. He is in his 18th year with SKF.

SKF Training Solutions team profiles



Charles Worden

Charles.E.Worden@skf.com

Chuck Worden is currently the Director of Technical Training and is part of the SKF Training Solutions team. With over 38 years of SKF experience, Chuck has had a varied career from Applications Engineering to Quality, Six Sigma and Applications Engineering Training Program in the US. As an Applications Engineer, Chuck dealt with a range of customers and applications ranging from automotive hub units to industrial electric motors. In addition to his primary training and development duties, Chuck is also responsible for the Technical, Quality, Six Sigma, Business Excellence and Manufacturing Academies within the SKF College. He has responsibility for the current Applications Engineering Training Program which is a one year program that engages the next generation of engineers from universities around the US and trains them to become SKF Applications Engineers. Chuck is a certified Black Belt in both Six Sigma and Design for Six Sigma.

Chuck holds a BS in Mechanical Engineering Technology from Temple University.



Scot Anderson

gsanderson.tc@gmail.com

Scot Anderson is a Training Consultant as part of the SKF Training Solutions team. With over 40 years of Maintenance & Reliability experience, of which 30 years is in direct supervision and management of the maintenance and engineering of pulp & paper, aviation, mining and governmental operating facilities. In addition, another 10 years is in reliability and project management consulting in nuclear power, steel, hydro-electric, chemicals and pulp & paper. Most recently with SKF, Scot was the lead trainer providing a months-long mentoring program for a group of new Reliability Engineers on the theory, basics, and day-to-day fundamental reliability responsibilities and processes for the facility in which they worked. This included developing Reliability Key Performance Indicators for their specific organization, Maintenance Strategy Review, maintenance best practices assessment and Root Cause Analysis.

Currently, Scot can teach MS212 Proactive Reliability Maintenance for Managers and Supervisors, MS230 Maintenance Strategy Review (MSR) Awareness, MS300 Asset Reliability Improvement, MS332 Reliability Centered Maintenance (RCM), and LP200 Root Cause Analysis for Reliability Engineers. Scot works closely with the customer to provide site specific applications of the materials presented.

Scot holds a BS in Mechanical Engineering from The University of Pennsylvania and an MBA from California Lutheran University along with the CMRP and CRL certifications.

SKF Training Solutions team profiles



George Barr

gpbsta23@netscape.net

George Barr has 35 years of service with SKF, the last several years as a Senior Applications Engineer. George began his career at SKF as a Research Technician in the Mechanical Testing Laboratory conducting testing and collecting test data for research reports. He then became an Assistant Engineer in the Service Engineering Department providing technical assistance to SKF distributors and training for end users. As an Applications Engineer, George was involved in applications for the Metals Industry, specifically bearings for rolling mill applications. But most of his Applications Engineering experience at SKF was with Railway applications. As a result, George has an extensive background in all SKF products but especially Cylindrical Roller Bearings for traction motors and Tapered Bearing Units (TBU's) for rail car journal bearing applications. George holds a Bachelor of Mechanical Engineering degree from Villanova University.



Glenn Cook

glenncookconsulting@gmail.com

Glenn is a Training Consultant for SKF USA and previously worked as an Industry Specialist for SKF. With over forty years of experience in the pulp and paper industry, Glenn has taught bearing training, precision maintenance practices, lubrication practices, bearing failure analysis and hydraulic courses to maintenance technicians, management and engineers in the pulp, paper, steel, mining and hydro carbon processing industries.

As a Industry Specialist with SKF for over 11 years, Glenn has worked with end users and distributors providing application reviews and recommendations, root cause bearing failure analysis, bearing inspections, observing on-site bearing installations/dismounting procedures, lubrication procedures and reliability programs recommendations to resolve repetitive maintenance issues.

Glenn has twenty five years of maintenance management experience in pulp and paper manufacturing facilities. As a maintenance manager, effective communications to achieve goals, continuous improvement practices and administered labor agreements with three local unions were key areas of responsibility. Also, he helped develop and manage multi-craft training and apprentice development programs.

Glenn attended Lee College with studies in Industrial Maintenance and has attended over 600 hours of management leadership and technical courses in his career.

SKF Training Solutions team profiles



John Erickson

John.Erickson@skf.com

John is a Reliability Engineering Manager, and works with Training and Development for SKF Training Solutions. With over 30 years of vibration analysis experience, John holds a ISO Category III vibration certification. In his current role, John oversees technicians throughout the Midwest. John works within a broad range of industries, including pulp and paper mills, chemical plants, refineries, tire and rubber plants, food processing, and the mining industry. In addition to vibration analysis, John also holds a level 1 thermography certification, and handles the training and development duties for new technicians and customers new to vibration analysis.

John has extensive troubleshooting experience on a range of machinery and structural problems. He also has extensive field balancing experience on a wide range of equipment.

John holds a BS in Technology Education from the University of Wisconsin-Stout and has a minor in Safety.



Randy Greaser

randy.greaser@gmail.com

Randy Greaser a Training Consultant for SKF USA. He has worked for SKF in various roles over a 30 year career. His initial assignment with SKF was with Applications Engineering, then moved to Bearing and Service Sales, Sales Management, and Service Division Management. He has also acted as SKF's Project Manager for large movable bridge projects and movable structures such as Caesars 550 ft high observation wheel in Las Vegas. Randy has expertise in a variety of industries including paper, aggregate, surface mining, movable bridges and structures, food processing, and general industries. His experience also includes development and implementation of facility maintenance strategies.

Randy's experience previous to SKF included working as a design engineer for both the agriculture and food processing equipment industries. His formal education includes Engineering and MBA degrees.



Jim Hillen

jhbearingconsultants@gmail.com

Jim is a Senior Consulting Engineer, Training and Development, for the SKF Training Solutions. With over 34 years of experience, Jim has taught bearing maintenance, installation techniques, lubrication practices, and technology and analysis procedures to thousands of maintenance personnel throughout North America.

As a Senior Territory Manager with SKF for 25 years, Jim has worked with a broad range of industries, including mineral extractors, food processors, petrochemical producers, agricultural equipment OEM's, fan and blower OEM's, electric motor OEM's and rebuilders, pump OEM's and rebuilders along with pulp and paper makers. Jim also has experience with off highway equipment, and traction motor bearing applications for the railroads. Jim has managed the Reliability group for SKF, and was an Industry Specialist in the Hydro Carbon Processing Industries. He has performed Bearing Service Engineering work which involves installation of a wide variety of bearings in various applications and equipment.

Jim holds a BS in Industrial Education from The College of New Jersey and an AS in Business Administration from Burlington County Community College. Jim has served in the U.S. Navy.

SKF Training Solutions team profiles



Mike Johnson

mike.johnson@amrri.com

Mike is a Certified Manufacturing Reliability Professional, Certified Lubrication Specialist, ICML Certified Machine Lubricant Analyst Level III, and ICML Certified Machine Lubrication Technician Level II.

Mike has 27 years of experience helping manufacturers improve machine reliability. Mike has served Fortune 1000 companies in their respective interests in developing machine lubrication practices and other lubrication related concerns toward improved business performance.

Mike pioneered the highly successful three day Machine Lubrication Best Practices course in 1998 that has become the industry cornerstone for preparation for ICML MLT certification. Additionally, Mike has created and delivered multi-week immersion training programs to provide quick development of lubrication technicians for several customers, and has continued to add to the three day Precision Lubrication and four day preparation courses for both Oil Analysis and Machine Lubrication Certifications.

Mike has published nearly 100 combined technical articles, papers, and reference chapters and has offered instruction and presentation at 20 different symposia around the world. Mike is also an Associate Editor for the Tribology and Lubrication Technology monthly publication. Mike has an MBA and a BA, and is a standing member of the Society of Maintenance and Reliability Professionals, the Society of Tribologists and Lubrication Engineers.



Jeff Lord

jeff.s.lord@skf.com

Jeff Lord is a Senior Reliability Systems Specialist and is part of the SKF Service team. With over 15 years of SKF experience, Jeff's role in SKF is to help customers establish various reliability programs. He is adept with the SKF @ptitude Analyst and SKF @ptitude Observer software, and with the various data collectors including the Microlog AX, Microlog GX, Microlog Inspector, MARLIN, and several of the online IMx platforms. Jeff is responsible for software installations, database building, and customer training for the software and data collectors. He has also been the project manager for the implementation of several ODR (Operating Driven Reliability) programs across the US. Jeff is a certified Vibrations Analyst Level II (ISO Category III). Jeff has worked with several customers with customized on-site mentoring to meet their specific needs.

Jeff holds a Bachelor's Degree in Mathematics from the University of New Hampshire, and had served in the US Navy as a nuclear Electronics Technician.

Registration information

In the USA:

How to register:

Register online for public classes using links on each course page or use the registration form and contact information on the following page.

On-site courses

For tuition requests, to schedule an on-site class or for more information:

skf.reliability.systems.usa@skf.com

or 866-753-7378.

Payment options

Credit card – Complete credit card information requested on the form.

Purchase order – Send copy of your purchase order with the registration form.

Check – For USA courses, company checks should be made payable to “SKF USA Inc.”

Course locations and start times

General locations are indicated in the catalog. If a specific address location is not available at the time of registration, it will be provided prior to course date.

Classes start at 8:00 a.m. and include a continental breakfast at 7:30 a.m. unless otherwise noted. Most classes end at 5:00 p.m. but times may vary.

Why early enrollment is important

Space – Many classes fill quickly, so early enrollment secures your seat.

Course materials – Course materials must be ordered ahead of time. Registering early assures room and adequate materials for all students.

If you need to enroll on short notice – Please contact SKF Training Solutions Customer Service at 866-753-7378.

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. No refunds will be issued. Cancellation fees may apply.

Disclaimer

Information listed in this catalog is subject to revision without advance notice. Class dates and locations are subject to change. SKF Training Solutions is not responsible for any errors or omissions.

For more information: skfusa.com/STS

Passports

All citizens of the United States, Canada and Mexico, are now required to present a valid passport when entering and leaving the United States, Canada and Mexico at any airport and/or border crossing. This includes children of any age, including children of Legal Permanent Residents who are United States citizens.

Travelers who have not applied for U.S. passports should plan 12 to 16 weeks for standard passport processing and three to six weeks for expedited processing.

For information on obtaining a U.S. passport, visit the US Department of State website at:

travel.state.gov/passport/passport_1738.html

In Canada:

How to register

Complete the registration form on the following page and send to:

Email: training.canada@skf.com

Fax: (403) 232-9255

Mail: Training Solutions
Attn: Lubhani Sharma
SKF Canada Limited
928 72 Ave NE
Calgary, AB T2E 8V9

Call: (403) 232-9262

Payment options

Credit card – Complete credit card information requested on the registration form.

Purchase order – Send copy of your purchase order with the registration form.

Check – In Canada, company checks should be made payable to “SKF Canada Limited”.

For more information: skf.ca/STS to view course descriptions, locations, dates, and print out a registration form.

Passports

For information on obtaining a Canadian passport, visit the Passport Canada website at: cic.gc.ca/english/passport/apply/new/apply-how.asp

SKF Training Solutions® course registration form

Complete the registration form below and send to the appropriate contact, or register online:

skfusa.com/stsregistration

In the USA:

Email: skf.reliability.systems.usa@skf.com

Fax: 800-856-1475

Mail: SKF Training Solutions
Attn: Training Coordinator
890 Forty Foot Road
P.O. Box 352
Lansdale, PA 19446

Call: (866) 753-7378

In Canada:

Email: training.canada@skf.com

Fax: (403) 232-9255

Mail: Training Solutions
Attn: Lubhani Sharma
SKF Canada Limited
928 72 Ave NE
Calgary, AB T2E 8V9

Call: (403) 232-9262

Name _____

Company _____ Title _____

Address _____

City _____ State/Province _____ Zip/Postal Code _____

Telephone number (work) _____ Fax number _____

E-mail address _____

Course title _____ Date _____ Location _____

Course title _____ Date _____ Location _____

☐ Do not enroll me at this time, but keep me advised of new courses.

Payment options:

☐ Company PO# _____

☐ Visa ☐ MasterCard ☐ American Express Name on Card _____

Credit card number _____ Expiration date _____ Signature _____

Please fill out one form per attendee.

2019 SKF Training Solutions course schedule

BSD301*

Bearing System Design

Public class tuition: \$1,495

On-site class tuition: \$14,995

June 11–14..... Elgin, IL

October 8–11..... Charleston, SC

LP300

SiteMentor

On-site class tuition: On request

MS212

Proactive Reliability Maintenance™ for Managers and Supervisors

On-site class tuition: On request

MS230

Maintenance Strategy Review (MSR) Awareness

On-site class tuition: On request

MS300

Asset Reliability Improvement

On-site class tuition: On request

MS331*

SKF Reliability Centered Maintenance (SRCM)

On-site class tuition: On request

MS332*

Reliability Centered Maintenance (RCM)

On-site class tuition: On request

VB120

Detecting bearing failure with vibration data

Public class tuition: \$249

On-site class tuition: On request

March 28..... Lansdale, PA

May 14..... Salt Lake City, UT

May 16..... Portland, OR

June 4..... Elgin, IL

June 6..... Detroit, MI

November 12..... Houston, TX

November 14..... Baton Rouge, LA

WC200

Maintenance Planning and Scheduling

On-site class tuition: On request

WC230

Spare Parts Management and Inventory Control

On-site class tuition: On request

WE201*

Bearing Maintenance and Technology

Public class tuition: \$1,395

On-site class tuition: \$12,995

February 26–28..... San Diego, CA

May 7–9..... Salt Lake City, UT

September 10–12..... Philadelphia, PA

November 5–7..... St Louis, MO

WE202*

Bearings in Rotating Machinery Applications

Public class tuition: \$1,395

On-site class tuition: \$12,995

April 9–11..... Philadelphia, PA

WE203

Lubrication of Rolling Element Bearings

On-site class tuition: On request

WE204

Root Cause Bearing Damage Analysis

Public class tuition: \$1,395

On-site class tuition: \$12,995

March 12–14..... Elgin, IL

July 9–11..... Portland, OR

August 6–8..... Houston, TX

October 22–24..... Philadelphia, PA

WE212

Bearing Reliability in Aggregate and Cement Machinery

On-site class tuition: On request

WE214

Bearing Reliability in Paper Machines

On-site class tuition: On request

WE240

Precision Shaft Alignment – Laser Systems

Public class tuition: \$1,395

On-site class tuition: \$12,995

April 9–11..... Salt Lake City, UT

October 1–3..... Cleveland, OH

WE241

Precision Maintenance Skills – Principles of Proactive Maintenance

On-site class tuition: On request

WE242

Precision Maintenance Skills – Rotor Components and Power Transmission

On-site class tuition: On request

WE245

TKSA Series Laser Alignment

On-site class tuition: On request

WE250

Practical Field Balancing

Public class tuition: \$1,195

On-site class tuition: \$8,495

March 19–21..... Dallas, TX

April 9–11..... Charlotte, NC

July 23–25..... Myrtle Beach, SC

October 29–31..... Charlotte, NC

WE255

Balancing with an SKF Microlog

On-site class tuition: \$8,495

WE291

Aeroengine Bearing Inspection Level 1

On-site class tuition: On request



* SMRP approved course

For on-site class details, please refer to the course page.

2019 SKF Training Solutions course schedule

WI201

Fundamentals of Machine Condition

On-site class tuition: On request

WI205

Vibration Troubleshooting – Practical Methods/Advanced Results

Public class tuition: \$1,495

On-site class tuition: \$9,995

March 12–14 Salt Lake City, UT

September 24–26 Atlanta, GA

WI210

Vibration Analysis – ISO Category I Entry Level

Public class tuition: \$1,495

On-site class tuition: On request

January 22–25 Charlotte, NC

February 5–8 Orlando, FL

February 19–22 Dallas, TX

March 5–8 Charlotte, NC

March 26–29 Seattle, WA

April 23–26 New Orleans, LA

June 4–7 Myrtle Beach, SC

June 11–14 St Louis, MO

July 9–12 Denver, CO

July 30–August 2 Myrtle Beach, SC

September 10–13 Charlotte, NC

September 24–27 Dallas, TX

October 8–11 Philadelphia, PA

October 22–25 San Diego, CA

November 5–8 Charlotte, NC

December 3–6 Houston, TX

WI211

Vibration Analysis – ISO Category II Level 1

Public class tuition: \$1,695

On-site class tuition: On request

Jan 29–Feb 1 Charlotte, NC

February 12–15 Orlando, FL

Feb 26–Mar 1 Dallas, TX

March 12–15 Charlotte, NC

April 2–5 Seattle, WA

April 30–May 30 New Orleans, LA

May 7–10 San Antonio, TX

June 11–14 Myrtle Beach, SC

June 18–21 St Louis, MO

July 16–19 Denver, CO

August 6–9 Myrtle Beach, SC

September 17–20 Charlotte, NC

October 1–4 Dallas, TX

October 15–18 Philadelphia, PA

Oct 29– Nov 1 San Diego, CA

November 12–15 Charlotte, NC

December 10–13 Houston, TX

WI212

Vibration Analysis – ISO Category III Level 2

Public class tuition: \$1,895

On-site class tuition: On request

March 5–8 Dallas, TX

March 19–22 Charlotte, NC

April 9–12 Seattle, WA

June 18–21 Myrtle Beach, SC

June 25–28 St Louis, MO

August 13–16 Myrtle Beach, SC

September 24–27 Charlotte, SC

November 5–8 San Diego, CA

November 19–22 Charlotte, NC

December 17–20 Houston, TX

WI213

Vibration Analysis – ISO Category IV Level 3 – Part 1

Public class tuition: \$1,995

On-site class tuition: On request

March 12–15 Dallas, TX

March 26–29 Charlotte, NC

June 25–28 Myrtle Beach, SC

October 1–4 Charlotte, NC

WI221

Airborne Ultrasound Level 1

Public class tuition: \$1,495

On-site class tuition: On request

January 14–18 Charlotte, NC

February 4–8 TBD

March 4–8 Buford/Oakwood, GA

March 11–15 Dallas, TX

March 18–22 New Smyrna, TN

April 1–5 Charleston, SC

May 6–10 Salt Lake City, UT

June 3–7 Columbus, OH

June 3–7 St Louis, MO

June 10–14 New York, NY

June 10–14 Knoxville, TN

July 15–19 Portland, OR

July 22–26 Cedar Rapids, IA

August 5–9 Kalamazoo, MI

August 12–16 Allentown, PA

September 16–20 Houston, TX

October 7–11 Grottes, VA

October 14–18 TBD

October 21–25 TBD

November 4–8 San Jose, CA

November 11–15 New Orleans, LA

December 9–13 TBD

WI231

Thermographic Applications Level 1

Public class tuition: \$1895

On-site class tuition: On request

Jan 28–Feb 1 Jacksonville, FL

February 11–15 Houston, TX

February 11–15 San Diego, CA

March 4–8 Memphis, TN

March 14–22 Louisville, KY

March 25–29 Chicago, IL

April 15–19 Pittsburgh, PA

April 29–May 3 Kansas City, MO

May 6–10 Charleston, SC

May 20–24 Chicago, IL

June 3–7 Minneapolis, MN

June 24–28 Barre, VT

August 19–23 Seattle, WA

September 9–13 Cleveland, OH

September 9–13 Chicago, IL

September 16–20 Dallas, TX

September 23–27 Indianapolis, IN

October 7–11 Charlotte, NC

November 4–8 San Antonio, TX

November 4–8 St Louis, MO

November 11–15 Cincinnati, OH

November 11–15 Tampa, FL

November 18–22 Chicago, IL

For on-site class details, please refer to the course page.

2019 SKF Training Solutions course schedule

WI235

SKF TKTI Series Thermal Camera
On-site class tuition: On request

WI241E Online Course

Machine Lubrication Technician/
Machine Lubricant Analyst Level 1
Online only, available anytime: \$995

WI241

Machine Lubrication Technician/
Machine Lubricant Analyst Level 1
Public class tuition: \$1,295
On-site class tuition: \$13,995
March 11–14 Atlanta, GA
May 13–16 Houston, TX
September 23–26 Cleveland, OH
November 4–7 Birmingham, AL

WI252E Online Course

Machine Lubrication Technician Level 2
Online only, available anytime

WI253E Online Course

Machine Lubricant Analyst Level 2
Online only, available anytime: \$995

WI304

Advanced Vibration Analysis – ISO
Category IV Level 3 – Part 2
Public class tuition: \$2,095
On-site class tuition: On request
April 1–5 Charlotte, NC

WI305

Applied Modal and Operating Deflection
Shape Analysis
Public class tuition: \$2,145
On-site class tuition: On request
August 19–23 Charlotte, NC

WI313

Time Waveform Analysis on
Rotating Machinery
Public class tuition: \$1,545
On-site class tuition: On request
June 4–6 Charlotte, NC
October 8–10 Charlotte, NC

WI321

Airborne Ultrasound Level 2
Public class tuition: \$1,495
On-site class tuition: On request
April 8–12 Charlotte, NC
September 9–13 Charleston, SC
November 4–8 Atlanta, GA

WI332

Thermographic Applications Level 2
Public class tuition: \$1,995
On-site class tuition: On request
February 18–22 Charleston, SC
March 18–22 Tampa, FL
April 8–12 Cincinnati, OH
May 6–10 Phoenix, AZ
May 13–17 Charlotte, NC
May 20–24 Chicago, IL
June 3–7 Minneapolis, MN
July 15–19 Barre, VT
September 9–13 Chattanooga, TN
September 16–20 Seattle, WA
Sept 30–Oct 4 Dallas, TX
October 14–18 Indianapolis, IN
November 11–15 San Antonio, TX
December 9–13 Omaha, NE

WI333

Thermographic Applications Best
Practices Level 3
Public class tuition: \$1,995
On-site class tuition: On request
May 13–17 Kansas City, MO
September 16–20 Barre, VT

WICM255

Introduction to SKF Microlog® Series
Analyzers and SKF @ptitude Analyst™
On-site class tuition: \$8,595

WICM264

AX Series SKF Microlog® SmartStart™
and SKF @ptitude Analyst™
On-site class tuition: \$8,995

WICM265

GX Series SKF Microlog SmartStart™
and SKF @ptitude Analyst
On-site class tuition: \$8,995

WICM350

Advanced SKF @ptitude Analyst™
and SKF Microlog® Applications
On-site class tuition: \$9,995

SPECIALITY CLASSES

Public class tuition: \$995

Pulp and Paper	July 17–18	York, PA
Metals Industry	Sep 25–26	York, PA
Food Industry	Oct 31–Nov 1	York, PA
Power Gen	June 12–13	York, PA
Cement & Mining	Mar 13–14	York, PA

For on-site class details, please refer to the course page.

skf.com

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