SKF Training Solutions

2015 SKF Training Handbook

- Asia Pacific

Welcome to the world of SKF Knowledge Engineering

Our 2015 Training Handbook contains a wide range of courses to support you in developing a successful training programme for your employees.

SKF training courses are based on over 100 years of experience and knowledge of rotating machine reliability that is unmatched in the world. We have established close working partnerships with our clients. As a result, we have gained a unique insight into the processes and challenges that every major industry faces today.

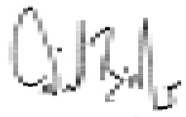
In the current business environment, companies who really stand out are the ones that invest time and money in upgrading the skills of their employees and helping them maximise their potential. The same companies, who continually create opportunities for their employees to learn, will in time reap the rewards of their investment and stay ahead of their competition.

From an industry perspective, SKF training courses focus on enhancing the efficiency of plant machinery and equipment assets, which are integral to the production process in your business. Your employees will have the opportunity to learn from our experienced instructors, as they impart their knowledge on 'best in class' reliability maintenance practices.

Our partnerships with global certification councils along with educational institutions in Asia Pacific will provide your staff with key knowledge of emerging technologies in the field of engineering, specifically rotating equipment. With comprehensive training sessions that involve 'hands-on' learning experience, your employees will be equipped with SKF knowledge that enables them to become highly skilled technicians who will add value to your business.

We would like to extend our congratulations to you in making your best business decision – that is, to invest in training for your employees. At the same time, we warmly welcome all participants who register for our courses in 2015. We wish you an enjoyable learning experience!

Best Regards

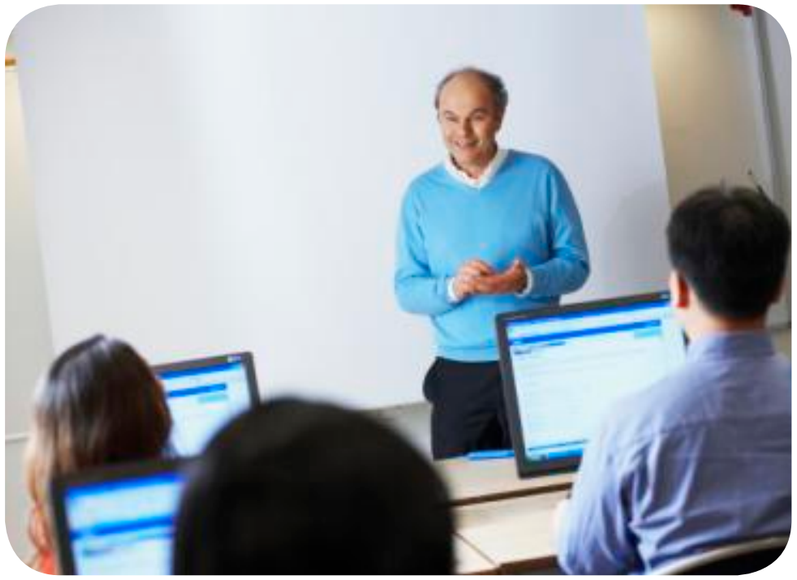


David Bishop

Area Director

Asia Pacific

Take a Look at our SKF Feature Program and some of SKF global courses newly introduced to the Region!



Benefits of training

- Eliminates re-work and machinery problems to increase reliability and productivity
- Helps prevent catastrophic failures before they happen by identifying the early symptoms
- Minimizes repeated failures by addressing the root causes
- Enhances plant safety
- Improves job satisfaction
- Aids in the recruiting process by making the company more attractive in the eyes of potential employees
- Reduces turnover as employees are less likely to leave if they keep learning new skills and keep up within their industry
- Increases employee productivity by teaching them advanced techniques to complete everyday tasks more efficiently
- Rewards long-time employees who have learned new skills and are ready to take on new challenges
- Reduces the need for employee supervision

SKF Regional training courses at a glance.

Best Return on Investment for Your Organization

Learn, Practice and Excel

Customer Testimonials

"The recent vibrations course was very beneficial to my line of work. In fact, upon return to my office I introduced this course to our production department as they have several old machines that have a history of breakdowns mainly due to bearing failure. Currently I am looking at a trending package that could be used by our service as well as production personnel."

Engineer, Hamsworth Singapore, WI202 Vibration Analysis ISO Cat. 1 Sinagpore

"Thank you very much for the wonderful experience during recent training at SKF! We really benefited from the training programme. I got all the answers to my questions with regards to bearings, fittings and tolerances. I would definitely recommend the courses to my colleagues at Star Publications too."

Technician, Star Publications (Malaysia) Berhad, WE201 Bearing Maintenance and Technology Malaysia

"We never really understood what we could get out of condition monitoring until our staff attended the SKF training course. Now, we have a full understanding about the health of our equipment at all times. We have managed to avoid several really costly shutdowns using SKF data collection tools."

Engineer, Antara Steel Labuan Malaysia, WI202 Vibration Analysis ISO Cat. 1 Malaysia

Nestle and SKF are companies that share a similar vision and more than 100 years of experience, with a strong focus on compliance, professionalism, ethics and creating value with their customers, partners and the community at large. Since 2005 Nestle has worked with SKF, as its Global Knowledge partner for rotating equipment. We have worked together across all continents to develop our people and to improve reliability by creating solutions for our different processes. More than 1000 people have been trained by SKF throughout Nestle offices around the world. Nestle is proud to see the ongoing evolution of this partnership with SKF and looks forward to the mutual sharing of our knowledge.

Nestle, Phillippines

"This seminar is great and adds more to our knowledge as maintenance and operations teams"
"I think your class is awesome and I learned a lot in 3 days"
"This seminar will help enhance in carrying out our next turnaround activities"

Engineers, STO Team, Energy Development Corporation, STO MasterClass Philippines

"One of the best training course presentations I've attended. Very good!"

Electrician, Sucrogen, WE215 Electric Motor Maintenance Australia

"The program is very useful and the trainer delivered the material in a very clear way and there were lots of examples of good case studies"

Engineer, Semen Padang, WC230 Spare Parts Management and Inventory Control Indonesia

"This Course is very applicable in our daily maintenance activities. In my part, now I'm fully aware of the factors I should consider"

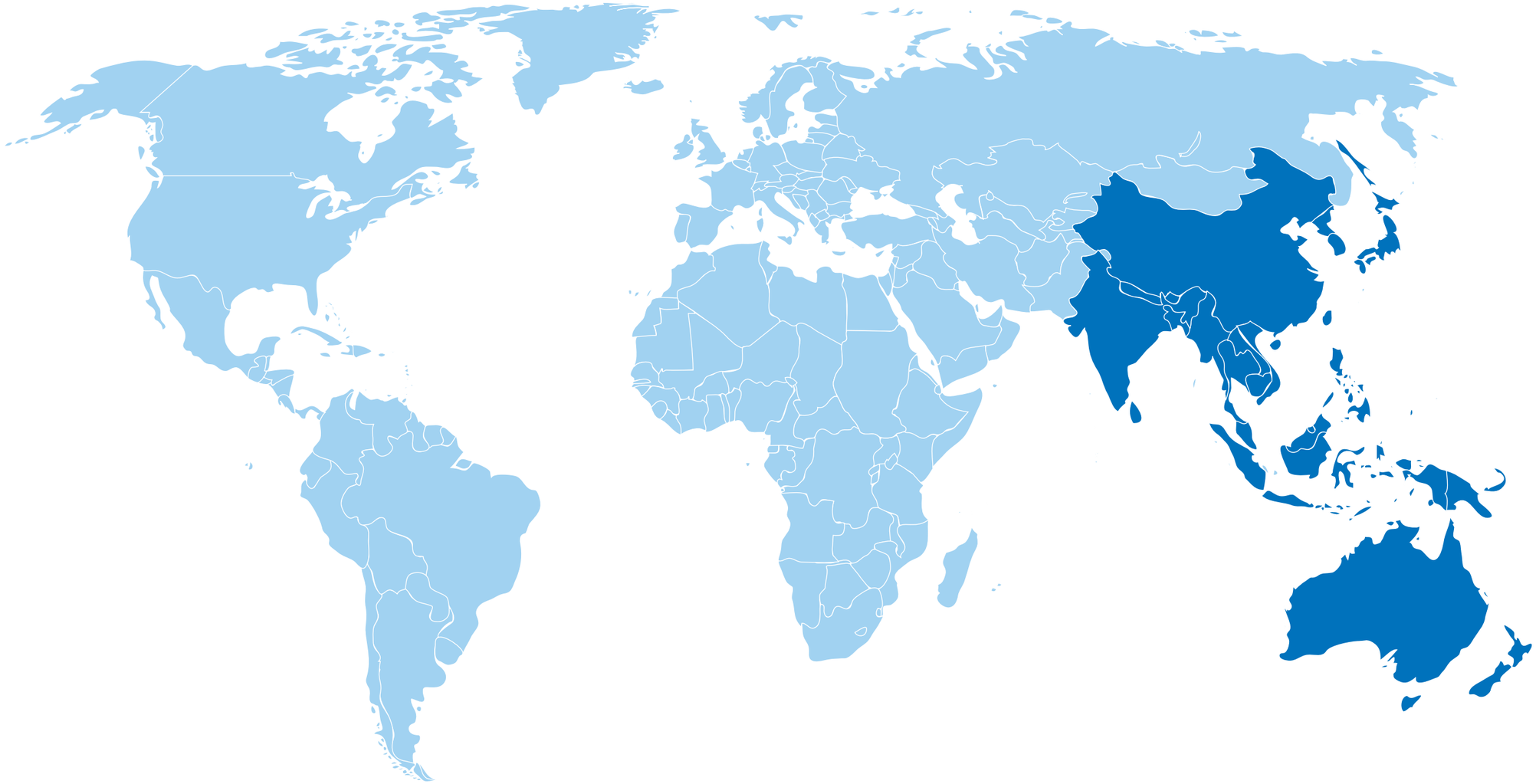
"The Course is very informative and life-changing. It covers what we need"

"I'm very satisfied with this seminar. It is very helpful and timely to our daily tasks. We would practice it as soon as we go back to work"

Maintenance Supervisors, Energy Development Corporation, WC200 Maintenance Planning & Scheduling Philippines

SKF Asia Pacific

The Asia Pacific Regional Training offer is part of the SKF global portfolio of training courses for all industries.



How can I increase profitability through Skill Management?

SKF recommends 5 Key Steps to ensure Successful Training Results

Step 1 — **Select the Right Work Category**
(Highest return on investment to an organisation)

Step 2 — **Training Needs Analysis**
(Clearly Identified skills improvement opportunity for staff)

Step 3 — **Customised Learning Planning**
(Most Effective learning paths to required competency levels)

Step 4 — **Monitor Performance Improvement**
(Through structured Documented Savings process)

Step 5 — **Work Category Re-assessment**
(Continuous improvement and re-activation of skills cycle)

Step 1: Select the Right Work Category

Best return on investment for an organisation

Drawing on years of SKF productivity experience, we can help you identify improvement opportunities that will yield positive bottom-line results, then suggest a strategy for implementing a programme to achieve them.

Our goal at SKF is to help you achieve maximum return on your reliability investment. The SKF Client Needs Analysis (CNA) is a performance benchmarking process with proven success in many industries.

The SKF Client Needs Analysis enables this understanding, combining our experience in reliability-focused maintenance with your knowledge of plant conditions. The goal is to provide useful, actionable information to help you focus on credible performance improvement opportunities.

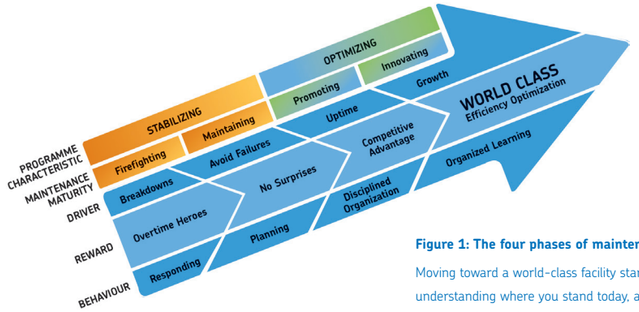
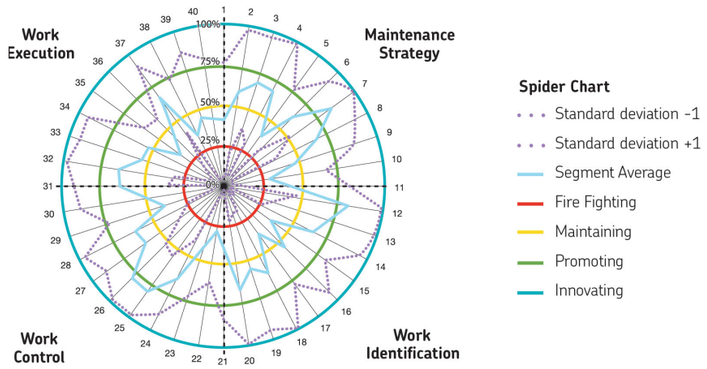


Figure 1: The four phases of maintenance maturity.
Moving toward a world-class facility starts with understanding where you stand today, and defining your objectives for the future.

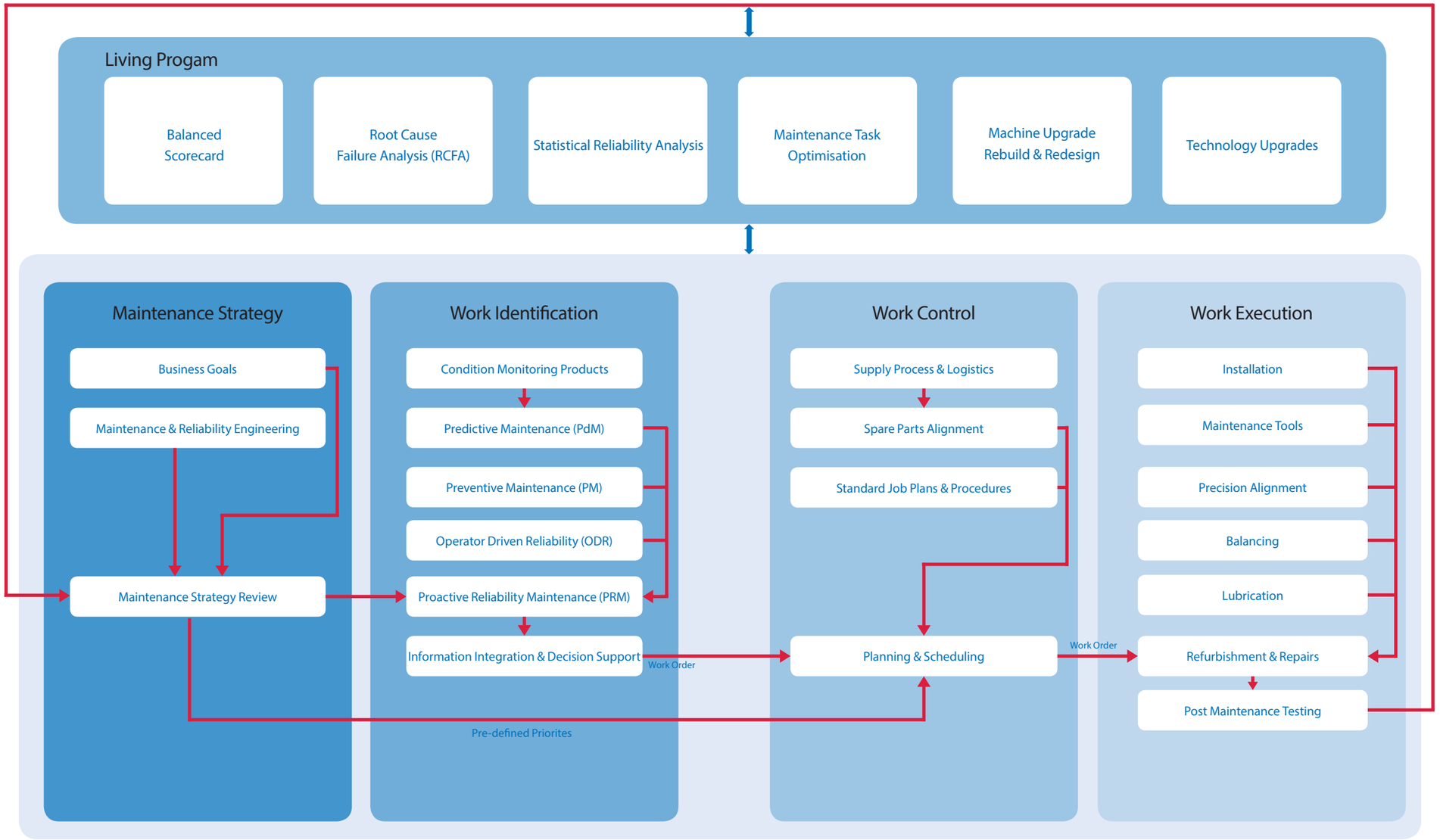
Ideally the CNA will give you the opportunity to gain a clearer perspective on your reliability programme that is generally not possible while immersed in daily activities. Once the analysis is complete, you will receive a comprehensive report that includes:

- A summary of initial set-up details
- A Spider Chart illustrating a micro-level assessment for each question versus the maturity phases
- A Maturity Summary Matrix showing a macro-level assessment for all four main facets of the Asset Efficiency Optimisation Process versus the maturity phases
- A Ranked Deviation Chart illustrating your performance question-by-question versus your industry averages
- A detailed roadmap of recommendations for improving plant reliability



The SKF Client Needs Analysis allows us to identify improvements in specific work categories that can help you achieve optimum results.

SKF Asset Efficiency Optimisation (AEO) Programme



Step 2: Clients Training Needs Analysis

Clearly Identified skills improvement opportunity for staff

Client Training Needs Analysis (CNA-Training): The shift to a fully integrated, reliability and risk-based asset management strategy starts with a good initial understanding of where your staff are today and where your staff need to be to attain optimum plant performance.

The CNA-Training enables this crucial understanding, combining our experience in training and knowledge of maintenance and reliability. The goal is to provide useful and meaningful information to help you focus on improvements for plant performance.

CNA-Training is conducted with individuals or a group of your staff from the following work areas:

Managers
- Maintenance
- Reliability
- Engineering

Superintendents/Supervisors
- Mechanical Maintenance
- Electrical Maintenance
- Planning and Stores

Engineers
- Mechanical
- Electrical
- Reliability
- Condition Monitoring
- Application

Technicians
- Mechanical
- Electrical
- Reliability
- Condition Monitoring
- Lubrication

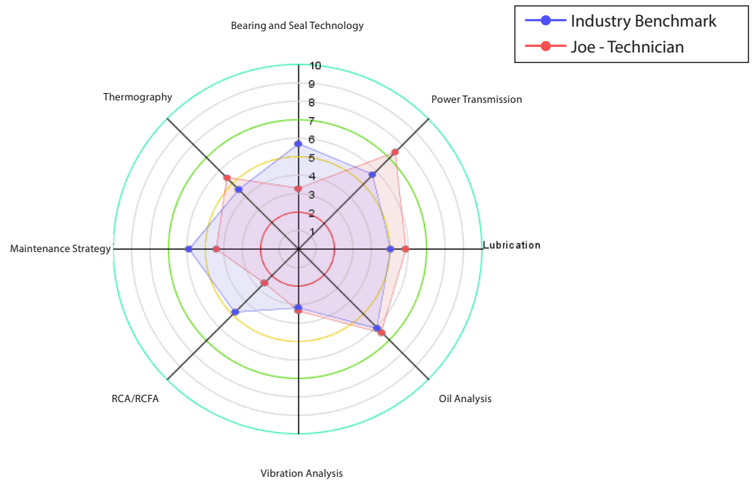
Targeting eight areas of competency for improvement

Opportunities for improvement are determined based on findings from the CNA-Training. Typical improvements fall in the following areas:

1. Bearing and Seal Technology
2. Power Transmission
3. Lubrication
4. Oil Analysis
5. Vibration Analysis
6. RCA/RCFA
7. Maintenance Strategy
8. Thermography

A progressive and structured approach to Training Assessment

Skill Gap Analysis in all key areas of Competency.



The CNA-Training will give you a clearer perspective of your staff's competency and skill levels. The results are analysed and you will be provided with a report which includes:

1. A summary of individuals or group of individuals work profile
2. A 'spider chart' showing a micro-level assessment of each question, with skill levels for each area of competency, opportunities for improvement as well as areas of exceptional performance (refer to spider chart above)
3. A skills summary matrix showing macro level assessment for each of the areas of competency
4. A detailed proposal of recommendations for improvement for the individual or group of individuals supported by the finding of the training needs analysis

Step 3: Customised Learning Planning

Most Effective learning paths to required competency levels

SKF reliability and maintenance training

Course levels

The SKF Training courses focus on disseminating maintenance related knowledge worldwide. It offers various programmes that are developed for easy application.

SKF offer training courses by skill levels. Following this development path is not mandatory, yet highly recommended, as participants will realise the most benefits by taking the courses sequentially.

E-learning
E-learning modules delivered online, 24/7, at SKF Knowledge Center. Introductory courses familiarise students with basic terms and offer basic training on subjects such as bearings, lubrication, thermography, and more.

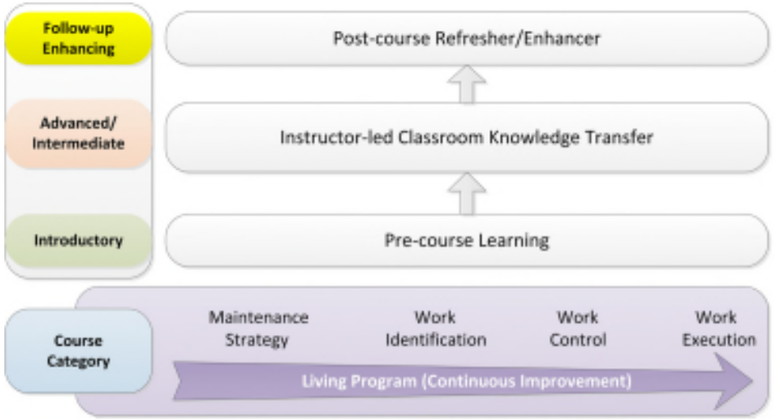
SKF Self-Learning Tools are a one-stop solution for students at various levels, which go deeper into specific subjects through good interaction with users.

Intermediate Classroom Courses
Classroom courses, which typically last 2-3 days, taught by SKF specialists at customer locations or SKF facilities. A combination of theory and hands on activites.

Advanced Classroom Courses
Classroom courses, which typically last 3-5 days, taught by SKF specialist or external experts at customer locations or SKF facilities. Advanced courses dig deeper in theory and principles underlying practical operations and provide adequate opportunities for participants to practice learnings during the course.

SKF Blended Learning Solution

– the effective way to enhance training effectiveness by flowing with 'Learning Curve'



Course categories

While specific course topics vary widely, SKF training courses are organised around the following five facets of the SKF Asset Efficiency Optimisation (AEO) model:

Maintenance Strategy (MS)
Relates to methods and technologies used to develop a maintenance strategy. Courses focus on the formulation of a technically and financially sound maintenance strategy to match business goals.

Work Identification (WI)
Relates to methods and technologies used to identify maintenance work. Course topics include condition monitoring, data collection, information integration and analysis.

Work Control (WC)
Relates to methods and technologies used to control maintenance work. Course topics include maintenance planning and scheduling, spare parts alignment, and inventory control.

Work Execution (WE)
Relates to methods and technologies used to complete maintenance tasks. Course topics mainly include bearing maintenance, best practices in lubrication, precision alignment, dynamic balancing, and electric motor maintenance.

Living Program (LP)
Relates to methods and technologies used to evaluate maintenance work and strategy, thereby "closing the loop" by making maintenance a continuous improvement process. Course topics include root cause analysis, reliability analysis, maintenance work feedback and performance management system, machine redesign, and technology upgrades.

Step 4: Monitor Performance Improvement

Through structured Documented Savings process

Spend minutes. Save thousands.

With SKF Documented Solutions.

Using a powerful new software programme, an SKF representative can show you how to track thousands or even hundreds of thousands of dollars of savings when knowledge gained from SKF training is implemented.

Solutions range from unique SKF training and products that reduce maintenance costs, to reliability services that solve recurring machine problems and virtually eliminate unplanned downtime.

How can you have confidence in the forecasted savings? All this is achieved using your own resources – for materials, labour, downtime, energy costs, inventory, lubrication, replacement costs and more.

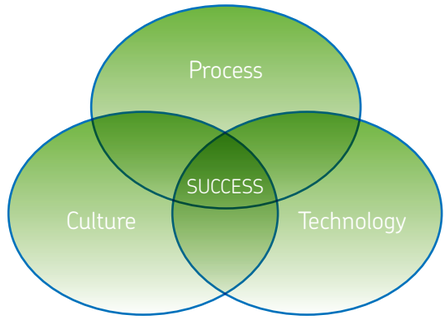
Step 5: Work Category Re-assessment

Continuous improvement and re-assessment of skill

SKF recommends customers to re-assess the improvements made in different work categories after a period of 12-24 months. It also allows customers to identify new improvement opportunities, thereby closing the re-assessment loop and making this part of a continuous improvement process.

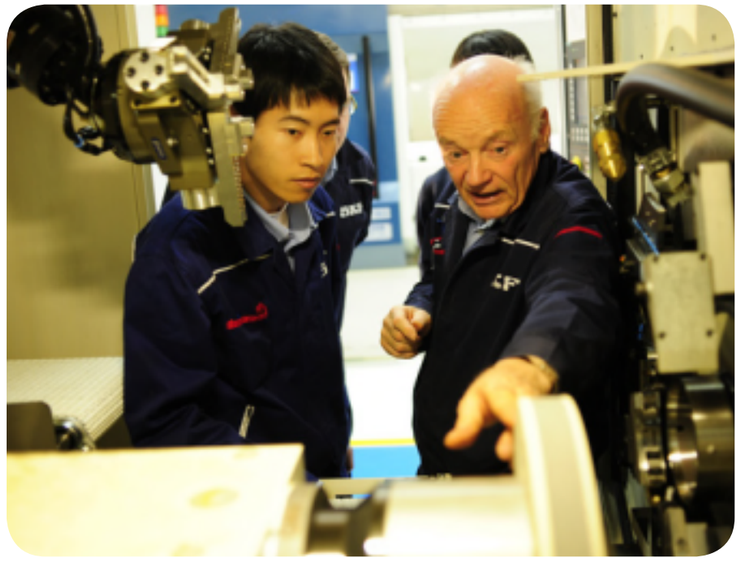
Key to success...

- A corporate culture willing to embrace the need for change
- Commitment to implementing new technologies with requisite financial, training and personnel resources
- Willingness to support processes for implementing cultural and technology changes



Can’t spare time for training? Looking for a convenient solution?

Did you know SKF Training Solutions can provide expert training at your premises?



Advantages

Diverse Range of Courses

- Access to a full range of public programmes as well as programmes specifically tailored to meet your unique training needs

Convenience

- We arrange timing and delivery of courses to suit your schedule
- No travel time for delegates, thus providing time and cost savings – we come to you!

Experienced Instructors

- Industry experts who are able to provide course participants with the full spectrum of maintenance and reliability based training

Cost Effective

- Cost effective method for training groups of employees from your organisation

Team Environment

- On-site group training promotes a team environment and provides easy access to more practical workshop exercises and hands-on activities to enhance learning impact

On-site training would be an ideal option for you, if:

- You have 8 or more potential participants from your organisation;
- You want to choose a date and location that suits you;
- You want a trainer that understands your industry as welll as a program customized to meet your unique training needs;
- You want to save time and money while getting the best training;

Example of a SKF Reliability Training Centre setup at the customer site.

This Technical Training Centre consists of the latest equipment and technology in Bearing Maintenance and Condition Monitoring fields. This provides a unique opportunity for employees to attend hands-on training programmes and gain practical knowledge. The Centre was set up in close collaboration between SKF and the client.

SKF Instructors

Veera Anantaratikun, Thailand

Veera is a Certified Maintenance Reliability Professional and an individual member of the Institute of Asset Management. His areas of expertise are Reliability-Centred Maintenance (RCM), CMMS/EAM implementation, Root Cause Failure Analysis, Risk Based Inspection, RAMS, Life Cycle Costing, maintenance performance assessment and Asset Performance Management. Veera has performed RCM/RBI/RAMS and RCFA projects for various clients in order to develop and optimise equipment asset management systems.

He has also developed and implemented several Proactive Reliability Maintenance programmes for facilities and has assisted in the start up of programmes for clients. He has worked with all varieties of rotating equipment primarily focused on machine reliability, utilizing a variety of predictive maintenance technologies, such as vibration spectrum analysis, lube oil analysis and other non-destructive testing techniques.

Darío R. Rodríguez, Singapore

Dario started as application engineer with SKF Argentina in 1980s. Through all these working years with SKF, he has accumulated a great deal of experience working with customers from across almost all major industries, including Metals, Mining and Pulp and paper, Food and Beverage, Power Generation, Oil and Gas, Electrical, Textile, Sugar and etc.. In his work experience, he has been heavily involved in the technical part of service contract development including IMS, PdM, PRM contracts.

He's currently the Regional Application Engineering Manager with SKF Asia Pacific. Besides leading the application engineer team to provide engineering solutions and support to SKF customers, he's also a highly pursued and experienced trainer both internally and externally with strong expertise in bearing technology and maintenance, root cause failure analysis and vibration analysis.

Gary Patrick, America

Gary is a Senior Consulting Engineer, Training and Development for the SKF Reliability Maintenance Institute for the past fifteen years. 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. He has a BS in Mechanical Engineering from the University of Cincinnati, is certified to ISO Category IV vibration analysis, has written numerous technical articles for publication in trade journals, and has presented at reliability conferences around the world.

Natalie Sun, China

Natalie joined SKF as Asset Management consultant in 2007. after she graduated from Loughborough University UK with Ph.D degree in System Risk & Reliability Assessment. She's currently responsible for training business development in the Region, and has also been closely involved in training course development as well as training delivery.

She has accumulated extensive experience in Asset Performance Management, SKF Reliability Centred Maintenance (SRCM), Maintenance Planning & Scheduling and Root Cause Analysis, and conducted numerous training courses on these subjects. She's a certified Project Management Professional (PMP).

Paul Knock, Australia

Paul has over 20 years experience in the electric motor and rotating plant industry. He has worked as a manager of repair workshops in Europe and Australia and has vast experience in the repair and service of AC and DC electrical motors, pumps & gearboxes. He hasfield experience in compiling, diagnosing and reporting electrical and mechanical condition monitoring techniques and has managed service contracts in pulp & paper, shipping, food & beverage, steel & metals, mining, wind, nuclear & power generation industries.

More recently he has been involved with energy and sustainability projects for SKF and now manages motor diagnostic products and services with SKF Asia Pacific.

Joost van Doodewaard, Singapore

Joost has been in the field of precision alignment for the last eight years. After his bachelor's degree in Naval Architecture, he started with SKF/Machine Support in The Netherlands. The first 3 years, he mainly worked in the field to get hands on experience. In 2007 Joost moved to Singapore to further develop the business for SKF Vibracon elements in South East Asia and from 2009 until 2012 he managed the SKF Marine / Machine Support team in the USA. Now he is back in Singapore and responsible for the alignment, installation and chocking services in the Asia Pacific region.

SKF Instructors

Prawit Apinansomboon, Thailand

Prawit has been working with SKF since 2000 and is currently working as project engineering manager to provide solution and support for online condition monitoring and protection system installations. With more than 22 years of work experience in the field of mechanical maintenance (preventive & predictive), he has led a number of projects in the design, development and installation of online condition monitoring & protection systems along with commissioning plans for cement, metal, oil & gas and power industries.

His expertise mainly lies in advanced vibration analysis, modal analysis, field dynamic balancing, motor current signature analysis and reliability centered maintenance. His strong background makes him a highly pursued trainer.

Ian McMillan, Singapore

Before joining SKF in 1999, Ian had been serving as Category 1 Nuclear Power Plant Supervisor and Engineering Department Maintenance & Administration Supervisor at sea in the Submarine Service in the Royal Navy for more than 25 years. He's got extensive experience in the offshore Oil & Gas Industry, conducting troubleshooting surveys on client critical machinery, commissioning, operational deflection shapes, pipework structural vibration investigations involving the assessment of bending/ hoop stresses derived from the strain measurements, pump performance testing precision alignment and field balancing. He currently holds the position of Technical Manager for Asia Pacific South and is responsible for service delivery development and personnel capabilities advancement within the region.

Zainul Rashid Shamsudin, Malaysia

Zainul Rashid Shamsudin is an Application Engineering Specialist working with SKF Malaysia since early 2005 under Maintenance Support Center, Training & Services and since then been doing bearing maintenance support to end-users, distributors and dealers. Among others are from design projects to installation, precision shaft alignment job to failure analysis while conducting training as primary function. He has a Degree in Mechanical (Aeronautics) Engineering and worked as a maintenance engineer and technical trainer at several companies in Malaysia prior joining SKF. He has combined experienced in technical training for more than 10 years.

N. Venkatesan, Indonesia

Venkatesan is an Implementer of Asset Management Services solutions who and worked in Maintenance management and consulting in manufacturing and process industries for his entire career. He has 34 years of hands-on experience in engineering, maintenance management and consulting. He is considered to be a technical subject matter expert regarding Physical Plant Asset Management and hence Asset Management Services. His experience and knowledge is his chosen field applied to the Asset Management consulting field bbring credibly within SKF and with clients to" with "brings credibility with clients and SKF's Asset Management Services division.

Jinyoung Park, Korea

Jinyoung is currently working as AMS (Asset Management Services) consultant of SKF Korea, and has worked in asset management field (Maintenance Engineer, PdM Engineer, ERP PM Development and Implementation Engineer, TPM Office Assistant Manager, AMS Consultant) of process industries for 12 years. His areas of expertise include; TPM (Total Productive Management), Reliability-Centered Maintenance (RCM), CMMS/ EAM implementations, Root Cause Failure Analysis (RCFA), Work Planning and Scheduling, Operator Driven Reliability (ODR), and maintenance performance assessment.

Ee Chin Tan, Singapore

Ee Chin Tan has been the SKF Asia Pacific General Manager of Online & Protection Systems since 2001. Ee has extensive experience in rotating equipment maintenance, system engineering (condition monitoring & protection), machine diagnostics (vibration, lubrication, thermodynamic performance and failure analysis), onshore/offshore maintenance strategies, gas compressors system availability optimisation, project management and international market development. Prior to SKF, Ee was the Managing Director of Vibrometer's Asia Pacific office and the Senior Mechanical Engineer in Brunei for Shell Petroleum where he had extensive condition monitoring and maintenance engineering experience on gas and steam turbines, centrifugal & recip compressors, pumps.

SKF Instructors

Vijay Apte, India

Vijay has over 23 years of experience as a functional expert in the fields of maintenance, bearings and services ranging from Plant health assessment, Condition monitoring of equipment & mechanical services. He has hands-on experience in the above fields in key industrial segments like Power, Metals, Pulp and Paper & Cement. As an instructor for SKF Training Solutions Vijay delivers training on World Class Maintenance, Proactive Maintenance techniques and Condition Monitoring. Vijay is an SKF Certified Six Sigma Green Belt and has delivered more than 20,000 hours of professional training.

Ganesh Natarajan, Australia

Ganesh is an Asset Management practitioner with over 25 years experience in Maintenance, Engineering, Operations and Consulting. He is considered to be a subject matter expert in the field of Asset Management. He has successfully applied and implemented asset management methods, systems, processes and practices in a range of industries including Marine, Oil & Gas, Food and Beverage, Petrochemical, Mining, and Metals.

His practical and hands-on maintenance experience readily translates to concepts and holistic solutions that deliver results. A proponent of the Asset Management discipline, he is passionate about training and affecting knowledge transfer. Ganesh has also published articles and conference presentations.

Wuttipun Phukoed, Thailand

Wuttipun's current position is Asia Pacific Business Manager for Condition Monitoring Portable Products and Service Solutions which includes Microlog Inspector, Analyser, Handheld Products and Condition Monitoring Services. With 12 years of experience in SKF, he develops and teaches several courses from product introduction to courses which include Vibration Analysis, Condition Monitoring and Basic Product Handling and Usage. In his current position, he uses his experience to develop operator driven reliability for the APAC region. This combines Microlog Inspector and @ptitude Xchange to assist the plant operator to do their job.

Soami Pamnani, Indonesia

Soami has over 25 years of experience in the field of bearing applications ranging from electric motors to blowers; gear boxes to crushers; traction motors to drying cylinders, material handling to casters.

He is a B-Tech (Mechanical Engineering) Graduate with a Certification in Bearing Technology from the SKF Engineering Research Centre (ERC), Netherlands. He has delivered more than 50,000 training hours in segments such as Cement, Mining, Power, Steel, Pulp & Paper, Railways, Oil & Gas, Textiles, etc.

HJ Jung, Korea

HJ holds BS & MS in Mechanical Engineering. He has extensive knowledge in condition monitoring and teaches in courses, such as vibration analysis, dynamic field balancing, GX Series SKF Microlog and SKF @ptitude Analyst, IMx System and SKF @ ptitude as well as Microlog Applications

HJ Jung has a certification in ASNT Level 3A vibration analysis and ISO Category III condition monitoring and diagnostics of machines. In addition, HJ Jung is equipped with six years of field vibration troubleshooting experience in the Pulp & Paper, Metal, Cement, Hydrocarbon, Metal, Cement, and Wind Power segments.

Kumaran Dakshinamurthy, India

Kumaran completed his Mechanical Engineering and is an ASNT Level 2 Certified Vibration Analyst. He is also BINDT Category-2 Certified Vibration Analyst. With a rich experience of 18 years" replace with "18 years of experience in of Condition Monitoring and Dynamic Analysis as well as more than 20,000 training hours completed Kumaran Dakshinamurthy is one of the finest experts we have for training in Vibration analysis.

SKF Instructors

Lim Ann Hock, Malaysia

Ann Hock is a graduate from Southern Illinois University with a major in Mechanical Engineering. Working in training and consultation industries for more than five years in engineering software industries. Has conducted more than 400 hours of training prior to joining SKF Malaysia. Coordinates and develops training programmes on Bearing Technology and Maintenance Basic to Advanced levels.

Currently conducts training for SKF Bearing Technology and Maintenance for both advance and basic levels. Also involved in practical training for mountingand dismounting of bearing via SKF mechanical method, induction heaters and drive up method.

Artemis Hsu, Taiwan

Artemis has five-year experience in Bearing Application Engineering. He's been working in Spindle Service Center of Solution Factory Taiwan since 2010. In his work experience, he's heavily involved in not only spindle design but also practical services such assembling and repair of spindle. He is also one of the trainers in Machine Tool application training. And besides his experience in bearing application engineering, he also has good knowledge in machine diagnostics and vibration monitoring and analysis with ISO Category III certification.

Steven Chiou, Taiwan

Steven has extensive knowledge in condition monitoring and has been providing training courses in vibration analysis, dynamic field balancing, and SKF CoMo products such as SKF Microlog portable devices and @ptitude Analyst, iMx System etc.

Steven holds a certification in ISO Category III condition monitoring and diagnostics of machines. In addition, Steven is equipped with ten years of field vibration troubleshooting experience in the Pulp & Paper, Metal, Cement and Power Plant.

Chong Tong Leong, Malaysia

Tong Leong has joined SKF Malaysia as trainer since 2007 and he is conducting training courses such as Bearing Technology & Maintenance Course, Precision Shaft Alignment, SKF Industrial Shaft Seal and Lubrication of Rolling Elements Bearing Course.

Tong Leong holds a BSc. in Electrical Engineering and MBA degree.

In addition, Tong Leong has 2 years of working experience as a plant manager in the Bedding and Packing Industry.

Michael Chang, Taiwan

Michael is a graduate from National Taipei University of Technology with a major in Mechanical Engineering. He joined SKF Taiwan reliability system department in 2000 then transfer to currently working as application engineer in 2003. He has extensive knowledge in bearing application engineering and has been delivering hundreds of sessions in traning courses including bearing mounting and dismounting, lubrication, shaft alignment, bearings design and etc.

In addition, Michael Chang is equipped with fifteen years of field vibration troubleshooting combine of bearings damage and their causes experience in the Electric motors, Pulp & Paper, Metal, Cement, Metal, Cement, and Wind Power segments.

Sushant Kodialbail, Singapore

Sushant holds a BE in Mechanical Engineering and is an ISO Category II Certified Vibration Analyst. He has 5 years of experience in analysis and trouble-shooting both in Acoustic Analysis and Vibration Analysis. He's also got practical experience in Process Plant, Chemical Industry and Oil & Gas segments being involved in Condition Monitoring Surveys, Database Setup & Maintenance, Analysis and Trouble Shooting.

SKF Instructors

Lorenzo Perez, Singapore

Lorenzo is currently a Sr Service Engineer for SKF Reliability System in SKF Asia Pacific, Singapore. He holds a bachelor's degree in Mechanical Engineering from the University of San Carlos, Philippines. He started with SKF in 1997 as an Application Engineer, and re-joined SKF Asia Pacific in 2013 after having worked with Shell Philippines and General Electric where he's got extensive experience handling Bently Nevada online machine protection systems.

He has a combined work experience of 25 years with a solid background in the steel industry. He has held various positions in engineering and plant maintenance with extensive hands-on experience in Condition monitoring and machinery diagnostics in heavy industries. He' ISO Category III certified Vibration Analyst (2013) and ASNT Thermography Level I certified.

S H Son, Korea

SH Son currently holds the position of Alignment trainer and has experience of precision alignment and measurement for more than ten years in the Pulp & Paper, Metal, Chemical, Shipbuilding and Wind Power segments.

He holds a BS. in Mechanical Engineering and worked in heavy equipment transmission development team for three years. He has joined SKF Korea as a mechanical engineer since 2002 and The first 3 years, he mainly worked in the field to get hands on experience such as precision alignment with dial gauge and laser alignment system, vibration analysis and dynamic field balancing with SKF Microlog, bearing housing mounting and supervising.

***Note: Not all of our instructors have been listed in this catalogue.**

E-Learning Courses

E-Learning Courses

Reliability knowledge delivered at your convenience

Our expanding range of e-learning courses covers a wide range of topics that you can learn from at your own pace and convenience.

http://www.skf.com/group/knowledge-centre/elearning/index.html

A personal approach in an online environment

- The online e-learning courses from SKF are designed to introduce you to the subject and are considered the pre-requisites for the Intermediate level classroom courses
- Course participants will benefit from the opportunity to interact with a course tutor, via the “ask the expert” functionality that is accessed from within each training module
- Each course is also accompanied by a dedicated support forum, allowing participants to interact with other learners and subject experts to further enhance their learning experience

Online/Offline interactive trainings

SKF Self-Learning Tools (SLT) are the essence of our 100 years of rotating machinery experience gathered from virtually every industry, machinery and application, packaged into ready to use, easy to apply courses.
Each SLT module consists of theory are full of information and practical knowledge with relevant case studies.

E-Learning Courses

MS100 AEO Basics

Course Overview

This is an introductory course on Maintenance Optimisation. It considers the shortcomings of traditional maintenance and the benefits to be gained by replacing a cost focus with one of value and risk. Tools to assist with the optimisation exercise are briefly discussed and the Asset Efficiency Optimization (AEO) work process is outlined to ensure that the optimised maintenance plan achieves the desired results.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Maintenance Strategy

MS101 Assessment Basics

Course Overview

Excellence in asset management is no more or less complex than being able to ask and answer structured questions routinely and accurately. This course provides a general introduction to the subject of assessing maintenance performance. Tuition includes guidance on the selection and implementation of the correct assessment approach. The nature of organisational change is also discussed and suggestions made regarding management of the change process.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Maintenance Strategy

MS113 Proactive Reliability Maintenance

Course Overview

This course provides an introduction to proactive maintenance. It starts by exploring what is meant by the term “proactive maintenance” and goes on to discuss five of the primary tools that are typically used in its implementation. An introduction to the use of key performance indicators to monitor programme effectiveness is included, along with suggestions for a disciplined approach to operational review.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Maintenance Strategy

MS120 Operator Driven Reliability

Course Overview

This course provides an introduction to the concept of Operator Driven Reliability (ODR). Its origins and terminology are explained, and the relationships between ODR and other maintenance methodologies is discussed. Factors that are key to successful implementation are also described.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Maintenance Strategy

MS130 Maintenance Strategy Review

Course Overview

The course starts with an explanation of what a good maintenance strategy is meant to achieve. It then goes on to introduce “Reliability Centred Maintenance” (RCM) as a means of devising an effective strategy. Some variations on the classic RCM methodology are described, including SRCM and Risk Based maintenance. A cost-based approach to RCM is also outlined.

The course goes on to suggest how a maintenance strategy review project might be organised, and concludes by discussing the challenges that must be faced when implementing the results of such a project.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Maintenance Strategy

WI130 Introduction to Thermography

Course Overview

This interactive course provides an introduction to infrared thermography and the associated background science . It explains many of the basic terms associated with the activity. Four main areas of industrial application are discussed, and practical examples from each of these areas are presented.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Identification

E-Learning Courses

WI140 Introduction to Lubrication Analysis

Course Overview

The lessons provide an overview into the history of lubricant analysis, evolution of maintenance practices, friction and lubrication basics, lubricant analysis techniques, wear mechanisms, and lubrication regimes.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Identification

WC130 Spare Parts Management

Course Overview

This course introduces you to the terminology, processes and activities associated with spare part and inventory management. The objective of this course is to increase your knowledge of basic spare parts and inventory management terminology, processes and principles with respect to your business goals. This course will help you to identify, structure and classify spare parts based on their criticality and re-order parameters, and help you to optimise your spare parts inventory.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Control

WE140 Introduction to Shaft Alignment

Course Overview

This interactive tutorial will provide a basic introduction to the importance of shaft alignment. The programme provides technical information about the proactive approach to shaft alignment, the process itself, common terminology as well as highlight key alignment methods such as simple mechanical, dial indicator and laser shaft alignment. Corrective actions will also be explained in this comprehensive module.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

WE150 Balancing Basics

Course Overview

This course provides a basic introduction to field balancing from first principles.

Imbalance is one of the most common causes of machinery vibration. Nowadays vibration monitoring and analysis instruments typically include a dynamic balancing facility. These balancing programmes can usually be relied upon for good results. Occasionally, however, things do not appear to go as they should, and it is useful in such circumstances to have an understanding of the fundamentals of balancing in order to arrive speedily at a solution.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

WE170 Introduction to Industrial Seals for Rotating Motion

Course Overview

This interactive tutorial aims to provide a basic introduction to the selection of industrial seals for rotating motion. The study material is divided into six chapters:

1. Introduction
2. Industrial seals
3. Operating condition factors
4. Radial shaft seals
5. V-rings
6. Applications

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

E-Learning Courses

GRB0001 Bearing Basics

Course Overview

On completion of this course the learner will be able to: Describe the three primary functions of a bearing. Correctly identify the component parts of a standard bearing. Explain eight factors that will affect the choice of bearing for a particular application. List the most common bearing types. Describe the main characteristics of each of the common types of bearing. Identify the bearing type described by use of a basic designation. Identify variants of a standard bearing design from information given in prefixes and suffixes applied to standard designations.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

GRB0002 Spherical Roller Bearings

Course Overview

This course consists of a number of lessons, including introduction, executive summary, features and benefits; product range and designations; and applications.

Before taking the Spherical Roller Bearings course, it is recommended that you have passed the Bearings Basic course (GRB001), or have some prior knowledge about bearings.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

GRB003 Angular Contact Ball Bearings

Course Overview

Before taking the Angular Contact Ball Bearings course, it is recommended that you have passed the Bearings Basic course (GRB001), or have some prior knowledge about bearings.

Lessons focus on features and benefits of single row and double row angular contact ball bearings. Arrangement of universally matchable angular contact ball bearings is also discussed. Four-point contact ball bearings are also considered.

SKF Angular Contact Ball Bearings are used in many pump and compressor applications. Three examples of demanding applications are presented.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

GRB004 CARB Toroidal Roller Bearings

GRB004

Course Overview

In this course you will learn about the features and benefits of CARB Toroidal Roller Bearing performance variants. Additionally, you can go into further details about hardening, adjustment, catalogue values and other technical information by reading the available pdf-documents.

CARB Toroidal Roller Bearings are used in many types of applications. This lesson presents no less than five applications of CARB Toroidal Roller Bearings that highlight different aspects of the product benefits.

Before taking this course, it is recommended that you have passed the Bearings Basic course (GRB001), or have some prior knowledge about bearings.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

E-Learning Courses

GRB005 Taper Roller Bearings

Course Overview

The course covers the following sections:

- An introduction to the course contents and an explanation of how the course works.
- This extended summary presents the product features and benefits that characterise SKF Taper Roller Bearings.
- In this section you will learn about the features and benefits of the three SKF Taper Roller Bearing performance variants. Additionally, you can go into further details about hardening, adjustment, catalogue values and other technical information by reading the available pdf-documents.
- Product range and designations: This lesson focuses on the SKF Taper Roller Bearing range and the most relevant designations.
- Applications: Taper Roller Bearings are used in many types of applications. This lesson presents no less than five applications of SKF Taper Roller Bearings that highlight different aspects of the product benefits.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

GRB006 Deep Groove Ball Bearings

Course Overview

Before taking the Deep Groove Ball Bearings course, it is recommended that you have passed the Bearings Basic course (GRB001), or have some prior knowledge about bearings.

In this course you will learn the basics about SKF Deep Groove Ball Bearings. The course consists of the following parts:

- An introduction to the course contents and an explanation of how the course works
- In this section you will learn about the features and benefits that set SKF Deep Groove Ball Bearings apart from the competition
- Product range and designations: Working with bearings on a daily basis, it is useful to recognise the most common bearing designations. In this lesson, you will learn about the SKF Deep Groove Ball Bearing range and the most relevant designations
- Applications: SKF Deep Groove Ball Bearings are successfully used in a wide range of applications. This lesson illustrates four different applications

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

E-Learning Courses

GRL001 Introduction to Lubrication

Course Overview

Before taking the SKF Lubrication course, it is recommended that you have passed the Bearings Basic course (GRB001), or have some prior knowledge about bearings. In this course you will learn about the physics of lubricants and the function of a lubricant within a bearing. The features and benefits of SKF standard bearing greases will be outlined, and you will be shown how to select grease for a specific application. The presentation also discusses the features and benefits of SKF automatic lubricator systems; SYSTEM 24 and SYSTEM Multipoint.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

GRPT01 Power Transmission

Course Overview

This course presents the basics of the unique SKF Power Transmission product range, which consists of six main product categories which are belts, pulleys, chains, sprockets, couplings, as well as bushings and hubs.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

PT01-MCA SKF Machine Condition Advisor

Course Overview

This course introduces the SKF Machine Condition Advisor, and its application in assessing the condition of rotating machinery. This involves three key tasks:

- Preparing and planning for measurements
- Collecting and recording readings
- Evaluating the collected data to detect changes in machinery condition.

Tuition is divided into four main lessons:

1. **The basics:** This lesson introduces the SKF Machine Condition Advisor as a predictive maintenance tool, and describes the three determinants of machine condition that it measures.
2. **Instrument Setup:** In this lesson you will learn how to prepare the instrument for use, and how to configure the instrument to suit your own preferences.
3. **Using the Instrument:** A virtual instrument is used to collect data from a typical fan. A simple data recording system is discussed, and instruction offered regarding the evaluation of the collected data.
4. **Practical conditions:** This lesson considers some of the practical difficulties that might be encountered in using the Advisor on real process machinery. Once again, a virtual instrument is used to collect data from a typical machine.

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

E-Learning Courses

PT02-TKSA20 SKF Shaft Alignment Tool

Course Overview

This course introduces the SKF shaft alignment tool TKSA20, and covers the following topics

- The importance of precision alignment
- What's in the kit
- Use of the TKSA20 to check for soft foot, and to align a machine.

The course is intended for use in conjunction with the manual supplied with the instrument. Tuition is divided into six sections:

1. Introduction to shaft alignment.
2. Introduction to the TKSA20
3. Preparation for shaft alignment
4. Alignment procedure overview
5. Real-world case study
6. Alignment report

Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

PT03-TKSA40 SKF Shaft Alignment Tool

Course Overview

This course introduces the SKF shaft alignment tool TKSA20, and covers the following topics

- The importance of precision alignment
- What's in the kit
- Use of the TKSA40 to check for soft foot, and to align a machine.

The course is intended for use in conjunction with the manual supplied with the instrument. Tuition is divided into nine sections:

1. Introduction to shaft alignment.
2. Introduction to the TKSA40
3. Preparation for shaft alignment
4. Measuring the misalignment
5. Correcting the misalignment
6. The soft foot module
7. File manager
8. Troubleshooting
9. Real-world case study

Estimated study time is approximately 30-45 minutes, and on completion you will have the opportunity to take a test, to check your understanding of the topics covered during the course.

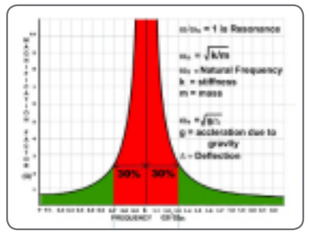
Course Information	
Subscription	12 months subscription
Course Type	Online
Category	Work Execution

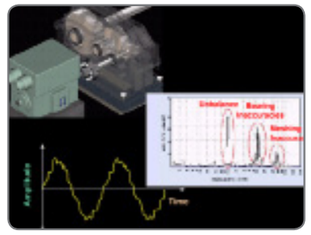
SKF Self-Learning Tools

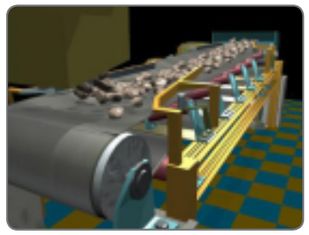
SKF Training Solutions, an integral part of SKF services focuses on disseminating maintenance related knowledge worldwide. We're now proud to present training in the form of an interactive CD-based or online application - SKF Self-Learning Tools.

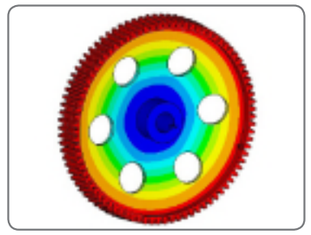
SKF Self-Learning Tools offer a comprehensive solution for basic training in the field of condition monitoring, Bearings, O&M of pumps and conveyors, including dynamic analysis.

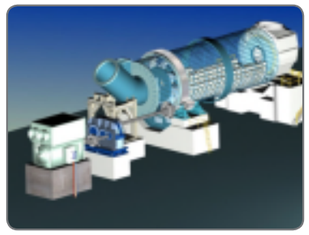
Target audience includes engineers at various levels and also students of mechanical and other engineering streams. This eliminates the need to take time off from work and travel long distances to acquire knowledge, thereby reducing costs considerably. SLTs offers impartial assessment, enable the updates of and acquisition of new skills at your convenience 24/7. These tools are periodically updated to reflect current technology trends and practices. These tools are installed in the customer's intranet (LAN) or available online.

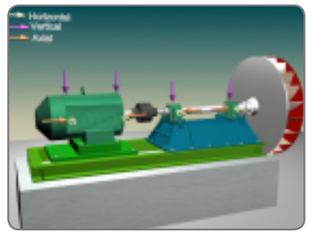












Self-Learning Tools

SLT1

Basics of Vibration and Preliminary Analysis

Course Overview

This SLT explains with clarity and simplicity, the theory and precise simulations of the basics of vibration, vibration measuring instruments, the ISO standards followed by the industry, and the methods of doing a simple vibration analysis.

List of Topics

- What is Vibration
- Characteristics of Vibration
- What is Condition Monitoring
- Machine Health Assessment as per ISO standards
- Basic Diagnostics
- Analysis Procedures

Benefits

This SLT gives an in-depth overview of

- All the fundamentals
- The basic knowledge required for understanding Vibration Analysis

It is paramount to understand Level 1 before attempting Level 2, Vibration Analysis and Problem Diagnostics.

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT2

Vibration Analysis and Problem Diagnostics

The universal fact is that industrial equipment are subjected to rigorous operating conditions. Therefore, the possibilities of a breakdown from various inaccuracies and problems are quite significant. Hence, a predictive maintenance based machinery problem diagnostics is a must in ensuring a trouble-free operation. Though there are many methods of machinery fault diagnostics (condition monitoring for example), one of the most effective methods is Vibration Analysis.

Course Overview

This SLT demonstrates vibration analysis and problem diagnostics of all the major machinery problems through spectrum and phase characteristics, which are common for all industrial equipments.

List of Topics

- Imbalance
- Misalignment
- Mechanical looseness
- Bent shaft
- Eccentricity
- Coupling inaccuracies
- Bearing defects
- Gear related problems
- Defective belt driven system
- Inadequate rigidity
- Rubbing
- Distortion
- Piping forces

Add-Ons

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT3

Vibration Analysis of Industrial Fans

Course Overview

This SLT discusses in detail vibration analysis of industrial fans.

List of Topics

- Classification of Fans
- Types
- Various Parts
- Vibration Analysis of Industrial Fans

Benefits

This SLT gives an in-depth overview of major problems that can occur in process fans using Vibration Diagnostics

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Module: SLT4

Vibration Diagnostics of Cement Plant Machinery

In the cement industry, a high level of diagnostic accuracy is expected from vibration analysis because of the lack of stand-by equipments. There is also the need for continuous and trouble-free operation of all critical equipment.

Course Overview

This SLT discusses Vibration Analysis of Cement Plant equipment in detail.

List of Topics

- Cement Plant - Division and Sections Wise Equipment Details
- Vibration Analysis and Problem Diagnostics of Cement Plant Machines

Benefits

This SLT gives an in-depth overview of problem diagnostic procedures with spectrum and phase characteristics using vibration analysis

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT5

Dynamic Balancing

Imbalance has been identified as one of the most common causes of machinery vibration. This is present to some degree on all the rotating machines.

To achieve dynamic balancing a lot of theoretical as well as practical knowledge is required. Correcting imbalance and effectively applying suitable techniques requires additional knowledge and understanding.

Course Overview

This SLT discusses the types of imbalance and methods of balancing in detail.

List of Topics

- What is Imbalance
- Types of Imbalance
- Identification of Imbalance
- In-situ Dynamic Balancing
- Types of Balancing
- Balancing Procedure for Single Plane Balancing

Benefits

This SLT gives an in-depth overview of imbalance and insitu dynamic balancing

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Execution

Self-Learning Tools

SLT6

Basics of Rolling Element Bearings

Course Overview

This SLT gives an insight into the basics of Rolling Element Bearings and will primarily focus on types of bearings.

This knowledge will be a springboard for the user and will help you in understanding the SLT that covers Vibration Analysis of Bearings, Mounting and Dismounting better. It also consists of exercises that will gauge your understanding of the basics of rolling element bearings.

List of Topics

- Bearing Terminology, Bearing General Data, Bearing Types, Selection of Bearing Type, Selection of Bearing Size, Application of Bearings
- Lubrication
- Mounting and Dismounting

Benefits

This SLT gives an in-depth overview of:
- Bearing Design
- Bearing Selection
- Application and Lubrication

Value-add

Practical tips, exhaustive case studies and stimulating exercises

**The Bearing Technology package comprises 5 SLTs, namely, Bearing Basics, Mounting, Dismounting, Vibration of Rolling Element Bearings and Plain Bearings.*

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Execution

SLT7

Mounting of Rolling Element Bearings

It's staggering to know that around 16% of all premature bearing failures are caused by poor fitting. The common causes are using too much force or simply being unaware of the presence of the correct mounting tools and methods.

The methods generally used for the correct and efficient mounting are Mechanical, Heat or Hydraulic application methods.

Course Overview

This SLT gives information about professional fitting with the usage of specialised tools and techniques, which in turn will help in achieving maximum machine uptime.

List of Topics
- Preparation for Mounting
- Cold Mounting
- Hot Mounting
- SKF Drive-up Method and Mounting Tools

Benefits

This SLT gives an in-depth overview of:
- Methods of mounting using the correct tools
- Ways to increase the life of the bearing with minimal wear and tear

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Execution

Self-Learning Tools

SLT8

Dismounting of Rolling Element Bearings and Failure Analysis
When shafts and bearings are damaged during the dismounting of bearings, there is always a cost associated with it, in terms of both time and material.

In addition, the use of the wrong tools and techniques for dismounting can be hazardous to the operator.

Course Overview

This SLT basically gives information about how dismounting of bearings can cause damage to both the bearings and associated components. This demonstrates how to avoid using incorrect tools and techniques.

List of Topics

- Basic Principles
- Cold Dismounting
- Hot Dismounting
- Dismounting Tools
- Bearing Damages and Failures

Benefits

This SLT gives an in-depth overview of:

- Methods of dismounting bearings using the correct tools
- Ways to increase the life of the bearing with minimal wear and tear

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Execution

SLT9

Vibration Analysis of Rolling Element Bearings
Condition monitoring of Rolling Element Bearings using Vibration Analysis can prevent a majority of problems and failures.

Course Overview

This SLT is designed to teach you more about the Basics of Rolling Element Bearings. It covers vibration theory and bearing vibration in detail

List of Topics

- Basics of Vibration
- Bearing Vibration, Variable Compliance Vibration
- Geometrical, perfections and SEE (Spectral Emitted Energy)
- Random Ultrasonic frequencies, Natural Frequencies of Bearing Components
- Spike Energy Measurements, Rotational Defect frequencies
- Bearing damages and failure

Benefits

This SLT gives an in-depth overview of:

- Vibration Analysis of Rolling Element Bearings to diagnose problems in bearings during operation
- Methods of reducing the stoppage of machinery
- Methods of increasing the life of machine/bearing

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT10

Vibration Analysis of Plain Bearings
Plain Bearings are the predominant choice for bearings used to position the rotors of high power turbo machinery, ship propulsion machinery and other equipment where reliability as well as life is very important.

Course Overview

This SLT includes vibration analysis and diagnostic studies with common vibration problems that can occur in plain bearings. A case study on a turbine generator set is discussed in this SLT. It also gives information about the selection, operation and performance characteristics of Plain Bearings.

List of Topics

- Journal Bearings (Hydrodynamic Bearing Pressure, Eccentricity, Rotor Instability), and Classifications of Journal Bearings
- Vibration In Bearings
- Common Bearing Problems

Benefits

This SLT gives an in-depth overview of:

- Vibration Analysis of Plain Bearings to diagnose problems in bearings during operation
- Methods of reducing the stoppage of machinery
- Methods of increasing the life of machine/bearing

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT11

Vibration Analysis of Electrical Machines
Vibration Analysis is one of the best methods to diagnose all types of defects and inaccuracies in electrical machines. Electrical machines will be subjected to all inaccuracies like any mechanical equipment.

In addition, these machines shall be subjected to all types of electrical inaccuracies as well. Therefore, Vibration Analysis of Electrical Machines is more complex than mechanical equipment.

The method of using Vibration Analysis to identify mechanical defects is separately covered in our earlier SLTs and the same methodology shall be equally applicable on electrical machines such as motors, generators etc.

Course Overview

This SLT covers the Vibration Analysis and Diagnostic Studies of Electrical Machines such as motors, generators etc.

List of Topics

- General Construction of Electrical Machines
- Vibration Analysis of Electrical Machines
- Line Frequency Vibration and Slot Frequency Vibration
- Stator and Rotor Defects
- Non-Uniform Air Gap and Motor Magnetic Field

Benefits

This SLT gives an in-depth overview of methods of using Vibration Analysis of electrical machines to diagnose problems causing various Stator and Rotor Defects, Non Uniform Air Gap etc.

Value-add

Practical tips, exhaustive case studies and stimulating exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT12

Operation and Maintenance of Pumps
Pumps are one of the most important machines in any industry. They are used to move fluids in an efficient way from the source to any required destination. Understanding the operation and maintenance of pumps is very important.

Course Overview

In this SLT we cover in detail the various types, characteristics, operation and maintenance aspects like Preventive, Predictive and regular maintenance.

List of Topics

- Operation of various types of pumps
- Operating characteristics of pumps
- Efficient operation and maintenance procedures of pumps
- Diagnose the problem through vibration analysis

Benefits

Maintenance scheduling and trouble shooting are the high points of this SLT.

Value-add

Practical tips, case studies and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Maintenance Strategy Work Execution

SLT13

Operation and Trouble shooting of Material Handling Systems

Material Handing Systems is very important to any industry. Understanding the equipment and its maintenance is the responsibility of every maintenance engineer.

Course Overview

This SLT will give you an insight into Material Handling equipment, operation and trouble shooting of Belt Conveyors, Bucket Elevators, Deep Bucket Elevators, Drag Chain Conveyors and Screw Conveyors.

List of Topics

Types, specifications, advantages, functions, components, trouble shooting, causes and defects of material handling systems like:

- Belt Conveyors
- Bucket Elevators
- Deep Bucket Elevators
- Drag Conveyors
- Screw Conveyors

Benefits

Components of Material Handing System with Operation and trouble shooting are the high points of this SLT.

Value-add

Practical tips and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification Work Execution

Self-Learning Tools

SLT14

Analysis of Resonance Related Problems

Down time of equipments due to resonance in a plant is very common phenomena. Solving the same after understanding the same is very important.

Course Overview

The vibration can be greatly amplified if a forcing function, such as imbalance, misalignment or a blade pass frequency happens to be within the range of a natural frequency. When such forcing frequencies coincide with or nearer to a natural frequency this phenomenon is known as “Resonance”.

List of Topics

- Vibratory Motions
- Critical Speed Problems
- Resonance Related Problems
- Bode Plot
- Natural Frequency Testing
- Mode Shapes
- Polar Plots
- Correction methods

Benefits

Practical case studies for solving resonance are the high point of this SLT.

Value-add

Practical tips and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT15

Dynamic Analysis for Equipment and Structural Analysis

High vibrations in plant equipment due to resonance are solved by using dynamic analysis. Finite Element Analysis (FEA) is the scientific method used for such analysis. FEA is used for many other solutions including the design optimisation.

Course Overview

Understanding the Dynamic Analysis using various methods of FEA and modelling are very important to solve equipment problems.

List of Topics

- Basics of Dynamic Analysis
- Types of Analysis
- Planning a Dynamic Analysis
- Steps Involved in Dynamic Analysis
- Industrial Systems
- Case Studies
- Practical Tips
- Exercise

Benefits

Step by step procedure to dynamic analysis is the high point of this SLT.

Value-add

Practical tips, do’s and don’ts and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT16

Alignment – Theory and Practice
Misalignment is responsible for up to 50% of breakdowns in rotating machinery. Those breakdowns cause increased machine downtime that translates directly into higher costs.

Implementing the latest alignment methods like laser alignment discussed in this SLT can improve the reliability of the equipments.

Course Overview

In this SLT, we have covered the various types of misalignments, causes and harmful effects of misalignment and diagnostics of misalignment. We have also covered in detail about alignment methods like dial indicator method and laser alignment.

List of Topics

- Types of misalignment
- Causes and harmful effects of misalignment
- Pre-alignment check and diagnostics of misalignment
- Alignment methods and procedures

Benefits

This SLT gives a never before in-depth overview of diagnostics of misalignment using dial indicator and laser alignment methods.

Value-add

Practical tips and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Execution

SLT17

Diagnostics of Sugar Plant Machinery
In the sugar industry, a high level of diagnostic accuracy is expected from vibration analysis because of the non-availability of stand-by equipments. There is also the need for continuous and trouble-free operation of all the critical equipments.

Course Overview

In this SLT, we are covering the major machinery problems common for all sugar plant equipment and also the spectrum and phase characteristics of each problem and how to detect them using vibration analysis.

List of Topics

- Sugar Plant - main process and equipment details
- Vibration characteristics
- Vibration analysis and problem diagnostics of sugar plant machineries

Benefits

This SLT gives an in-depth overview of problem diagnostic procedures with spectrum and phase characteristics using vibration analysis.

Value-add

Practical tips, case studies and exercises are the highlights of this SLT.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT18

Diagnostics of Thermal Power Plant Machinery
In a thermal power plant, the chemical energy stored in fossil fuels such as coal, fuel oil, natural gas is converted successively into thermal energy, mechanical energy and finally electrical energy for continuous use and distribution across a wide geographic area.

Thermal Power plants should have very high availability and to achieve this a proper maintenance plan should be followed.

Course Overview

In this SLT, we are covering the brief introduction about operations, equipment, sections and diagnostics of thermal power plant. It also deals in detail about the vibration analysis of critical equipment in thermal power plant.

List of Topics

- Main section and equipment
- Vibration characteristics and fault diagnostics
- Vibration analysis of critical equipment
- Vibration diagnostics chart

Benefits

This SLT gives a never before in-depth overview of:

Problem diagnostics procedures with spectrum and phase characteristics using vibration analysis.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT19

Diagnostics of Paper Plant Machinery
Paper machines are high pieces of equipments sometimes much more than 100 metres in length equipped with a large number of rolls.

Keeping track of vibration levels of the rolls and felts makes sure that problems are detected early and appropriate actions can be planned.

Course Overview

In this SLT, we are covering the major machinery problems common for all the paper plant equipments and also covering the spectrum and phase characteristics of each problem and how to detect them using vibration analysis.

List of Topics

- Main section and equipment
- Lubrication
- Vibration characteristics and fault diagnostics
- Vibration analysis of critical equipment
- Bearing failure modes and online system

Benefits

This SLT gives a never before in-depth overview of:

Problem diagnostics procedures with spectrum and phase characteristics using vibration analysis.

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT20

Oil & Grease Analysis – Version 1.1
Monitoring oil/grease condition is very important. By being proactive, actions can be taken before improper lubrication contributes to the deterioration of machinery condition, such as increase in bearing temperature and/or vibration level.

Course Overview

In this SLT, we have covered the mechanism of lubricant contamination and its effect on machine operation. Oil/grease testing and analysis methods are explained in details, and practical example are given to help better understand and grasp best practice in sampling. Real application cases are used to show grease test results and the reporting of grease condition.

List of Topics

- Wear & its types
- Oil condition & contamination
- Oil analysis test and methods
- Sampling procedure
- Grease analysis
- SKF oil check & SKF Grease test
- Dos and Don'ts
- Practical Tips
- Exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

SLT21

Diagnostics of Oil Rig Equipment –Version 1.1
Rig equipment is one of the critical functional units in oil production. Its failure will cause immediate disruption to production and incur great losses. By monitoring the condition of critical equipment and identifying potential failures through effective diagnosis, production downtime can be significantly reduced.

Course Overview

In this SLT, we have covered different types of drilling rig and the identification of critical equipment in rig system. The vibration characteristics of these equipment are explained and analyzed in details. Practical case studies are used to help better understand how to make diagnosis of potential failures based on vibration analysisÐ

List of Topics

- Drilling rig classification
- Critical equipments
- Vibration characteristics
- Vibration analysis & problem diagnostics of oil rig equipments
- Case Studies
- Exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	Online
Category	Work Identification

Self-Learning Tools

SLT22

Diagnostics of automotive machinery – Car plant – Version 1.1
A large portion of automotive manufacturing machinery is rotating equipment. By effectively monitoring the vibration condition of these equipment, we can get a better knowledge of the machine condition and prevent potential failures through correct diagnosis to minimize production loss.

Course Overview

In this SLT, we have covered the automotive manufacturing process in relation to main sections and equipment units. Focus is placed upon understanding the vibration characteristics of major equipment and fault diagnostics. The utilization of online condition monitoring system is introduced and practical case studies are used to show how to use vibration diagnostic chart to facilitate the identification of potential failures.

List of Topics

- Main sections & equipments
- Vibration characteristics & fault diagnostics
- Vibration analysis of critical equipments
- Vibration Diagnostic chart
- Online system
- Case studies
- Exercises

Course Information	
Subscription	3-year subscription with renew available
Course Type	CD-based
Category	Work Identification

Intermediate Classroom Courses

MS230

Maintenance Strategy Review (MSR) Awareness

Course Objectives

The course objectives are to ensure that each participant will:

- know if a review of strategy is required and why
- recognize the importance of data structure and content before you do 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 in total to conduct the right analysis, but then what the implications are of making the strategy work
- recognize the commonalities and difference in possible strategies
- understand that the conduct of MSR has important implications to spares
- understand that certain classes of equipment require specialized approaches to strategy review (i.e., SCS > via SIL/IPF, etc.)

Course Content

Before we explore the technical details of strategy, we must know about each organization and what their issues are, why which issues matter to whom, and how the issues can be ordered into a plan. There must be a documented need to look at an existing maintenance strategy or create a new one for the right and unique business reasons. The following topics are included in this course:

- 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 that 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 PRM programs

Who Should Attend

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

WI201

Fundamentals of Machine Condition

Course Objective

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

Course Content

Basics of vibration

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

Set up the vibration measurement

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

Alarm methods and setting alarms limits

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

Spectral analysis and phase analysis

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

Vibration signal processing methods

- Enveloping
- SEE™ Technology
- 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

Who Should Attend

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.

WI202

Vibration Analysis ISO 18436 Part 2 Category 1

Course Objectives

At the end of the Course, the participants will be able to:

- Operate portable instrumentation on pre-assigned or pre-programmed routes
- Acquire readings from permanently installed instrumentation
- Input results into a database and download sampling routes from a computer
- Conduct testing under steady-state operating conditions following predefined procedures
- Compare overall or single value vibration measurements against pre-established alert settings
- Verify integrity of collected data; prevent or control poor data
- Evaluate and report test results in accordance with instructions; highlight areas for further investigation

Course Content

Introduction to Predictive Maintenance and Machine Vibration

- Definitions of PdM and condition monitoring
- How PdM compares with other maintenance systems
- Goals of a PdM programme
- Critical role of Vibration Analysis in Pdm

Machine vibration – basic theory and analysis:

- Characteristics of vibration (frequency and period)
- Amplitude – magnitude of vibratory motion
- RMS peak and peak-to-peak conversations
- Frequency – how often the vibration occurs
- Phase – how one machine component or support frame vibrates relative to another
- Basics of a time waveform versus a spectrum

Preparation for data collection:

- Types of vibration transducers
- Choosing the optimum transducer location
- Effects of transducer mounting on it's performance, accuracy and repeatability
- Choosing the optimum FFT data collector

Introduction to data collection systems:

- Setting up a PdM database (plants, trains, machines and points)
- Choosing the proper parameter (vibration, acceleration, velocity and/or displacement)
- Selecting the proper parameters
- Setting up the optimum PdM routes and schedules
- Printing out the proper reports after uploading

Introduction to problem recognition:

- How to recognise abnormal conditions
- How to identify hardware versus software faults
- How to identify good versus bad data
- How to detect common machine problems

Who Should Attend

Plant personnel requiring an introduction to vibration analysis techniques and technologies used in a condition predictive maintenance program, including maintenance supervisors, rotating machinery engineers, predictive maintenance technicians and coordinators, reliability engineers, and multi-skilled mechanics.

WI203

Vibration Analysis ISO 18436 Part 2 Category 2

Course Objectives

At the end of the Course, the participants will be able to:

- Select the appropriate machinery vibration measurement technique
- Set up instruments for basic resolution of amplitude, frequency and time
- Perform basic vibration analysis of machinery and components such as shafts, bearings, gears, fans, pumps, and motors using spectrum analysis
- Maintain a database of results and trends
- Perform basic (single channel) impact tests to determine natural frequencies
- Classify, interpret and evaluate the test results (including acceptance tests) in accordance with applicable specifications and standards
- Recommend corrective actions
- Recommend the use of alternative condition monitoring (CM) technologies with an understanding of the principles of all four CM technologies

Course Content

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:
  - Frequency, a time waveform, phase, an FFT spectrum (signature)
  - Displacement, velocity, and acceleration
  - RMS, peak, and peak-to-peak amplitude
  - How to know when vibration is too high
- Vibration sensors and their application
- Vibration and detection by various instruments. Analog vs digital methods
- High frequency detection (HFD) and alarm levels at various speeds
- Vibration analysis and how it is used to evaluate machine operating condition:
  - Mass unbalance, eccentric rotors, bent shafts, and misalignment
  - Mechanical looseness, improper component fit, soft foot, and belt drive problems
  - Rolling bearing problem detection using vibration spectrum analysis
  - Gear wear problem detection
  - Electrical problems within induction motors
  - Balance resonances, detection, and effects on machinery
- Vibration alarms, spectral band alarms, and optimum frequency ranges
- Common pitfalls in making everyday vibration measurements and 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

Who Should Attend

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.

WI255

Field Lubricant Analysis ISO 18436 Part 4 Category 1

Course Overview

This Course was developed in compliance with ISO 18436 Part 4: Field Lubricant Analysis Category 1. It is designed to provide the new lubricant analyst/technician with all the basic knowledge and principles they will need to understand behind the techniques. This course will also benefit users of other CM techniques, such as vibration analysis or infrared thermography, by introducing another technique to their Condition Monitoring program and providing valuable knowledge on the subject that will allow them to advance to higher levels in their own discipline.

Course Objectives

At the end of the Course, the participants will be able to:

- Identify different lubricant types with their compositions and properties
- Appreciate the importance of correct storage and transfer of lubricants
- Describe sampling methods and understand the importance of correct sampling
- Understand different lubricant failure mechanisms
- Understand how the lubricant health monitoring works
- Gain knowledge in wear debris analysis

Course Content

A Brief Introduction to Condition Monitoring Techniques

- Vibration Analysis
- Infrared Thermography
- Acoustic Emissions
- Motor Current Analysis
- Role of oil Analysis
- Lubricants
- Good lubrication practices

Lubrication Theory & Fundamentals

- Lubricant Fundamentals
- Lubrication Conditions
- Base Oil and Categories
- Additives and Their Functions
- Oil Properties & Classification
- Synthetic Oil
- Grease Lubrication
- Inadequate Lubrication Failures

Lubricant Selection

- Hydraulic Systems
- Rolling Element/Journal bearings
- Internal Combustion Engines
- Gearing & Gearboxes
- Turbines
- Refrigerant Compressors

Lubricant Application

- Lubricant Volume Guidelines
- Re-Lube & Change Frequencies
- Grease Paths
- Manual & Automatic Greasing
- Centralized Lubrication Systems
- Lubricant & Air Systems

Lubricant Storage & Management

- Cleaner Oil
- Storage of Oil

Lubricant Condition Control

- Solid Contaminant Control
- Filtration Principles & Technology
- Moisture Contamination Control

Oil Sampling

- Primary/Secondary Sample Points
- Test Port Flushing
- Sample Containers & Guidelines
- Sampling from Un-Pressurized Systems

Lubricant Health Monitoring

- Lubricant Failure Mechanisms
- Anti-Oxidants / Oxidation Inhibitors
- Thermal Degradation
- Wrong or Mixed Lubricant
- Test Methods & Measurement Units
- Viscosity
- TAN / TBN
- Water Content
- Elemental Analysis
- Fourier Transform –Infrared Spectroscopy
- Particle Quantifier Index
- Particle Count
- Gas Chromatography
- Flash Test
- Rotating Pressure Vessel Oxidation Test

Wear Debris Monitoring & Analysis

- Abrasive Wear including
- Gouging, High Stress & Low Stress
- Surface Fatigue
- Adhesive Wear
- Erosive

Who Should Attend

Lubricant analyst, lubrication technician, personnel engaged in Lubrication Program Review and Improvement

WC200

Maintenance Planning & Scheduling

Course Objectives

After completing the course, participants will be able to:

- 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 the knowledge and skills necessary to write a data driven maintenance job plan

Course Topic

The course contains the following topics:

- Roles and responsibilities
- Work Order Management Process Flow
- Prioritising of work orders
- Planning
  - Theory
  - Recommended process flow for Planning
  - Case Study
- Scheduling
  - Theory
  - Recommended process flow for Scheduling
  - Backlog Definition, Monitoring and Management
- Shutdown/Turnaround planning
- Follow up and key performance indicators (KPIs)
- Effective utilization of CMMS to facilitate Planning & Scheduling

Who Should Attend

Personnel from Production, Operations, Maintenance, Planners, Schedulers and Warehouse and Purchase

WC230

Spare Parts Management & Inventory Control

Course Objectives

The course objectives are to provide participants with a sound knowledge and understanding of:

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

Who Should Attend

Engineers, Supervisors and Managers from the following functions:
Inventory control, purchasing, reliability and maintenance engineering, logistic support, quality, production and warehouse management

Course Content

SKF spare part management and inventory optimisation training has been developed to support SKF customers (industrial end-users), improving their bottom line results. This course will consist of the following modules:

Module 0: Introduction
Module 1: Spare parts management (SPM)
Module 2: Maintenance and spare parts strategy
Module 3: MRO inventory management
Module 3-A: MRO inventory management – Basics
Module 3-B: MRO inventory management – work processes and CMMS
Module 4: Obsolete management

Case studies

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

WE201

Bearing Technology and Maintenance*

Course Objectives

At the end of this course students will be able to perform routine bearing checks during operation and non operation, identify bearing requirements for replacement or installation, and remove and install bearings.

Course Content

Basics of Bearings and Their Applications

- Rolling bearing theory
- Anti-friction bearing types and applications
- Plain bearing types and applications
- Meaning of “L 10 Life” and “Service Life”
- Application of fits and tolerances

Fundamentals of Lubrication

- How bearing lubrication works
- The importance of selecting the proper lubricant for an application
- Maximise bearing life through understanding of proper lubricating principles and functions
- How much and how often to lubricate rolling bearings

Seal Types and Application

- Contact seals, Non-contact seals
- Housing seal types

Principles of Mounting and Dismounting Bearings

- Cylindrical seating
- Tapered seating
- Adapter and withdrawal sleeves
- Cold and hot mounting and dismounting
- Mounting and dismounting using oil injection
- Principles of mounting plain bearings

Introduction to Bearing Failures and Their Causes

- Identify and interpret actual bearing failures

Practical Mounting and Dismounting of Bearings

- Preparation for mounting and dismounting
- Checking the components
- Mounting and dismounting tools
- “Hands on” exercises

Who Should Attend

Service, maintenance, machine repair, plant/facility engineering staff, managers, technicians, rotating equipment engineers, reliability engineers, mechanics and maintenance supervisors of an industrial plant, OEM facility, public utility using roller bearings and related equipment.

WE202

Bearings in Rotating Machinery

Course Objectives

The overall objective of the Course is to teach participants how to improve the service life of machinery with rotating equipment systems. The Course focuses on the four most common types of rotating equipment: motors, pans, pumps and gearboxes. The participants will learn world-class techniques for installation, maintenance, troubleshooting and repair that can be carried over to all types rotating machines.

Course Content

Part 1: Industrial Motors

- Friction and sealed-for-life bearings
- Component conformance, measuring for:
  - Shaft and housing fits
  - Installation errors
- Troubleshooting and preventing common motor problems:
  - Stray currents
  - Improper bearing installation
  - Lubrication: large and small motor lubrication discussion
- Motor condition monitoring: methods and practice

Part 2: 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

Part 3: 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

Part 4: Industrial Gearboxes

- Coupling machinery: alignment overview
- Selecting the proper lubricant - oil lubricated machinery:
  - The role of chemical additives in lubricant
  - Synthetic lubricants discussion
- Gearbox monitoring and inspection
  - Detecting gear problems
  - Oil analysis
  - Low and high frequency vibration monitoring
  - Damage verification with the Borescope

Who Should Attend

Application Engineer, Condition Monitoring Engineer / Design Engineer, Maintenance Engineer / Manager / Supervisor, Quality Engineer, Reliability Engineer / Manager / Supervisor.

WE203

Lubrication in Rolling Element Bearings

Course Objectives

At the end of this course, students will be able to:

- Understand the fundamentals of lubricant formulation and mechanisms
- Understand different types of lubricants
- Understand the need for the correct lubricant for the application – oil, grease or solid lubricant
- Understand how speed, temperature, load, influence the selection of the correct lubricant
- Understand why viscosity is important
- Awareness of the consequences of incorrect selection and application
- Understand how their actions can result in cost savings to their organisations due to enhanced lubrication practices

Course Content

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

Who Should Attend

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

WE204

Bearing Damage Root Cause Analysis

Course Objective

The course objective is to provide background and methodology for analysing failed and damaged bearings and their components. Students will be able to uncover the true root causes of bearing damage and failures, and reduced service life.

Course Content

Bearing fundamentals

- Review of common 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

Load path patterns in bearings

- Understand bearing operation
- Understand normal load patterns
- Discuss abnormal load patterns and their causes

Various Failure Mechanisms

- Mounting damage
  - Examples of improper installation procedures
- 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 identify and correct

Analysis and Reporting

- Perform bearing damage analysis including reporting in accordance with ISO 15243 – bearing failure modes and classification
- Understand the basis underlying the ISO classification
- Understand the terminology and visual appearance of failure modes

Case Studies

- Inspect a series of sample failed bearings*
- Perform hands-on analysis and reporting findings in accordance with ISO 15243

*We encourage participants to bring a failed bearing (and machine history) from their plant, to analyse during the workshop sessions

Monitoring Bearings

Condition monitoring of Rolling Element Bearings using Vibration Analysis can prevent a majority of problems and failures.

Who Should Attend

- 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

WE211

Bearing Reliability in Centrifugal Pump

Course Objectives

Upon completion of this course, attendees will be able to:

- Understand the purpose of a pump
- Know the different types of centrifugal pumps, as well as their operation
- Comprehend the use of different bearings and bearing arrangements used in pump applications
- Understand both bearing and pump installation
- Understand lubrication theory and the effect of lubrication and contamination on bearing life
- Comprehend pump reliability, including condition monitoring and vibration analysis
- Understand bearing failure analysis

Course Description

Pump classification and function

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

Bearing selection and internal dynamics

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

Seal design and function

- Seal design and application
- Seal selection and troubleshooting

Maintenance and troubleshooting

- Routine maintenance concerns plus bearing and seal installations
- Lubrication systems
- Troubleshooting hints and suggestions

Lubrication

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

Who Should Attend

Application Engineer, Condition Monitoring Engineer/Technician, Electrical Engineer/Fitter/Manager/Supervisor/Technician, Engineering Draftsman/Manager/Supervisor, Mechanical Maintenance Engineer/Manager/Supervisor/Technician/Fitter/Lubrication Fitter, Operations Manager/Supervisor, Planning Manager, Quality Engineer, Reliability Engineer/Manager/Supervisor, Store Supervisor

WE215

Electric Motor Maintenance

Course Objectives

Electric motors are among the highest in reliability incident reports. How parts are installed, lubricated, handled, stored, aligned, and maintained is critical.
At the end of the course, participants will have an appreciation and understanding to perform optimal diagnoses and repairs, and gain an in-depth understanding of practical implementation of motor maintenance through hands-on exercises.

Course Content

Motor Maintenance

- Motor parts overview
- Repair overview

Electrical testing

- Predictive maintenance motor diagnostics
- Electrical motor tests
  - Winding Resistance
  - Meg-ohm Test
  - Polarisation Index (PI)
  - Hipot Test
  - Surge Test
- Turn to turn failure

Bearing arrangements

- Bearing basics: electric motor bearings
- Locating / non-locating bearing arrangements
- Thermal growth
- Horizontal arrangement
  - medium size motors
  - small motors
- Bearing arrangements: belt drive motors
- Vertical electric motors
- Variable speed motors

Motor teardown and bearing dismounting

- Identifying bearings for replacement
- Bearing dismounting methods
  - Hydraulic puller
  - Arbor press
- Post dismounting procedures

Shaft and housing fits

- Checking fit integrity
- Mounting preparations
- Bearing seat run-out and form tolerance
- Radial and axial clearance

Motor assembly and bearing mounting

- Cold mounting
- Induction heating

Lubrication

- Bearing life
- Grease selection and procedures
- Contamination
- Typical lubrication mistakes
- Grease ducts and fittings

Final tests and delivery procedures

- Post motor service: testing
- Mechanical integrity
  - Foot flatness
  - Vibration levels
  - Motor temperature
  - Rotor balancing
  - Shaft run out
- Circulating currents
- Preparing motor for transportation and storage

Bearing failure analysis

- Why bearings fail
- Wear path patterns
- Examining failure samples
- Benefits of failure analysis
- Practical motor overhaul
- Hands-on practical exercise

Who Should Attend

Condition Monitoring Engineer / Technician, Electrical Manager / Supervisor, Engineering Manager / Supervisor, Mechanical Maintenance Engineer / Manager / Supervisor, Operations Manager / Supervisor, Quality Engineer, Reliability Engineer / Supervisor / Manager.

WE240

Precision Shaft Alignment

Course Objectives

The course objective is to help participants understand the fundamental concepts and theory as well as gain the practical knowledge and skills required to align two coupled rotating machinery shafts to specified tolerances using a laser alignment system, including proper planning, rough and precision alignment processes per approved procedures.

Course Content

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

Overview

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

Fundamental horizontal machine alignment processes

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

Dealing with alignment challenges

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

Who Should Attend

Maintenance, engineering, technical support and management personnel whose job functions involve alignment of rotating machinery

- Appropriate for those who align machines and those who detect, investigate and resolve premature machinery failure due to misalignment
- Those who direct activities relative to alignment and machine reliability

WE250

Dynamic Balancing

Course Objectives

At the end of this course, students will be able to determine the most appropriate procedure to be applied to selected balancing situations, identify the main causes of unbalanced equipment, and understand the procedures for operating the balancing equipment.

- Understanding principles of balancing
- Selecting the most appropriate procedure to be applied to selected balancing situations
- Understanding procedures for setting up the component to be balanced
- Understanding procedures for operating the balancing equipment
- Understanding procedures for recording out of balance readings
- Learn methods of rigid and flexible rotation balancing
- Understanding the techniques of single and multiple plane balancing
- Learn the appropriate balancing technique for given balancing situations
- Learn procedures for balancing imbalanced equipment

Course Content

1. Check balance

- Principles of equipment balance testing are understood
- Most appropriate balancing check procedure is selected
- Component is set up correctly and to site/ manufacturer's procedure for balance check
- Balance/imbalanced is determined and compared to specification requirements
- Out of balance readings are recorded to prescribed procedures

2. Balance equipment

- Principles and methods of rigid and/or flexible rotation balancing are understood
- Techniques of single and/or multi-plane balancing are used appropriate to application
- Equipment is balanced utilising correct procedures
- Practical methods with basic instruments
- Examples of advanced techniques used by analysts
- Proactive and precision tolerances
- The effects of assembly on rotor balance

Who Should Attend

Application Engineer, Condition Monitoring Engineer / Technician, Electrical Engineer / Fitter / Manager / Supervisor / Technician, Engineering Draftsman / Manager / Supervisor, Mechanical Maintenance Engineer / Manager / Supervisor / Technician / Fitter / Lubrication Fitter, Operations Manager / Supervisor, Planning Manager, Quality Engineer, Reliability Engineer / Manager / Supervisor, Store Supervisor.

WE270

SKF Industrial Shaft Seals Course

Course Objective

This course is designed to develop knowledge in industrial sealing products for rotary motion, application fundamentals and competence in devising effective sealing solutions. The information and training will enable students to understand the concepts and application of sealing solutions to achieve optimum seal, bearing and equipment performance.

- To provide the participants with the fundamentals of lip seals, principles of sealing operations, elastomeric materials and their properties, and the effects of operating parameters in seal performance
- To have an understanding of the various seal designs, their applications and seal design development trends
- To learn a systematic approach to "Sealing System Failure Analysis", most common failure modes; includes participation in actual case studies
- To provide an overview of common rotary sealing components used in various industrial applications and a guide to sealing system designs in heavy industry segments
- To learn appropriate handling and installation procedures, methods, tools and parameters; includes a workshop environment for hands-on experience
- To provide an overview of other sealing systems and services including SKF custom sealing solutions

Course Content

Introduction

- General industrial and catalogue shaft seals
- Design features – machined rotary seals

Radial Lip Shaft Seals

- Radial lip shaft seals
- Choosing an elastomer material

Design Requirements for other components

- Shaft and bore recommendations

Failure Analysis

- Seal failure modes
- Failure analysis methods
- Application troubleshooting

Installation Procedures

- Basic handling and installation procedures – theory
- Hands-on seal installation practice

Specific market segment applications and case studies

Who Should Attend

Machinery Designers, Mechanical Draftspersons, Reliability Engineers, Maintenance Engineers and Technicians, Consultants

WE290

Power Transmission—Application, Assembly and Maintenance

Course Overview

Power Transmission components are vital elements in a rotating machinery system. Aspects of power transmission reliability include inspection, monitoring, correct assembly, and system optimization to achieve maximum life. This course shows the way to assemble and maintain power transmission components: belts, chains, and/or couplings. Additionally, the student will learn power transmission application considerations such as speeds, operating environment, loads, etc., to confirm that the system is suite for a given application. Properly configured and assembled drives improve overall machine efficiency, component longevity, and lower the cost of operation

Course Objective

After completing this course, you will:

- Learn the operating principles of a range of mechanical drives and transmissions
- Understand techniques, tools and equipment to measure components
- Learn to recognize common malfunctions in mechanical drives, transmissions and their components
- Learn procedures for installing, checking and adjusting mechanical drives
- Learn preventive and proactive measures that can be undertaken to avoid recurrence of faults/failures
- Undertake appropriate testing and diagnoses of power transmission systems
- Learn basic steps to evaluate current designs to determine their suitability

Course Content

Undertake maintenance inspections of mechanical drives and mechanical transmission components

- Understand principles of mechanical drives and mechanical power transmission components
- Understand the function of the main parts of the designated mechanical drive/transmission assembly
- Appropriate maintenance principles, techniques, tools and equipment
- Check for wear, distortion, tension, alignment, fatigue, lubrication, slackness, tooth wear, breakages and other related malfunctions or failures
- Assembly requiring further diagnosis, repair or adjustment is identified and findings are documented

Install and adjust mechanical drives and transmission assemblies

- Determine suitable installation methods from manufacturers' instruction sheets, standard workshop manuals/procedures or other sources
- Use of appropriate maintenance principles, techniques, tools and equipment to ensure drives/transmission components are tensioned, aligned, balanced and/or adjusted to manufacturers' and/or site specifications using safe workplace practices
- Check drive/transmission assembly after adjustment for correct operation and identified for further diagnosis or repair if not in compliance

Diagnose faults

- Visual inspection of the assembly is undertaken in operating and/or non-operating conditions
- Given manufacturers' recommendations, and where applicable, diagnostic equipment, assemblies are tested using sound maintenance principles
- Faults are localized at the component level and identified for repair or replacement
- Fault causes are analyzed and preventive measures to avoid reoccurrence are developed and documented

Who Should Attend

Plant/facility maintenance and engineering staff, Rotating equipment engineers, reliability engineers, millwrights, mechanics, and maintenance supervisors

LP200

Root Cause Analysis

Course Objective

- Understand the importance of RCA in delivering internal services and its role in relation to other tools, notably vibration diagnostics, bearing failure diagnostics and maintenance strategy
- Become confident in building “why?” trees and the 7 steps of a root cause study
- Be equipped with tools to assist in resolving complex problems and thinking laterally to fully explore possible causes of a problem

Course Content

- Working from existing corporate information systems to capture events and incidents where RCA will be beneficial:
  - Machinery failures resulting in actual or potential loss of plant output
  - Machinery failure that represents a large or unbudgeted repair cost
  - Safety, health or environmental breaches
  - Repetitive failures that collectively represent an excessive maintenance cost
  - Non conformance in maintenance strategy
- Prioritise incidents and formally launch the RCA study by defining the problem
- Collect and preserve evidence that will provide evidence on the incident
- Expose the causes of the incident by building a “why?” tree. In general each incident will have three types of root cause:
  - Technical causes – the immediate technical cause of the failure
  - Human causes – actions or inactions that triggered the technical causes
  - Organisational causes – organisation factors that lie behind the human cause

The key elements of an RCA process discussed include

- Propose practical actions that will address the root cause of the incident and develop a business case for management approval of the resulting actions
- Following management approval, assign actions for implementation and track actions to completion
- Measure the performance of the RCA program through appropriate KPIs

Who Should Attend

Service, maintenance, machine repair, or plant/facility engineering staff of an industrial plant, or OEM facility

- Managers, Technicians, Rotating Equipment Engineers, Reliability Engineers, Mechanics, and Maintenance Supervisors.
- Those interested in rolling bearing and rotating equipment performance.

Operator Driven Reliability

Course Objective

Upon completion of this course, the participants will be able to:

- Explain and distinguish between the inter-related maintenance terminology;
- Understand the SKF Asset Efficiency Optimization model and process;
- Describe six common failure patterns that may be exhibited by process machinery, and explain the role of ODR in relation to each of these failure patterns;
- Explain the origin and evolution of ODR, and describe the three key elements of ODR;
- Describe the relationship between ODR and other maintenance philosophies, and explain how ODR and TPM can co-exist to form a natural partnership;
- Understand basic condition monitoring activities, and explain how Operators would impact upon those activities;
- Identify four key benefits of a successful ODR program;
- Identify three strategies that an Organization needs to implement in order for ODR to be successful;

Course Content

Definitions and Terminology

- Reliability, Availability and Maintainability
- What is ODR
- ODR involvement in Reliablity

Common Failure Patterns

- Perspective on Failure
- Six failure patterns
- Failure curve implications

ODR Overview

- SKF Asset Efficiency Optimization process
- ODR in context of AEO
- ODR as a nucleus in Asset Management
- ODR & TPM

ODR Components

- Three elements of ODR
- Technical Basis for ODR
- Enablers and Constraints
- Barriers to ODR

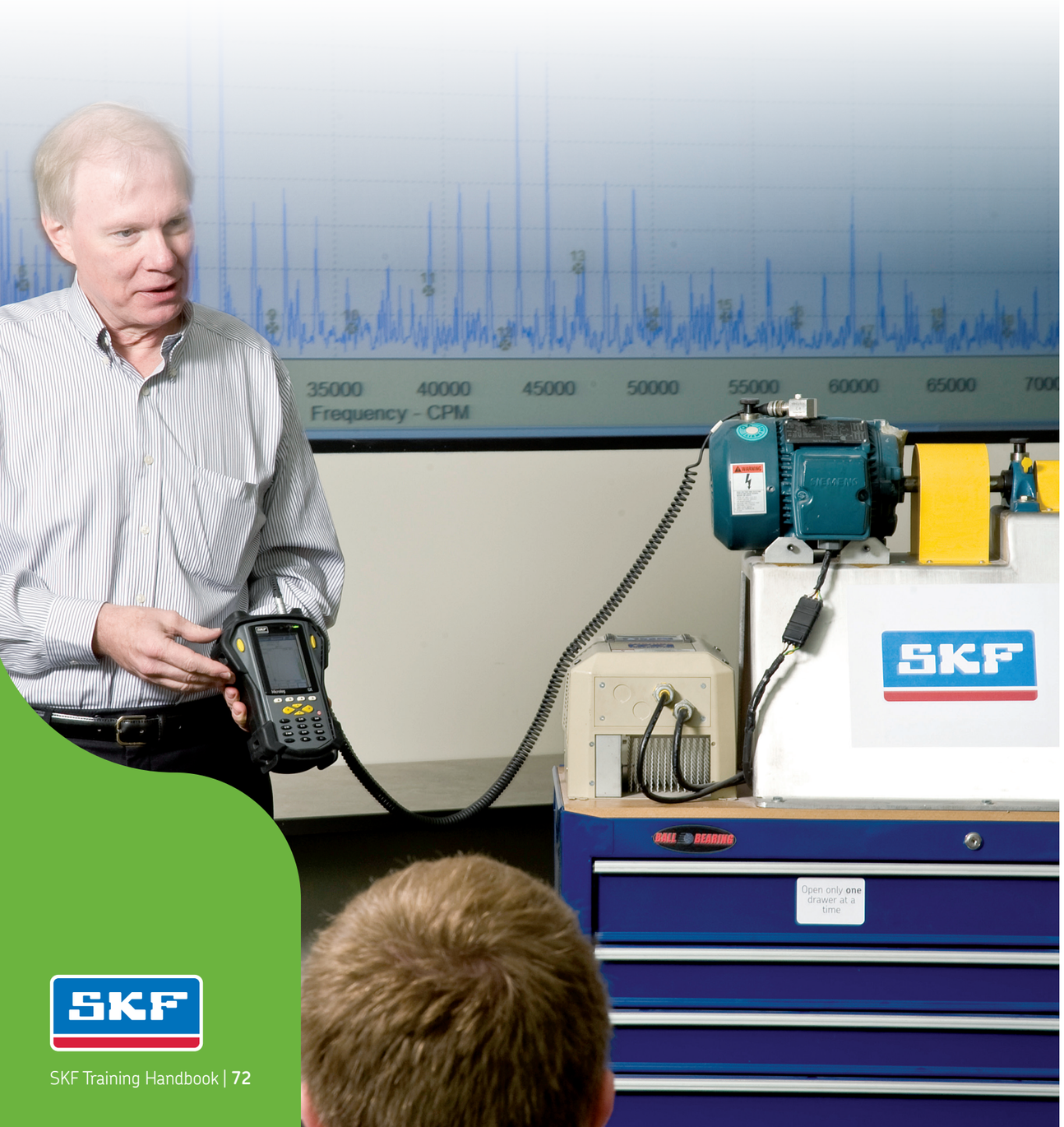
ODR Implementation

- Prerequisites to ODR
- Tools and software
- ODR & Predictive Maintenance
- Change management
- Keys to Success
- ODR Benefits

Who Should Attend

Condition Monitoring Engineer/Technician, Maintenance Engineer/Manager/Supervisor, Operations Manager/Supervisor, Quality Engineer, Reliability Engineer/Supervisor/Manager

Advanced Classroom Courses

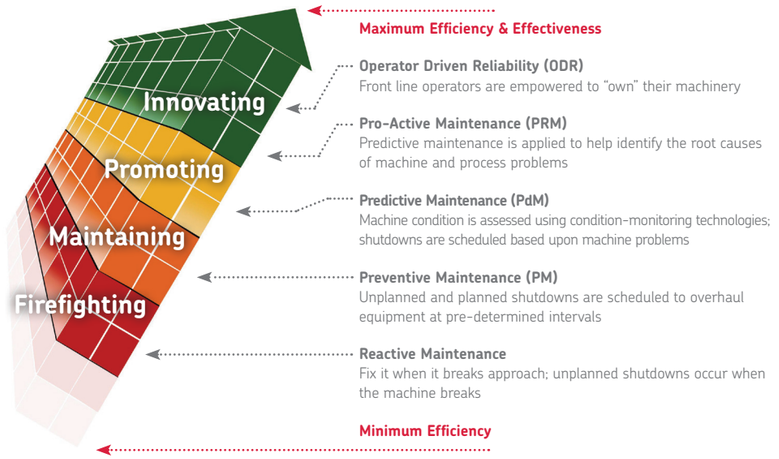


MS300

Asset Reliability Improvement/ Optimising Asset Management through Maintenance Strategy

Course Objective

- To understand the spectrum of asset management
- Ability to assess the situation, maturity and needs of an organisation
- To gain knowledge and understanding in rotating equipment degradation processes, failure and maintenance behaviour and various assessment techniques
- Ability to identify, structure and classify the required data recording, reporting on performance losses, evaluation and identification of reliability killers and selecting appropriate equipment functions for improvement by the customer CMMS
- Ability to perform analysis of root causes by appropriate techniques and methods
- Ability to facilitate root cause analysis, to develop the appropriate organisation, to involve the various functions for continuous equipment reliability improvement and to identify and structure the data required by the customer CMMS
- Knowledge about developing and optimising maintenance programs, operations and process control procedures and the development of modifications, Maintenance Engineering (ME) methods, asset knowledge and machine maintenance techniques
- Gain a working knowledge of maintenance strategy. Review techniques focused upon Reliability Centred Maintenance (RCM), optimise spare parts requirements, develop, improve or implement the Management of Change (MoC) process



CONTINUES NEXT PAGE

Asset Reliability Improvement/ Optimising Asset Management through Maintenance Strategy (cont.)

Course Content

Important Topics Covered

- What is Asset Management?
- Brief discussion on system and process thinking
- Review of course learning objectives and course flow
- Review of participants expectations
  - Detail any exclusions
  - Detail any change of emphasis flow
- Explanation of the use of module feedback sheets
- Case studies will be developed during the course

Module 1
Conceptual Models and Business Context

- Asset Management
- Maintenance Management and Maintenance Engineering (differences)
- Understanding basic terms reliability, availability, maintainability and safety
- Initial maintenance strategy review
- Life Cycle Management
- Interaction (of Asset Management) with other concepts – terotechnology, ILS and TPM
- Required knowledge of business drivers and opportunities
- Getting started – how and what to assess
- Why we need and use different types of assessments
- Role of assessments
- Case Study – A review of a completed client needs analysis

Module 2
Degradation, Failure and Maintenance Behaviour

- System breakdown structure (asset register), recording, reporting of performance and production losses and function
- Loss categories, events and causation – codification (ISO14224)
- Understanding failure modes, rates, characteristics
- Maintenance strategies (run-to-failure, preventive, predictive) and work types (maintenance modification, investment) (ISO standards)
- CMMS requirements (data structure and content)
- Case Study – Define failure and maintenance types, inclusion CMMS

Module 3
Evaluation and Selection of Reliability Killers

- Business Criticality
- Screening process
- Pattern recognition and causation
- Data required
- Evaluation of losses
- Selecting attractive reliability killers for analysis
- Case Study – Simple criticality analysis

Who Should Attend

Maintenance, Plant/Facility Engineering staff, rotating equipment Engineers, Maintenance Supervisors, Managers at industrial plants, Reliability Engineers and those interested in rotating equipment performance.

MS331

SKF Reliability Centred Maintenance

Course Objective

Upon completion of this course students will be able to:

- Describe the SRCM process flow
- Appreciate the importance of data structure and content before you do any kind of strategy work
- Understand the importance of identifying and categorising assets
- Understand criticality and the Failure Modes and Effects Analysis (FMEA) approach in SRCM
- Understand how to conduct a SRCM analysis, as well as the implications of making the strategy work
- Understand why to conduct a task comparison
- Understand methods needed for SRCM implementation
- Recognise what a living programme is

Course Content

Module 1: Setting the scene for SRCM (Introduction)

- Asset Management Support Tool (AMST) module structure

Module 2: 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

Module 3: SRCM methodology

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

Module 4: Identify what is important

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

Module 5: 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

Module 6: Change the existing program

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

Module 7: Project Implementation

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

Who Should Attend

Maintenance, Plant/Facility Engineering staff, rotating equipment Engineers, Maintenance Supervisors, Managers at industrial plants, Reliability Engineers and those interested in rotating equipment performance.

SKF Feature Program

Shutdown/Turnaround/Outage MasterClass – Practical STO Planning and Management

Course Overview

This program is presented by SKF in collaboration with Mr. John McLay, a Canadian Professional Engineer and President of JMC Consulting Ltd., a globally recognized Registered Education Provider (R.E.P.#3993) by the Project Management Institute for continuing education in the fields of industrial maintenance and Asset Integrity. The course is introduced to help customer's STO team improve the planning and implementation of STO to achieve optimum efficiency and minimize production downtime. The Program enables participants to understand momentum and dynamics of a plant shutdown at the field level by providing a detailed view of turnaournd management system process and procedure framework and translating that framework to practical field application.

Course Objective

At the end of the Program, the participants will be able to:

- Understand what the STO management system framework is composed of
- Describe the STO team composition and areas of responsibilities
- Understand the importance of Master Milestone and determination of work list cut-off date
- Establish a coherent and logical progression of turnaround procedure
- Understand the importance of Operations Plan to the success of STO
- Understand the importance of Turnaround Readiness Reivew Audits and necessity of developing Quick Action Work Packages
- Realize that 80% of the STO work scope should be identified within 90 days after the last turnaround

Course Content

Turnaround Management Systems

- Define turnaround process and procedure
- Establish turnaround framework

Turnaround Procedure

- Strategic Planning
- Detail Planning
- Organization
- Execution
- Close-out

Turnaround Team and Responsibilities

- Appiontment of STO Team
- Develop the nine areas of responsibility
- Identify common responsibilities
- Define each area of responsibility in details

Workscope Generation

- Identify work sources
- Develop Master Work List
- Set work list cut-off date
- Authorisation process for additional work
- Build comprehensive work package

Work Scope Support Systems

- Identify required work scope support systems
- Understand the criticality of support plans
- Develop support work packages

Operations Plan Development

- Identify main components of Operations Plan
- Define major tasks of Operations Plan
- Develop logistical details for major steps in the Plan

Contractor Management Plan

- Contractor classification
- Management of bidding and contract awarding
- Effective mobilization and demobilization

Transition Points, Efficiency and Momentum

- Understand the transition points
- Remove or reduce transition points
- Identify factors that increase turnaround momentum

Critical Path Management

- Identify critical path
- Identify key factors/events impacting critical path
- Critical path recovery

Turnaround Readiness Review Audits and Feedback Loop

- Define the audit scope
- Establish audit timeline
- Identify and implement remedy actions
- Feedback Review

Quick Action Work Packages (QAWP)

- Identify needs for QAWP
- Define QAWP
- Select and appoint QAWP team
- Establish detailed QAWP procedures

Practical Worshop on STO operation improvements

Operator Asset Care Program

Course Overview

Operator Asset Care is considered an integral element of a plant's Total Plant Reliability strategy. Through this tailor-made training program, Operators will learn to progressively take ownership of the machine and become proud responsibles for keeping equipment in basic conditions (facilitated by their closeness to the machine), through equipment inspections and simple maintenance activities.

Course Objective

This training course will teach the machine operator to perform many of the day to day tasks of simple maintenance and fault finding, such that the operator understands the machinery and identify potential problems, addressing them before they can impact production. And by doing so, decrease downtime and reduce production costs.

Key Learning Outcomes

- Understand what problems to detect and the tools required to detect these problems.
- Basic understanding of transmission systems and components
- What/why/how to inspect a transmission system and perform simple maintenance tasks
- Positive long-term impact on safety and environmental performance

Course Content

A. Bearings
- Scope of bearings and how bearings look
- Recognise main bearing types
- How bearings get damaged
- Importance of proper lubrication
- Importance of keeping cleanliness
- Importance of proper mounting and dismounting
- Bearing Failures Detection
- How bearing housings look like
- Importance of proper fastening
- Housings Inspection

B. Couplings
- Scope of couplings and how couplings look
- Recognise main coupling types
- Importance of shaft alignment
- Coupling failure detection

C. Gears/Gearboxes
- Scope of gearboxes and how they look
- How gears get damaged
- Importance of lubrication & cleanliness
- Gearbox failures detection

D. Belts/Pulleys
- Scope of belt transmissions and how they look
- Recognise main belts/pulley types
- How belt drives get damaged
- Effects of pulley misalignment
- Effects of wrong belt tensioning
- Belts failures detection
- Replacing belt drive

E. Driven Shaft
- Examples of driven shafts/application
- Effect of unbalance

F. Chains/Sprockets
- Scope of chain transmissions and how they look
- Recognise main chain types
- Chain failures detection

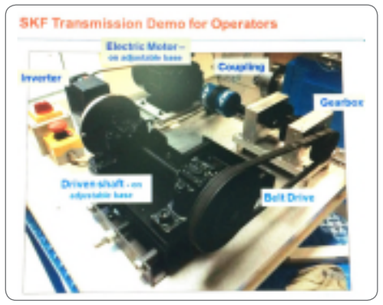
G. Final Inpsection
- Transmission bench inspection

Training Resource

SKF Transmission Demo for operators, including:
- Inverter
- Electric motor on adjustable base
- Coupling
- Gearbox
- Belt Drive
- Driven shaft on adjustable base

Who Should Attend

Operator, Operations Supervisor, Technician, Fitter



Graduate Engineer Training Program

Course Objectives

This tailor-made training program is designed to effectively prepare fresh graduate engieers for challenging real-world scenarios in daily work. Through the Program, the participants will not only obtain knowledge and skills in practical execution, such as bearing, bearing lubrication, alignment and balancing, but also gain an in-depth understanding in SKF Asset Efficiency Optimization model and Maintenance Strategy Optimization as well as condition monitoring techniques with a focus on vibration analysis and the application. The Program will help shorten the 'settle-in' period of young inexperienced maintenance engineers and inject new vitality into your maintenance organization through the knowledge transfer and lay the solid foundation for future improvements.

Course Content

Bearing Basics and Maintenance
- Basics of Bearings and Their Applications
- Fundamentals of Lubrication
- Bearing Mounting and Dismounting
- Introduction to Bearing Failures and Causes
- Basics of Shaft Alignment and Balancing
- Practical exercise

Condition Monitoring
- Introduction to Predictive Maintenance and Condition Monitoring techniques
- Basics of Vibration
- Data Collection – Preparation and Implementation
- Spectral analysis and phase analysis
- Typical machinery problem diagnosis
- Practical exercise on demo rig

Lubrication Management
- Lubrication Theory & Fundamentals
- Lubricant Application and Selection
- Lubricant Condition Control
- Oil Sampling
- Lubricant Health Monitoring
- Wear Debris Monitoring & Analysis

Maintenance Strategy
- SKF Asset Efficiency Optimization model
- Maintenance Stratey Optimization
  - What is Maintenance Strategy
  - Different phases in Maintenance Maturity progression
  - A Brief Introduction to SKF Reliability-Centered Maintenance

*We are more than happy to discuss with you regarding your specific training needs and customize the training program to cater to your unique needs in terms of program duration, course content and practical workshop exercises.

SKF Reliability Training Cell Program

Program Overview

SKF Reliability Training Cell Program is designed to greatly help customers in employee competence development by setting up training facility at customer site equipped with a wide range of training equipment and demo rigs of latest technology as well as SKF expert training resources. The Program will provide a unique and excellent opportunity for customer employees to attend hands-on training workshops as well as to facilitate knowledge sharing in the field of bearing maintenance and condition monitoring.

Program Set-up

The set-up of this Program consists of two aspects. One is the physical training facility set-up at customer site which mainly include training equipment and demo rigs. The other is the packaged training solution delivered by SKF experts at this training center to pre-established schedule agreed upon with the customer.

The training facility set-up is composed of three parts and aimed to provide customer employees with easy access to hands-on exercieses and to facilitate organized on-site training.

Bearing Technology and Machine Maintenance

- SKF TMDS series Mounting Star
- Lubrication Tools including lubricating gun and automatic lubricator set
- Shaft alignment rig
- Display kits, including bearing and power transimission products

Basic Condition Monitoring

- Handheld portable tools for condition monitoring, including stroboscopes, infrared thermal cameras, vibration analyzers, ultrasounds, endoscope, belt tension tester, belt & pulley gauges, seal kit, and Machine Condition Advisor etc.

Advanced Condition Monitoring

- SKF Microlog Consultant CMXA 48 which offers a sophisticated range of diagnostic options including in-the-field analysis, machinery diagnostics, and production line testing in a compact, rugged hand held computer

The training package, as an an integral part of this Reliability Training Cell Program, is designed to help customers build up the competence of maintenance workforce in a systematic and well planned way. It's composed of the following courses enhanced by the training facility set-up described above.

- WE201 Bearing Technology and Maintenance
- WE203 Lubrication in Rolling Element Bearings
- WE204 Bearing Damage Root Cause Analysis
- WE240 Precision Shaft Alignment
- WI202 Vibration Analysis ISO 18436 Part 2 Category 1
- WI203 Vibration Analysis ISO 18436 Part 2 Category 2
- WI212 Vibration Analysis ISO 18436 Part 2 Category 3

Program Customization and Implementation

SKF Training Solutions is dedicated to developing training programs that cater to customer's specific needs. The Reliability Training Cell Program is fully customizable to target at weak areas in customer employee competence metrics. Based on the unique situation of each customer, the Program can run from 1 year to up to 5 years, and to sustain the knowledge sharing and transfer, SKF can also help customers build up own in-house trainer team through 'Train the Trainer' program.

Product and Software Training

SmartStart™ Courses

WICM252

Introduction to GX-Series Microlog

Course Description

Course topics are organized into four sections.

Condition Monitoring Section
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)

- Predictive Maintenance Program Overview
  Overview of maintenance philosophies, associated costs, and operation
- Guidelines for Implementing a Portable Condition Monitoring Program
  Overview of 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) Condition based maintenance – program overview measurement database using SKF @ptitude

Microlog System Overview
Introduce the process steps involved in data collection and analysis and overview the necessary hardware and software.

- System Overview
  A brief overview of the measurement process and related hardware and software
- Getting Around in the GX-Series Microlog
  Learn how to get around in the GX-Series Microlog using its buttons and keypad

SKF Microlog Basic-Use Process Section
Walk through the basic process steps, including: download ROUTEs to the Microlog, walk through the data collection process, and upload resulting measurements.

- Downloading ROUTEs to the Microlog
  How to download measurement ROUTE to the GX Series Microlog data collection device
- Collecting Measurement Data
  How to operate the GX Series Microlog data collector/analyzer to collect both route and off-route measurements
- Uploading Measurement Data
  How to upload the collected measurement data to the @ptitude Analyst / BVAS software

Additional Features
Cover additional and optional features available on the Microlog device.

- Additional Microlog Hardware Operations
  Overview of charging and changing the battery and working with a PC card
- Additional Microlog Functionality
  How to configure "system" settings and "global measurement" parameters and use advanced data measurement types and analysis options
- Two Channel / Balancing / Bump Test / and Recorder Module Overview
  Overview of "advanced" applications available on the GX Series – Microlog

WICM264

@ptitude Analyst AX-Series SmartStart Course

Course Objective(s)

This SmartStart course introduces the SKF @ptitude Analyst vibration database management and analysis software along with the features of the AX Series Microlog to the new user. In addition, this course instructs on the basics of setting up an effective portable machinery monitoring system.

Course Description

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

Condition Monitoring Section

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)

- Predictive Maintenance Program Overview
  Overview of maintenance philosophies, associated costs, and operation
- Guidelines for Implementing a Portable Condition Monitoring Program
  Overview of 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) Condition based maintenance – program overview

Microlog System Overview

This section provides a brief overview of the data collection process and an introduction to the supporting hardware and software.

- System Overview
  A brief overview of the measurement process and related hardware and software
- Getting Around in the GX-Series Microlog
  Learn how to get around in the AX-Series Microlog using its buttons and keypad

SKF Microlog Basic-Use Process Section

This section is a walkthrough of the basic procedures for setting up, collecting, and analyzing measurement data.

- Setting up Data Measurement POINTs
  How to create a database of vibration measurements
- Downloading ROUTEs to the Microlog
  How to download measurement ROUTE to the AX Series Microlog data collection device
- Collecting Measurement Data
  How to operate the AX Series Microlog data collector/analyzer to collect both route and off-route measurements
- Uploading Measurement Data
  How to upload the collected measurement data to the @ptitude Analyst software
  Reviewing Collected Data in the Software
  How to perform an initial review of collected data and identify alarm conditions
- Analyzing Data with Basic Graphic Plots
  How to generate basic graphic plots for analyzing measured machinery condition

Additional Features

This section provides detailed information on optional setup parameters and additional features outside of the basic operations.

WICM265

@ptitude Analyst/GX Series - Microlog SmartStart Training

Course Objective(s)

This SmartStart course introduces the @ptitude Analyst vibration database management and analysis software as well as the features of the GX Series - Microlog to the new user.

Course Description

Course topics are organized into four sections.

Condition Monitoring Section

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)

- Predictive Maintenance Program Overview
  Overview of maintenance philosophies, associated costs, and operation
- Guidelines for Implementing a Portable Condition Monitoring Program
  Overview of 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) Condition based maintenance – program overview measurement database using SKF @ptitude

Microlog System Overview

Introduce the process steps involved in data collection and analysis and overview the necessary hardware and software.

- System Overview
  A brief overview of the measurement process and related hardware and software
- Getting Around in the GX-Series Microlog
  Learn how to get around in the GX-Series Microlog using its buttons and keypad
- Getting Around in SKF @ptitude Analyst –
  Learn how to get around in the software using its menus, dialogs, windows, etc

SKF Microlog Basic-Use Process Section

Walk through the basic process steps, including: Create an @ptitude Analyst database of vibration measurements, download ROUTEs to the Microlog, walk through the data collection process, upload resulting measurements, review alarms, and view data as graphic plots..

- Setting up Data Measurement POINTs
  How to create a database of vibration measurements
- Downloading ROUTEs to the Microlog
  How to download measurement ROUTE to the GX Series Microlog data collection device
- Collecting Measurement Data
  How to operate the GX Series Microlog data collector/analyzer to collect both route and off-route measurements
- Uploading Measurement Data
  How to upload the collected measurement data to the @ptitude Analyst / BVAS software
- Reviewing Collected Data in the Software
  How to perform an initial review of collected data and identify alarm conditions
- Analysing Data with Basic Graphic Plots
  How to generate basic graphic plots for analyzing measured machinery condition

Additional Features

Cover additional and optional features available on the Microlog device and in the @ptitude Analyst software.

WICM272

IMx Course

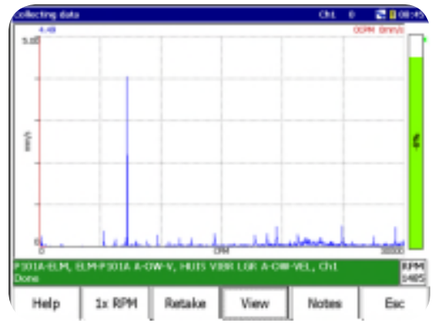
Course Description

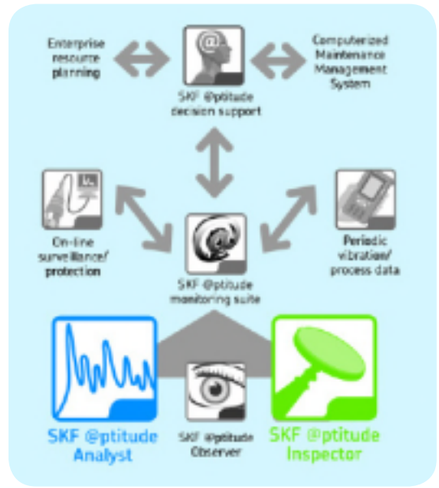
The training program for the two days of IMx and @ptitude Observer training include the following topics.

- Introduction the hardware product - IMx
- IMx's different communication possibilities
- How to set up and install the hardware
- How to install the software (MasCon/IMx and @ptitude Observer: Installation)
- Presentation of the program, different views, different plots, and software capabilities (@ptitude Observer Software)
- How to work in Observer via the demonstration of the set up of machines in Observer
- All of the necessary steps the user must take for a correct set up of the IMx and Observer online system (Starting up IMx Online System)

The following Product and Software Training Courses are also available upon request. Please contact local SKF representative/ training coordinator for more information:

- WICM201 @ptitude Analyst
- WICM230 Introduction to the SKF MARLIN System
- WICM232 Marlin and Aptitude Analyst Inspector
- WICM233 SKF Microlog Inspector SmartStart
- WICM241 Introduction to the TKSA 60 / 80 Alignment System
- WICM253 MX Series Microlog Course
- WICM254 Introduction to the AX-Series Microlog
- WICM260 Machine Analyst / CMXA50 Microlog
- WICM261 Machine Analyst / CMVA65 Microlog
- WICM350 Advanced Microlog and @ptitude Analyst Training





Industry Certification Program

Industry Certification Program

British Institute of Non-Destructive Testing (BINDT)

BINDT is an accredited certification body offering personnel certification against criteria set out in international and European standards through the internationally recognised PCN Certification Scheme. Formed on 1 January 1976, its purpose is to promote the advancement of the science and practice of NDT and all other associated materials testing disciplines - particularly condition monitoring.
(http://www.bindt.org/)

SKF is the only BINDT Approved Training Organization in Asia Pacific region to conduct Vibration Analysis courses which are in compliance with ISO 18436 Part 2. In the field of Condition Monitoring, we also provide training courses in Infrared Thermography ISO 18436-7 Category 1 and Field Lubricant Analysis ISO 18436-4 Category 1 with BINDT approved training materials and certified trainers.

To learn more about our BINDT certification programme, please contact us on **skfmkt@skf.com**

Box Hill Institute of TAFE

Box Hill Institute is a recognised leader in the provision of high-quality, cost-effective education and training services both in Australia and overseas. SKF Reliability Systems have established a partnering agreement with Box Hill Institute for the delivery, assessment and quality assurance of courses offered by SKF as per the national units of competency. This is to ensure that the quality of our training courses are of the high standards set by the Australian Skills Quality Authority (ASQA).

This partnership benefits participants in gaining latest industry knowledge and assessments and accreditation in a selection of units of competency that furthers their learning program and qualification.

To learn more about our TAFE Accreditation programme, please contact us on **+61 9269 0763** or via **rs.marketing@skf.com**.

The TAFE Accreditation program is available only in Australia.

Condition Monitoring Certification Board (CMCB)

CMCB – with direct support from the Australian Institute of Non Destructive Testing (AINDT) – was established to oversee the operation of the "condition monitoring certification scheme" and the policies and procedures in accordance with international requirements.

SKF is pleased to be associated with CMCB & AINDT to facilitate coordinated efforts in providing knowledge share with emerging technologies in condition monitoring. Senior members from SKF have worked in close conjunction with the world's leading accreditation bodies, contributing many years worth of our own condition monitoring experience in the process.

Many of our condition monitoring training courses conform to ISO18436. SKF has been approved as an Authorised Training Body by CMSkills in accordance with ISO18436/3. The CMSkills examination, combined with training, experience and verifiable competency requirements, will lead to the successful applicant achieving certification to ISO18436 in the relevant methodology. Such certification will be recognised by leading authorities on condition monitoring throughout the world.

The CMCB certification program is available only in Australia.

Technical Associates of Charlotte (TA)

Founded in 1961 at Charlotte North Carolina US, TA has developed into a successful service and training organization with a strong focus on Vibration Analysis.

With the strong partnership with TA which dates back more than a decade, SKF offers TA certified ISO and ASNT compliant Vibration Analysis courses at Entry Level, Level I and Level II, which are corresponding to ISO Category 1, 2 and 3 respectively.

To learn more about our TA certification programme, please contact us on **skfmkt@skf.com**

Infrared Thermography Level 1

Course Objective

This training will focus on the applications relevant to the inspection needs of the attendees, especially inspections of electrical and mechanical systems, approaches to production and process-related problems, and a general background in solving thermal problems.
At the completion of this course, the participants will:

- have a good understanding of the basic heat theory necessary for thermal work
- know how to best utilize the imaging equipment they have
- be able to capture clear thermograms and make basic inferences and diagnosis
- be better able to employ the equipment to perform surveys

Course Outline

Basic Infrared Theory

- Heat transfer
- Electromagnetic spectrum
- Emittance, reflectance, and transmittance
- Atmospheric transmission
- IR wavebands and lens materials

Infrared Equipment

- Selection criteria
- Range and level settings
- Class demonstrations
- Hands-on use in class

Infrared Electrical System Inspections

- Theory and thermal signatures of problems
- Seven types of detectable defects
- Conducting an inspection
- Safety practices
- Confirming exceptions
- Data recording
- Standards for inspections

Infrared Mechanical System Inspections

- Theory and thermal signatures of problems
- Rotating equipment
- Power transmission components
- High temperature insulation
- Steam systems, process equipment, heat exchangers, storage vessels
- Active thermographic inspection techniques
- Safety practices
- Confirming exceptions
- Data recording
- Standards for inspections

Infrared Roof Inspections

- Theory and component construction
- Insulation and material characteristics
- Inspection techniques – ground based / aerial
- Weather variables and influences
- Required site conditions
- Safety practices
- Thermal signature of latest moisture
- Verification of data
- Data recording
- Alternate methods of moisture detection
- Standards for inspections

Infrared Building Inspections

- Theory and component construction
- Insulation and material characteristics
- Inspection techniques – interior / exterior
- Weather variables and influences
- Required site conditions – creating sufficient Delta T
- Thermal signatures
- Mould detection
- Other tools
- Verification of data
- Data recording
- Standards for inspections

Implementing an IR Predictive Maintenance Program

- Nine steps to setting up a program
- Integrating with other predictive technologies
- Cross-verifying with other predictive technologies
- Why programs fail, how they succeed
- Generating standards compliant reports

*Course content may vary depending on certification program. Please contact your local SKF representative/training coordinator for more information.

Certification

Certification examination at the end of the course can qualify participants for the Level 1 certification in accordance with ASNT SNT-TC-1A. Certifying body may vary between countries. Please contact your local SKF representative/ training coordinator for more information.

Recommended for

Those who would apply thermal imaging for preventive/predictive maintenance, condition assessment and condition monitoring; electrical engineers / supervisors, mechanical maintenance, quality assurance, forensic investigations and building sciences

Vibration Analysis Entry Level (ISO Cat. 1)

Course Objective

The Vibration Analysis ISO Category 1 course is intended for personnel who have limited experience in vibration monitoring and analysis. This Course introduces the concepts of Condition-based maintenance, with an emphasis on the use of machinery vibration as a tool to determine machine health and identify root cause problems.

- Operate portable instrumentation on pre-assigned or pre-programmed routes
- Acquire readings from permanently installed instrumentation
- Input results into a database and download sampling routes from a computer
- Conduct testing under steady-state operating conditions following predefined procedures
- Compare overall or single value vibration measurements against pre-established alert settings
- Verify integrity of collected data; prevent or control poor data
- Evaluate and report test results in accordance with instructions; highlight areas for further investigation

Course Outline

Introduction to Predictive Maintenance and Machine Vibration

- Definitions of PdM and condition monitoring
- How PdM compares with other maintenance systems
- Goals of a PdM Program
- Critical role of Vibration Analysis in Pdm

Machine vibration – basic theory and analysis:

- Characteristics of vibration (frequency and period)
- Amplitude – magnitude of vibratory motion
- RMS peak and peak-to-peak conversations
- Frequency – how often the vibration occurs
- Phase – how one machine component or support frame vibrates relative to another
- Basics of a time waveform versus a spectrum

Preparation for data collection:

- Types of vibration transducers
- Choosing the optimum transducer location
- Effects of transducer mounting on it's performance, accuracy and repeatability
- Choosing the optimum FFT data collector

Introduction to data collection systems:

- Setting up a PdM database (plants, trains, machines and points)
- Choosing the proper parameter (vibration, acceleration, velocity and/or displacement)
- Selecting the proper parameters
- Setting up the optimum PdM routes and schedules
- Printing out the proper reports after uploading

Introduction to problem recognition:

- How to recognise abnormal conditions
- How to identify hardware versus software faults
- How to identify good versus bad data
- How to detect common machine problems

*Course content may vary depending on certification program. Please contact your local SKF representative/training coordinator for more information.

Certification

SKF delivers this course in collaboration with Technical Associates of Charlotte (TA) - who are world leaders in vibration analysis training. TA ISO Cat 1 Vibration Analysis Certification Exam is available at the end of the course. Please confirm with SKF local representative/training coordinator prior to the course.

Recommended for

Plant personnel requiring an introduction to vibration analysis techniques and technologies used in a condition predictive maintenance program, including maintenance supervisors, rotating machinery engineers, predictive maintenance technicians and coordinators, reliability engineers, and multi-skilled mechanics

Vibration Analysis Level 1 (ISO Cat. 2)

Course Objective

At the conclusion of this course, participants will be able to:

- Select the appropriate machinery vibration measurement technique
- Set up instruments for basic resolution of amplitude, frequency and time
- Perform basic vibration analysis of machinery and components such as shafts, bearings, gears, fans, pumps, and motors using spectrum analysis
- Maintain a database of results and trends
- Perform basic (single channel) impact tests to determine natural frequencies
- Classify, interpret and evaluate the test results (including acceptance tests) in accordance with applicable specifications and standards
- Recommend corrective actions
- Recommend the use of alternative condition monitoring (CM) technologies with an understanding of the principles of all four CM technologies

Course Outline

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

1. What is vibration and how can it be used to evaluate machinery condition:
   - Frequency, a time waveform, phase, an FFT spectrum (signature)
   - Displacement, velocity, and acceleration
   - RMS, peak, and peak-to-peak amplitude
   - How to know when vibration is too high
2. Vibration sensors and their application
3. Vibration and detection by various instruments. Analog vs. digital methods
4. High frequency detection (HFD) and alarm levels at various speeds
5. Vibration analysis and how it is used to evaluate machine operating condition
   - Mass unbalance, eccentric rotors, bent shafts, and misalignment
   - Mechanical looseness, improper component fit, soft foot, and belt drive problems
   - Rolling bearing problem detection using vibration spectrum analysis
   - Gear wear problem detection
   - Electrical problems within induction motors
   - Balance resonances, detection, and effects on machinery
6. Vibration alarms, spectral band alarms, and optimum frequency ranges
7. Common pitfalls in making everyday vibration measurements and the effect on detection and diagnosis of machinery problems
8. Time waveform and converting to an FFT spectrum
9. Predictive maintenance programs
10. Real-world case histories for problems found within the Illustrated Vibration Diagnostic Chart

Certification

SKF delivers this course in collaboration with Technical Associates of Charlotte (TA) - who are world leaders in vibration analysis training. TA ISO Cat 2/ASNT Level 1 Vibration Analysis Certification Exam is available at the end of the course. Please confirm with SKF local representative/training coordinator prior to the course.

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.

Vibration Analysis Level 2 (ISO Cat. 3)

Course Objective

At the conclusion of this course, participants will be able to:

- better refine a condition-monitoring program with diagnostic techniques that improve the performance of rotating machinery (both roller and sleeve bearing machinery)
- diagnose several malfunctions, from common to moderately severe, and make recommendation for corrective action.
- enhance condition-monitoring program with advanced measurement techniques, such as acceleration enveloping and SEE TM Technology

Course Outline

The course provides an in-depth study of diagnostic measurement techniques and the associated applications of the techniques. This course will give the analyst all of the skills and knowledge necessary to solve all fault conditions, and to run a successful condition monitoring program.

Principles of vibration

- Quick review of Category II fundamentals
- Waveform, spectrum, phase, vectors and orbits
- Transients, pulses, modulation, beating, sum/difference
- Force, response, damping, and stiffness
- Cepstrum analysis

Data acquisition

- Special tests: phase, triggering, strobes, low speed machines and variable speed machines
- Planning routes and route management
- Optimizing test locations and setup options

Signal processing

- Sampling, resolution, Fmax, averaging, windowing, dynamic range, signal-to-noise ratio
- A/D conversion: constant and variable sampling rate

Vibration analysis

- Spectrum analysis review - Harmonics, sidebands, and the analysis methodology
- Time waveform analysis
- Phase analysis: bubble diagrams and ODS
- Orbit analysis
- Analyzing enveloping/demodulation/ PeakVue, etc. data

Fault analysis

- Natural frequencies and resonances
- Imbalance, eccentricity and bent shaft
- Misalignment, cocked bearing and soft foot
- Mechanical looseness
- Rubs and instabilities
- Rolling element bearing analysis
- Analysis of turbo-machinery and sleeve bearings
- Analysis of AC, DC and variable frequency drives
- Analysis of gears
- Analysis of belt driven machines
- Analysis of pumps, compressors and fans
- LOTS of case studies and exercises for participants

Equipment testing and diagnostics

- Impact testing (bump tests)
- Phase analysis
- Transient analysis
- Operating deflection shape analysis
- Introduction to modal analysis
- Cross channel measurements

Corrective action

- General maintenance repair activities
- Balancing process: single-plane and two-plane
- Review of shaft alignment procedures: dial and laser
- Flow control and replacement of machine parts
- Resonance control, isolation and damping

Running a successful condition monitoring program

- Managing a successful program
- Reporting and financial management
- Growing the program
- Incorporating additional technologies

Acceptance testing and Review of ISO standards

Certification

SKF delivers this course in collaboration with Technical Associates of Charlotte (TA) - who are world leaders in vibration analysis training. TA ISO Cat 3/ASNT Level 2 Vibration Analysis Certification Exam is available at the end of the course. Please confirm with SKF local representative/training coordinator prior to the course.

Recommended for

The leader of the vibration team, or those who take a leading role in diagnosing faults and making the final recommendation. This person must fully understand all of the data collector options, special test capabilities, and analysis tools; and must understand the widest range of fault condition.

Customised Training

SKF Training Solutions provide a series of customized training programs to meet the unique training needs of your organization. Please refer to the following areas for your consideration. For more infomation, please contact local SKF sales representatives/ training coordinator.

Asset Efficiency Optimisation areas	SKF related training content	Priority Level 1-5
Maintenance Strategy	Maintenance Strategy Development	
	FMEA/FMECA	
Work Identification	Condition Monitoring Application	
	Infrared Thermography	
	Information Integration & Decision	
	Vibration Analysis	
	Lubricant Monitoring and Analysis	
	Airborne Ultrasound	
Work Control	Standard Job Plans & Procedures Development	
	Maintenance Planning & Scheduling	
	Spare Parts Management & Inventory Control	
	Work Order Process Optimization	
Work Execution	Bearing Maintenance-General	
	Bearing Maintenance - Application Specific	
	Dynamic Balancing	
	Electric Motor Maintenance	
	'Static and Dynamic Motor Testing and Monitoring	
	Lubrication	
	Precision Shaft Alignment	
Living Program	Maintenance Strategy Review & Optimization	
	CMMS Optimization	
	ODR - Operator Driven Reliability (in relation to TPM)	
	Reliability Engineering Improvement	
	RCFA - Root Cause Failure Analysis	

Contact Us

SKF Asia Pacific Pte Ltd
No. 1 Changi South Lane
Singapore 486070
Tel: +65 6 8767 7777
Fax: +65 6 8767 7700
Email: gavin.low@skf.com

SKF Australia Pty. Ltd.
17-21 Stamford Road
Oakleigh, Victoria 3166
Australia
Tel: +61 3 9269 0800
Fax: +61 3 9269 0888
Email: rs.marketing@skf.com

SKF India Ltd.
Regional Sales and Service
Chinchwad, Pune 411 033
Tel: +91-20-6611 2136
Fax:+91-20-6611 2399
Email: Rahul.E.Deshpande@skf.com

SKF Skefindo Primatama
BRI II Building
8th Flr, Suite 801
Jl. Jend. Sudirman Kav. 44-46
Jakarta 10210, Indonesia
Tel: +62 21 5795 3113
Fax: +62 21 5795 3115/6
Email: trainingskfindo@skf.com

SKF Korea Ltd.
20th Fl, Centum IS tower
1209 Jaesong-dong, Haeundae-gu,
Busan, Korea 612-050
Tel: +82 51 946 5300
Fax: +82 51 946 5310
Email: Boeun.Choi@skf.com

SKF Japan Ltd.
6 Floor, Mita Twin Bldg. East Wing
4-2-8 Shibaura, Minato-ku
Tokyo 108-0023, Japan
Tel: +81 45 478 2600
Fax: +81 3 3456 8171

SKF Malaysia Sdn. Bhd.
432 Jalan Ipoh
51200 Kuala Lumpur Malaysia
Tel: +60 03 4047 3333
Fax: +60 03 4043 9381
Email: Chong.Tong.Leong@skf.com

SKF New Zealand Ltd.
67 Lady Ruby Dr.
East Tamaki, Auckland 1701
New Zealand
Tel: +64 9274 0056
Fax: +64 9274 5175
Email: Steven.Hall@skf.com

SKF Phillipines Inc.
Unit 302, Algeria Bldg.
2229 Chino Roces Avenue
1231 Makati City Philippines
Tel: +63 2 810 4058/ 893 7950
Fax: +63 2 813 0341
Email: Maricar.Lizarondo@skf.com

SKF (Thailand) Limited
72/70 Rama III Road
Chongnonsee, Yannawa
10120 Bangkok, Thailand
Tel: +66 2 296 9300
Fax: +66 2 294 6221
Email: Suwimon.Klairatsamee@skf.com

SKF Taiwan Co. Ltd.
Rm. 605, 6F, No. 131, Minsheng E. Road,
Sec. 3,Taipei 105, Taiwan
TEL:+886-2-2718-7800
Fax:+886-2-8770-7512
Email: Steve.Hung@skf.com

SKF Vietnam Ltd.
SKF Representative Office
Crescent Plaza 105 Ton Dat Tian Street
#404 Tan Phu Ward, District 7
Ho Chi Minh City, Vietnam
Tel: +84 8 5410 7710
Fax: +84 8 5410 7701
Email: Doan.Le. Viet@skf.com




PUB AP/THB 2015 EN · November 2014

skf.com