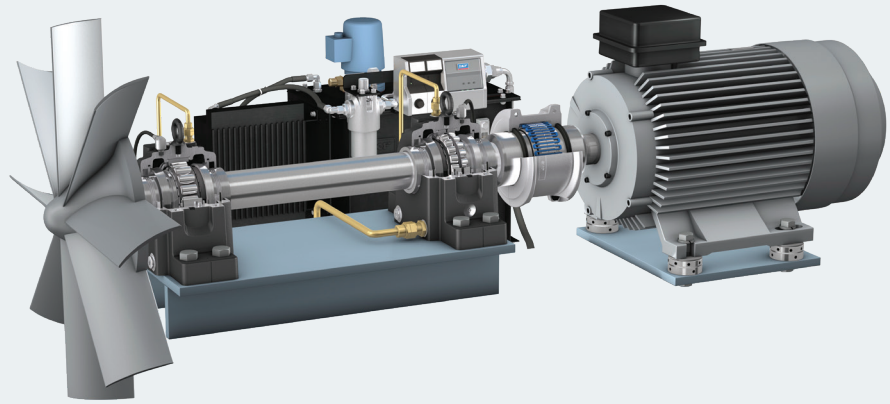
2019 SKF Training Handbook

Embark on a journey of equipment reliability through precision and proactive maintenance practices!



Maintenance Strategy

Condition Monitoring

Spare Optimisation

Bearing Installation

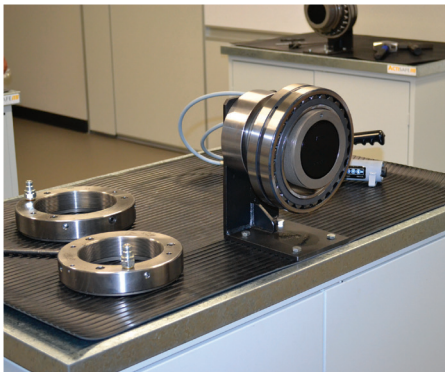
Lubrication and Contamination

Alignment and Balancing

Root Cause Analysis

Continuous Improvement

SKF Solution Factory
Training Centre



By combining our technical competence with our extensive industry experience and local customer demands – our state of the art service centre can assist in achieving higher levels of performance and overcoming specific challenges.

We call this SKF Knowledge!

SKF

Proactive Maintenance maximises its effectiveness by ensuring that we perform "The Right Work at the Right Time"

Today's industries need maintenance workers who are proficient in precision skills. They are often expected to perform tasks from a multitude of diverse craft areas, requiring a broad base of knowledge and skill.

The impact of practicing precision and proactive maintenance is not only to minimise the safety, environmental and operational consequences of failure but also to reduce the cost of maintenance by reducing secondary damage. Less secondary damage means that it takes less time to repair (labour savings) and consumes fewer parts (material savings).

Unfortunately, training, like maintenance, has often lived in a reactive state only addressing needs when it is too late to do an effective job. It has responded to perceived problems rather than root causes. Knowledge and skills training, along with clearly defined work packages, are a must if any company wants to move to the next level of discipline.

A properly designed, developed and implemented skills training program can certainly help companies save money, increase productivity, and improve employee morale. Once an individual is trained on the right activities, he must be provided with the time and tools to perform this new skills, be held accountable for his actions, and be recognised for following through.

Partner with SKF to a world of reliable rotation!

Our knowledge is backed by over 100 years of experience with rotating machine reliability. A close working partnership with our industrial end-users and equipment manufacturers; provides us an intimate understanding of the processes and challenges specific to every major industry.

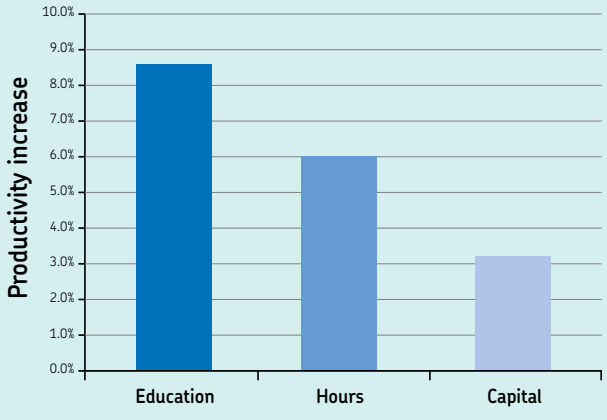
The key is to select a competent training provider who can really understand your development needs and offer what you need!

Make a positive impact on your daily work and plant performance this year!

Best Regards,
Hashim Poonawala
Business Manager – Training Solutions
SKF Australasia

Investing in people has the best payback

According to a government study, **10% increase** in a workforce's education, hours worked, or capital assets has **varying impacts** on productivity.



SKF Knowledge Centre

A rich resource for optimised rotating equipment performance and reliability

Over the past century, SKF has developed a unique understanding of how machine components and industrial processes are interrelated. This knowledge is shared to help customers achieve their goals – whether to become more profitable, productive and/or sustainable.

The SKF media library is your first stop for SKF catalogues, brochures, and data sheets.

Content in this area is free of charge, and available to all users.

The course portfolio is designed around the SKF Asset Management workflow process (AEO) and has been created to allow participants to gain the knowledge and expertise in a structured development path.

This area of the Knowledge Centre offers a range of handbooks and technical articles. To access this premium content you must register and log in, and for some items a subscription is required. Register for FREE, and learn about subscription options.

Our range of engineering tools comprises interactive advisory systems relating to a range of topics associated with rotating machinery. These tools will allow you to solve problems by utilising some of the knowledge that SKF has developed and accumulated in more than 100 years of working with a broad range of industries.

Need access?

Go to SKF Knowledge Centre: www.skf.com/group/knowledge-centre/index.html

Site visitors need to register and/or log in.

Academia and Industry Associations

Mobius Institute Board of Certification (MIBoC)

The Mobius Institute Board of Certification (MIBoC) is an impartial and independent entity that is directed by scheme and technical committees to ensure that its certification meets or exceeds the requirements defined by the applicable International Organization for Standardisation, ISO 18436 standards, including Vibration Analysis, Airborne Ultrasound, Thermography as well as Asset Reliability.

MIBoC is an accredited certification body per ISO/IEC 17024 and ISO 18436-1 authorised to provide Vibration Analysis certification in accordance with ISO 18436-1 and 18436-2, meaning students receive the highest certification recognised throughout the world.

SKF Australia has partnered with the Vibration Institute of Australia (VIA) for Vibration Analysis training and the Reliability Institute of Australia for Asset Reliability Practitioner (ARP) training, both of whom are licenced to invigilate the MIBoC certification exams.

International Council for Machinery Lubrication (ICML)

The International Council for Machinery Lubrication (ICML) is a vendor-neutral, not-for-profit organisation founded to facilitate growth and development of machine lubrication as a technical field of endeavor. Among its various activities, ICML offers skill certification testing for individuals in the fields of machine condition monitoring, lubrication and oil analysis, which was adopted by ISO as the basis to 18436-4 on certification of field-based analysts and 18436-5 for lab-based analysts.

SKF Australia have established a partnering agreement with ICML to ensure that the delivery, assessment and quality assurance of SKF's machinery lubrication courses conform to ISO standards and give students the opportunity to receive internationally recognised Machine Lubricant Analyst (MLA) or Machine Lubrication Technician (MLT) Certification.

Condition Monitoring Certification Board (CMCB)

CMCB – with direct support from the Australian Institute for 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 and AINDT to facilitate coordinated efforts in providing knowledge share with emerging technologies in condition monitoring. SKF has been approved as an Authorised Training Body by AINDT in accordance with ISO18436/3.

The CM Certification 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.

SKF Australia training courses at a glance

How can I increase profitability through effective skills management?

SKF recommends 5 Key Steps to Successful Training Results

Step 1 — **Select Appropriate Work Category**
(Understand the maturity levels)

Step 2 — **Training Needs Analysis**
(Identify the competence gap)

Step 3 — **Blended Learning**
(Develop customised training plans)

Step 4 — **Measure Training Effectiveness**
(Ensure what is learned transfers to on-the-job behaviours)

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

Step 1: Select Appropriate Work Category

Understand the maturity levels

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 program to achieve them.

Our goal at SKF is to help you achieve maximum return on your reliability investment. The SKF Client Needs Analysis 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.

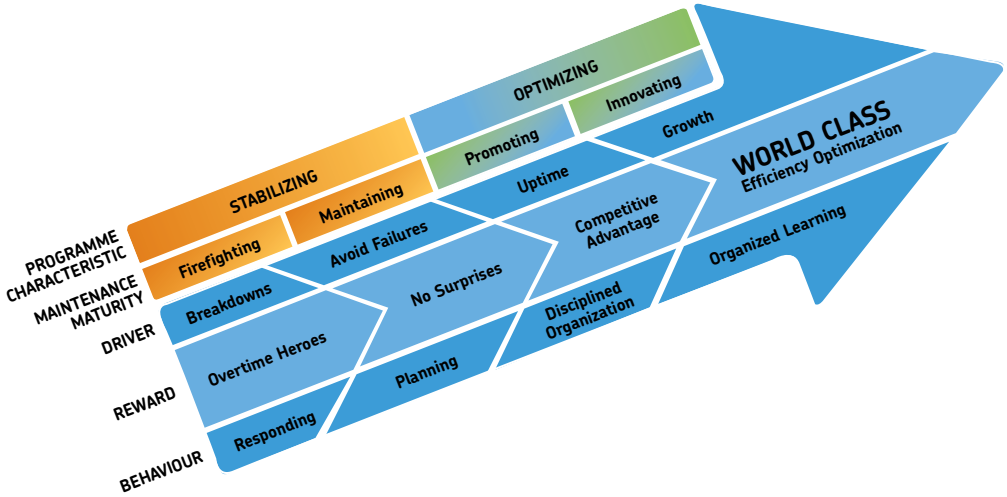
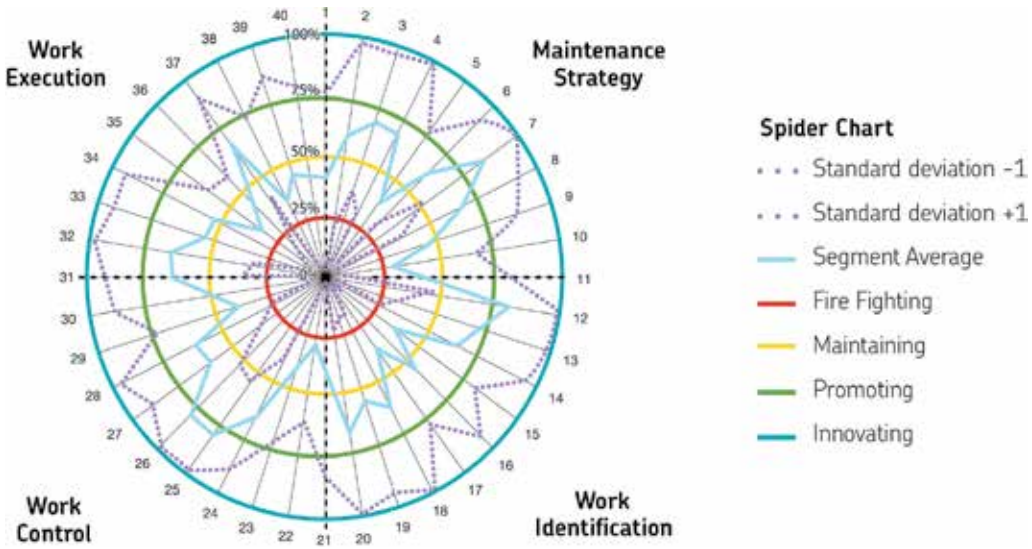


Figure 1: The four phases of maintenance maturity.
Moving toward a world-class facility starts with understanding where you stand today, and defining your objectives for the future.

Ideally the client needs analysis will give you the opportunity to gain a clearer perspective on your reliability program 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 Optimization 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.



Step 2: Training Needs Analysis

Identify the competence gap

Training Needs Analysis (TNA): 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 TNA 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.

TNA 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

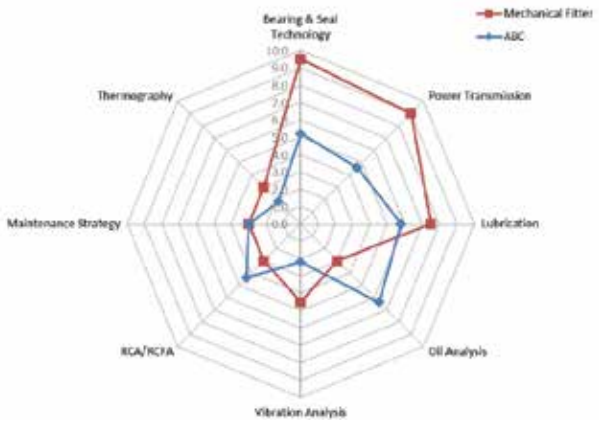
Targeting 8 areas of Competency for Improvement

Opportunities for improvement are determined when Training Needs Analysis is analysed. 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.



Starting with the job function analysis to identify key areas for Skill Gap Analysis, the TNA will give you a clearer perspective of personnel's competency and skill level. The results obtained through a well-designed online questionnaire are analysed and a report will be created for you which include:

- Individual work profile
- Spider chart showing competency gap in key assessment areas
- Skill summary matrix
- Detailed proposal of training recommendation

Step 3: Blended Learning

Develop customised training plans

Course levels

The SKF Training courses focus on disseminating maintenance related knowledge worldwide. It offers various programs 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.

Basic

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

SKF are pleased to offer the iLearnReliability™ e-learning program by Mobius Institute.

The program teaches reliability strategy, program management, implementation, best practices, condition monitoring and precision skills and how to address culture change needed to make reliability a reality at your plant. We make the complexities of reliability improvement easy to understand through our interactive e-Learning format filled with interesting 3D animations and interactive software simulators.

Level 1

"Classroom" courses taught by SKF specialists at customer locations or SKF facilities nationally. A combination of theory and hands-on instruction, these intermediate courses typically last 2–3 days.

Levels 2 and 3

"Classroom" courses taught by SKF specialists or external experts at customer locations or SKF facilities nationally. Advanced courses dig deeper in theory and principles underlying practical operations and provide adequate opportunities for participants to practice learnings during the course. These courses typically last 3–5 days.

Course categories

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

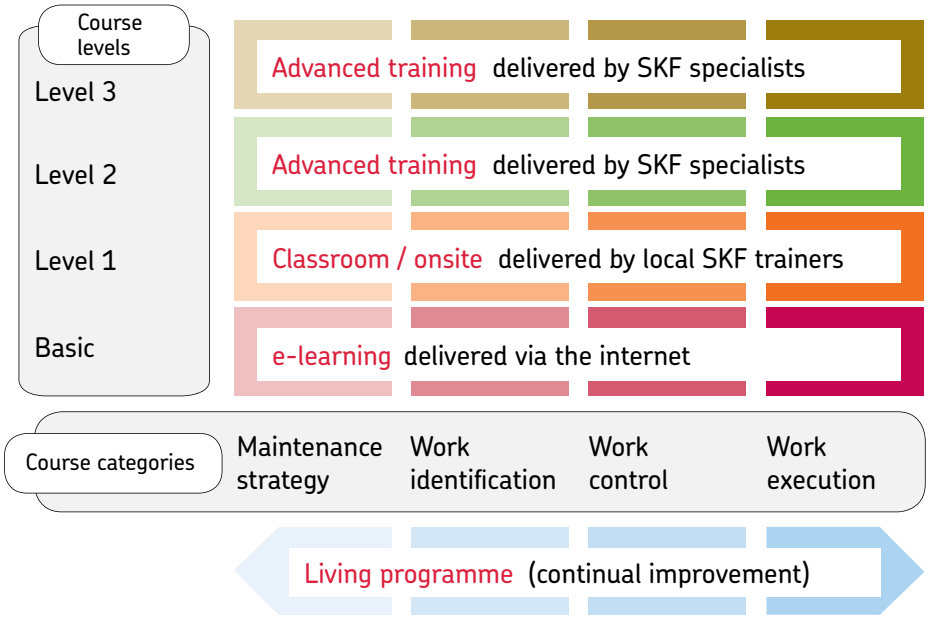
Maintenance Strategy (MS)
Relates to methods and technologies used to develop a maintenance strategy. Courses emphasise a technically and financially sound maintenance strategy developed to match business goals.

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

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 include precision maintenance, best practices in lubrication, bearing installation, precision alignment, balancing, and post maintenance testing.

Living Program (LP)
Relates to methods and technologies used to evaluate maintenance work and strategy, thereby "closing the loop" and making maintenance a continual improvement process. Course topics include root cause analysis, reliability analysis, maintenance work close-out, machine redesign, and technology upgrades.



Step 4: Measure Training Effectiveness

Ensure what is learned transfers to on-the-job behaviours

Training Implementation Support Program

An effective training implementation support will translate the generic knowledge gain and relate it to specific tasks. Ideally task analysis should be performed with the use of maintenance personnel and validated by management. SKF can assist you to build a training implementation support program which could include the following:

- Development of detailed work packages for critical tasks on critical assets that include step by step work instructions, inspection criteria, specifications, fits, tolerance, spares and special tools required for the task.
- Identification of specific tooling requirement related to the tasks, assist and support team members in securing the same and facilitate training on the special tools as required.
- Train team members on task execution based on the developed work packages and the delivered technical training
- Mentor team members through audits and assessments of task execution to embed and perpetuate best practice in maintenance execution.

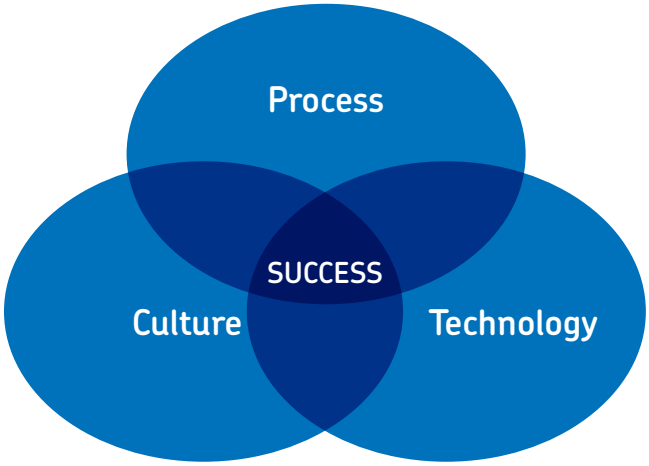
An effective implementation support program in combination with targeted training delivers the requisite step change to maximise business results and minimise resources employed.

Step 5: Work Category Re-assessment

Continuous improvement and re-enforcement of skills matrix

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

Instructors

Clyde Volpe

Clyde Volpe qualified as an electrical engineer over 27 years ago and started with Vibration Analysis over 25 years ago and since then practiced in this field in every type of industry known. Clyde has trained a wide range of personnel which includes artisans, technicians, operators analysts, engineers and reliability engineers and consultants. His extensive practical experience in this field enables him to present effectively to basic, intermediate and advanced skilled delegates. Clyde has expanded his training courses to over 30 countries, including Australia in Europe, Asia and Africa. He is known for his motivated method of training and ability to present complex issues in an understandable manner.

Ray Voselis

Ray Voselis is a senior training consultant and industry specialist in mining. He is a strong advocate of improving bearing reliability practices, by embracing new technology, following correct maintenance procedures, installation techniques and addressing the root cause of the failure mechanism.

Ray has a BE in Mechanical Engineering and is primarily teaching the SKF Bearing Technology and Maintenance courses as well as developing and conducting industry specific training courses for engineers, maintenance personnel and students within Australia, for over 20 years.

Wayne Dearness

Wayne Dearness has more than 40 years of experience in heavy industry and industrial lubrication. He has successfully helped numerous Australian and international companies improve their machinery lubrication and oil analysis programs.

Wayne has a Masters of Mechanical Engineering degree, specialising in industrial Tribology. His focus is on practical application of lubrication management within the industry. Wayne has written and conducted numerous public and onsite private Oil and Toil training courses, Noria training seminars, as well as authoring and presenting several articles covering a wide range of industry topics.

Brenton Ward

Brenton Ward is a Level III Infraspection Institute Certified Infrared Thermographer and Level II Certified in Airborne Ultrasound. As a professional infrared consultant specialising in mining, energy and large industrial facilities since 1994, he has provided thermal imaging services, training, and application solutions for a wide range of industries. Brenton teaches Certified Infrared Thermography and Ultrasound classes in Australia and Asia Pacific.

Instructors

Gary Pilley

Gary is an Application Engineer working with SKF in Technical Support and Reliability Services. After completing his Mechanical Engineering in the 1980s, Gary spent over 38 years in varied roles of Application Engineering for many international manufacturing companies producing bearings, gearboxes, couplings, clutches, hydraulic equipment, conveyor belts, chains. As a result, he is now able to draw on years of technical and practical experience to many heavy industry applications.

Scott Henderson

Scott completed his engineering course at British Army Military College and specialised in rotary wing aircraft. The extensive rotating components and requirement for extreme reliability and precision in the military aviation field, has allowed Scott to transfer these skills to the precision maintenance world at SKF. After leaving the military and emigrating to Australia, Scott was employed with SKF at a national level within Reliability Systems conducting varied projects Australia wide. With over 20 years' experience on varied equipment around the world, Scott has a wealth of experience and knowledge to pass on.

Rob Distill

Rob is a lead instructor for the Root Cause Bearing Damage Analysis course and a senior training consultant for a range of SKF Reliability Maintenance courses which he also delivers throughout Australia. He has an extensive background in training, maintenance, root cause analysis and trouble shooting. He regularly performs high skilled high impact services as required at client locations on a nationwide basis. Rob has an Associate Diploma in Mechanical Engineering with a Fitting and Machinist Trade background.

Trevor Huf

Trevor completed his engineering courses in the Royal Australian Navy and gained extensive knowledge in measurement and alignment since joining SKF in 1989. He has attended formal training with suppliers of laser based measurement systems in shaft alignment and geometrical measurement.

As a qualified Cert IV in Training and Workplace Assessment instructor, Trevor has conducted training for users of laser based measurement systems in all types of industries around Australia and overseas including mining, pulp and paper, oil and gas, marine and consulting companies. He has also presented technical papers at industrial conferences throughout Australia. Now semi retired, Trevor conducts training courses, on behalf of SKF, in Laser Alignment and other areas of condition based maintenance.

Instructors

John Bonnitcha

John served 40 years with Terex Jaques as National Parts and Service Manager, where he gained a wealth of experience in the field of Crusher Reliability and Servicing. John is regarded as one of the leaders in the Extractive Industries, where servicing and maintenance of crushing equipment is required to improve the bottom line and ensure equipment availability is improved. John has a wealth of knowledge of all manufacturer's equipment from Jaques Cedarapids, Pegson, Nordberg, Symons, Gemco Sandvik, Allis Chalmers to name a few. John has presented in Crusher Service Seminars throughout Australia, SE Asia and the USA.

Dr Dmitry Chaschin

Dr Dmitry Chaschin has over 30 years of experience in rotating machines design, manufacturing and operation. He has designed and supervised the manufacturing of the largest motors ever built in Australia. He is an expert in bearing reliability in electrical machines. For the last 15 years he is working in monitoring, repair and maintenance of motors and generators for various workshops in Australia.

Dr Dmitry has over 12 years of lecturing experience. During his time at ABB, he performed customer training in Australia, New Zealand, Indonesia, Malaysia, United Arab Emirates, and United Kingdom. Currently he has his own consulting business that he combines with teaching at Adelaide University and training on behalf of SKF.

Keith Sanders

Keith Sanders is a qualified Mechanical Engineer graduating from London University in 1963, followed by a number of Industry based training courses in UK. He also completed an MBA from Deakin University in 1996.

Keith has more than 40 years experience in the Pump industry covering manufacturing, marketing and export activities. He has held senior management roles both in Australia and the Asia Pacific region, with Kelly and Lewis, Thompsons Byron-Jackson, Ajax Pumps, KSB-Ajax Australia, KSB (Shanghai) and Southern Cross Pumps. He has been President of Pump Industry Australia (PIA) from 2009-11 and continues to act as a Councillor for the Association.

Terry Blackman

Terry Blackman has over 35 years of experience in the delivery of services and training that support improvements and effectiveness of plant maintenance and reliability. He has a Bachelor of Engineering (Mech.) as well as an MBA (Technology Management) and certifications in Reliability.

His work has required in-depth knowledge of predictive maintenance, lubrication, bearing applications, root cause failure analysis, RCM and maintenance audits. He has hosted many industry best practices forums, conferences and training courses covering a wide range of industrial maintenance and reliability subjects. Terry now specialises in delivering accredited training in asset reliability.

Can't spare time for training?

Get expert training at your premises.

Advantages

Diverse Range of Courses

- Access to a full range of public courses as well as courses tailored to meet your industry-specific 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

- Training all employees at the same time promotes a team environment and provides immediate learning impact

Is Onsite training an option for you?

- You have 7 or more people from your organisation who need training
- You want to choose a date and location that suits you
- You want a trainer that understands your industry
- You want to save time and money, while getting the best training

For more information on what Onsite training can do for you:

Tel: (Australia) 61 3 9269 0763 (New Zealand) 0800 705 705
Email: training.australia@skf.com
Visit: www.skf.com.au/training

Australian and New Zealand companies

MINING AND MINERAL PROCESSING

ALCOA WORLD ALUMINA

ANGLO AMERICAN

- CAPCOAL
- GROSVENOR
- MORANBAH NORTH
- GRASSTREE

AERIS RESOURCES -TRITTON COPPER MINES

BARRICK GOLD POGERA JV

BENGALLA MINING

BHP BILLITON BMA ALLIANCE

- BLACKWATER
- BROADMEADOWS
- HAYPOINT COAL TERMINAL
- SOUTH WALKER CREEK

BHP IRON ORE

- AREA C
- EASTERN RIDGE
- RAIL
- JIMBLEBAR
- NEWMAN
- PORT HEDLAND
- YANDI

BHP NICKEL WEST

- KALGOORLIE NICKEL SMELTER
- MT KEITH

BHP OLYMPIC DAM

CENTENNIAL COAL

CITIC PACIFIC MINING

CMOC - NORTHPARKES MINES

CRISTAL MINING

DOWNER - MEANDU MINE

EVOLUTION MINING

- COWAL
- CRACOW
- MUNGARI OPERATIONS

FORTESCUE METALS GROUP

- CHRISTMAS CREEK
- PORT OPERATIONS
- SOLOMON HUB

GLENCORE

- CLERMONT COAL
- COPPER REFINERIES
- ERNEST HENRY
- GEORGE FISHER
- MCARTHUR RIVER MINE
- MOUNT ISA COPPER
- MOUNT ISA ZINC
- MANGOOLA
- NEWLANDS
- OAKY CREEK
- ROLLESTON
- ULAN

DARLOT GOLD MINE

HASTINGS DEERING

ILUKA RESOURCES

KALGOORLIE CONSOLIDATED GOLD MINE

KIRKLAND LAKE GOLD-FOSTERVILLE MINE

MINERAL TECHNOLOGIES

NEWCREST MINING

- CADIA
- TELFER

NEWMONT BODDINGTON

NORTHERN STAR – KANOWNA BELLE

NYRSTAR

ORICA MINING SERVICES

OK TEDI MINING

PACIFIC ALUMINIUM

- BELLBAY ALUMINIUM
- BOYNE SMELTERS

PIMS MINING

QUEENSLAND ALUMINA

RIO TINTO ALCAN

- WEIPA
- YARWUN

RIO TINTO IRON ORE

- BROCKMAN OPERATIONS
- COASTAL OPERATIONS
- HOPE DOWNS
- MARANDOO
- PARABURDOO
- TOM PRICE

ROY HILL

SANDFIRE RESOURCES

SILVERLAKE RESOURCES

SOUTH 32

- GEMCO
- CANNINGTON
- TEMCO
- WORSLEY ALUMINA

MANUFACTURING

ADELAIDE BRIGHTON CEMENT

AKD SOFTWOODS

AUSPINE LIMITED

AUSTUBE MILLS

BALLANCE - KAPUNI

BLUESCOPE STEEL

BORAL CEMENT

BORAL QUARRIES

CARTER HOLT HARVEY

CEMENT AUSTRALIA

CSBP

FISHER & PAYKEL

GOLDEN BAY CEMENT

HANSON

HIGGINS AGGREGATES

HOLCIM

INCITEC PIVOT

INCITEC PIVOT – DYNO NOBEL

MILLTECH

JUKEN NZ

LIBERTY ONESTEEL

NZ STEEL

PACIFIC STEEL

PANPAC FORREST PRODUCTS

QENOS

QUEENSLAND NITRATES

SUGAR AUSTRALIA

SULLAIR AUSTRALIA

SUNSTATE CEMENT

TRONOX

TULLY SUGAR

VALMET

VISY PAPER

WINSTONE AGGREGATES

YARA PILBARA FERTILISERS

participating in our training courses

FOOD AND BEVERAGE

ARYZTA AUSTRALIA
ASAHI BEVERAGES
COCA-COLA AMATIL
FRCPA
FONTERRA
GEORGE WESTON FOODS
GRAINCORP OPERATIONS
GRIFFIN FOODS
INGREDION
KIMBERLY CLARK AUSTRALIA
LION
MALTEUROP
MANILDRA GROUP
MARS PETCARE
NESTLE AUSTRALIA
OCEANIA DAIRY
ORORA LIMITED
RIVCOTT COTTON GIN
SAPUTO DIARY
- WARRNAMBOOL CHEESE AND BUTTER
- MURRAY GOULBURN

SIMPLOT
VITERRA
WESTLAND DAIRY
WESTON MILLING

ENERGY AND UTILITIES

AGL
- MACQUARIE GENERATION
- LOY YANG
- TORRENS ISLAND

ALINTA ENERGY
- LOY YANG B

CS ENERGY
- CALLIDE POWER STATION
- KOGAN CREEK POWER STATION

DELTA ELETRICITY
ENERGY AUSTRALIA
MILLMERRAN POWER STATION
NRG GLADSTONE POWER STATION
STANWELL POWER STATION
SA WATER
WANNON WATER
WATER CORPORATION

OIL AND GAS

AIRLIQUIDE
BP REFINERY - KWINANA
CHEVRON
CONOCO PHILLIPS
EXXON MOBIL REFINING
ORIGIN ENERGY - APLNG
SANTOS
VIVA ENERGY
WOODSIDE ENERGY
WESFARMERS LPG

OEM

ASC
ASC AWD SHIPBUILDER
BAE SYSTEMS AUSTRALIA
CAMCO ENGINEERING
CATERPILLAR
DOWNER RAIL
EPIROC
FL SMIDTH
FALK AUSTRALIA
HOWDEN AUSTRALIA
KOMATSU
LIEBHERR AUSTRALIA
METSO MINERALS
NEPEAN CONVEYORS
OUTOTEC
PROGRESS RAIL
SEW EURODRIVE
SCHENCK AUSTRALIA
TEREX
THYSSENKRUPP MATERIALS HANDLING

EDUCATIONAL INSTITUTIONS

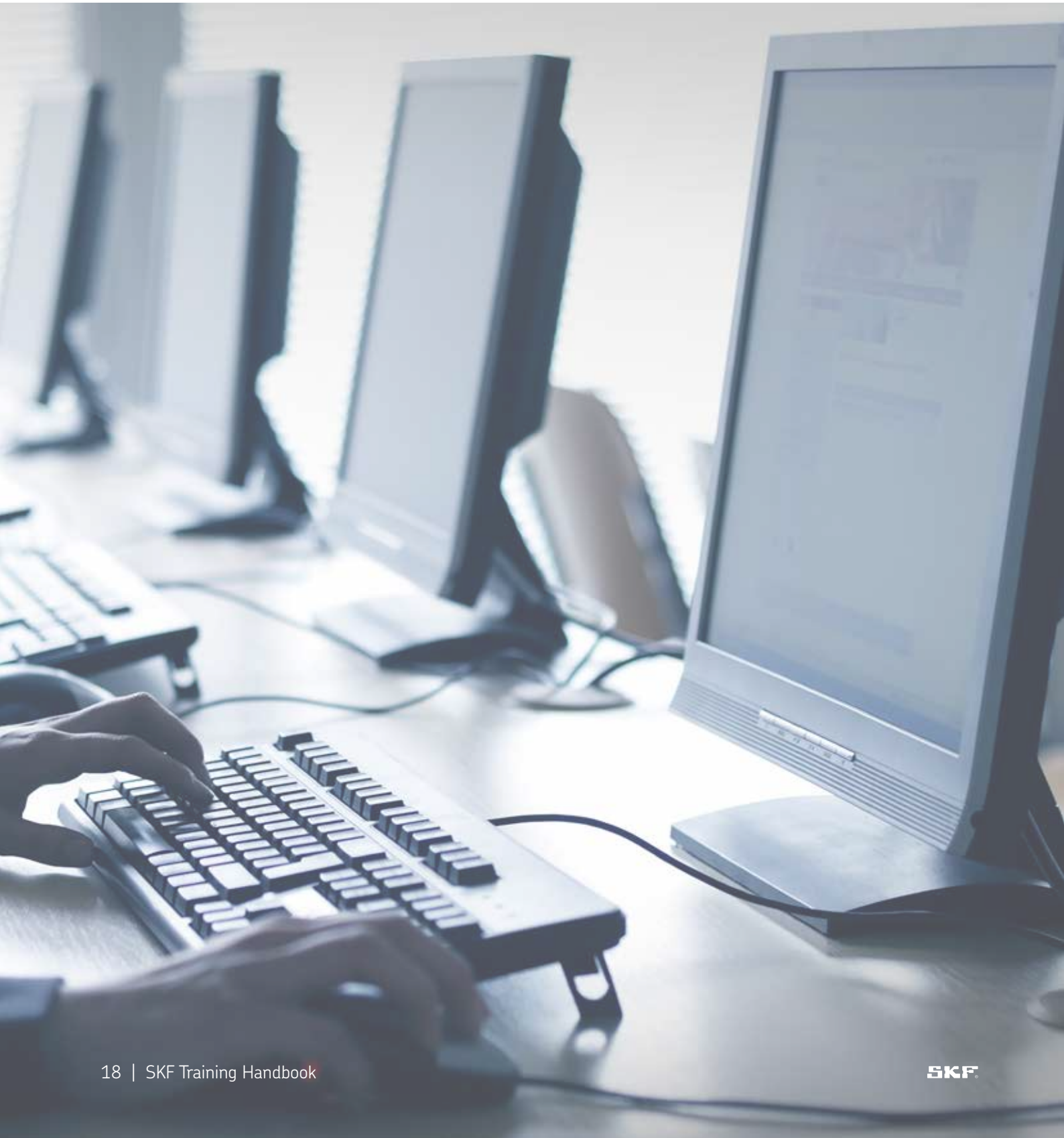
CENTRAL REGIONAL TAFE KALGOORLIE
CHALLENGER INSTITUTE OF TECHNOLOGY
CHISHOLME INSTITUTE OF TAFE
FEDERATION INSTITUTE
ILLAWARRA INSTITUTE
MUDGEE TAFE
PILBARA TAFE
SA TAFE
SOUTH METROPOLITAN TAFE

OTHER SERVICES

ABB SERVICE
ACE CONVEYORS
AEM CONSOLIDATED
AIRMASTER
ALS GLOBAL
APCO ENGINEERING
APM ENGINEERING
ARROW ELECTRICAL
ASP SHIP MANAGEMENT
AURIZON
AVOPILING
BROADSPECTRUM
BURGESS BLA
CSIRO AUSTRALIA
CARTERS GENERAL ENGINEERING
CLEMCORP AUSTRALIA
COVE ENGINEERING
CPC ENGINEERING
DALRYMPLE BAY COAL TERMINAL
DGH ENGINEERING
DOWNER GROUP
ELECTRIC MOTOR SOLUTIONS
FORICO
FUCHS LUBRICANTS
GLADSTONE PORTS CORPORATION
GOLDING CONTRACTORS
GRIFFITH CITY COUNCIL
HUNTER WATER CORPORATION
ITT INDUSTRIAL PROCESS
KARRIDALE GROUP
KERMAN SERVICES
LUNA PARK
MACKAY CONVEYOR EQUIPMENT
MNP ELECTRICAL
ORONTIDE SERVICES
PILBARA PORTS
PUMPTECH TASMANIA
QUEENSLAND RAIL
ROLLS-ROYCE MARINE
SCHOTTEL AUSTRALIA
SKILLED MATERIALS HANDLING
SOUTHERN METRO REGIONAL COUNCIL
VENTIA
WEARX

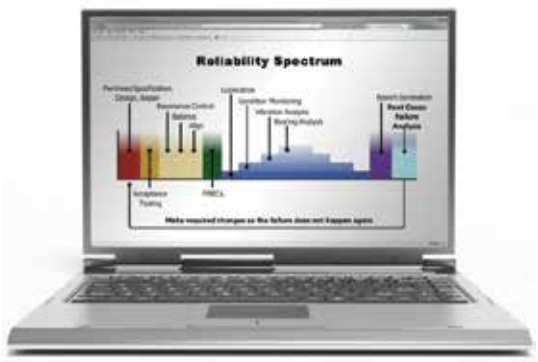
E-Learning Courses

Learn at your own place and pace with the suite of e-learning courses offered by SKF. These courses cover a wide range of product and technology topics and complement the courses taught by our specialist training staff.



iLearnReliability™ [Enterprise] by Mobius Institute

SKF are pleased to partner with Mobius Institute to provide iLearnReliability™ [Enterprise] to your organisation.



iLearnReliability™ [Enterprise] is reliability e-learning for your entire team that teaches reliability strategy, program management, best practices, condition monitoring and precision maintenance practices, and provides easy-to-understand awareness training for everyone that aids in developing a "reliability culture" across the plant-floor.

It includes five series of training that are structured for Managers, Program Management, Condition Monitoring specialists and the plant floor craftspeople and operators. Each series has a number of training modules that range from briefings to detailed training covering the topic areas of Management, Condition Monitoring and Precision Maintenance.

Essential Elements [EE]

The Essential Elements [EE] modules provide initial orientation of all of the reliability improvement topics covered in each respective version of iLearnReliability and can be used later for refresher training.

Manager Briefings [MB]

All Manager Briefings [MB] are short and focused. They are written for upper level managers who may not have the time to explore the intricacies of condition based maintenance, reliability improvement, and all the other topics, but do need a basic understanding of the issues, and most importantly, need to understand the financial benefits associated with the CBM program and reliability improvement initiative.

Program Management Training [MT]

The Program Management Training [MT] modules are intended for reliability engineers, PdM program managers, and other people who are charged with implementing the reliability improvement and PdM (CBM) program. These people generally do not need the same level of knowledge as the people who will actually use the condition monitoring tools and software, or the people who will work on machines (alignment, balancing, lubrication, etc.) but they do need to have a good working knowledge of those topics, and they certainly need to know how to run a successful program.

Skills Training [ST]

All Skills Training [ST] modules are very detailed and intended (primarily) for the person who is actually involved with the condition monitoring technique or craft (alignment, balancing, etc.). Of course, anyone can take the lessons in order to better understand the topic, but the detail provided is primarily intended for the practitioner.

Toolbox Talks [TT]

All Toolbox Talks [TT] are short and focused. They are primarily written for plant floor personnel or anyone who would like a quick introduction to a condition monitoring technology or precision maintenance activity without getting into too much detail. Toolbox Talks are intended to demystify condition based maintenance (and the associated technologies), the importance of reliability, and the techniques that can be used to improve reliability.

MOBIUS INSTITUTE

Online Courses

[EE] Essential Elements

Course Overview

iLearnReliability [Enterprise] “Essential Elements” provide an introduction to reliability topics. They are useful for the people who don’t need to know the details but should be familiar with the topic.

List of Topics

EE-RR	Roadmap to Reliability
EE-DE	Defect Elimination
EE-ACR	Asset Criticality Ranking
EE-RCM	Reliability Centered Maintenance (RCM)
EE-MP	Maintenance Practices
EE-FMEA	Failure Mode Effects Analysis (FMEA)
EE-PMO	Planned Maintenance Optimization (PMO)
EE-CBM	Condition Based Maintenance (CBM)
EE-VIB	Vibration Analysis
EE-UT	Ultrasound Testing
EE-IR	Infrared Thermal Imaging
EE-ALIGN	Alignment
EE-BAL	Balance
EE-CC	Lubrication Contamination Control
EE-PM	Preventive Maintenance
EE-ODR	Operator Driven Reliability

[MB] Manager Briefings

Course Overview

iLearnReliability [Enterprise] ”Manager Briefings” are aimed at higher level managers that primarily need to know the business case and strategic reason for implementing a reliability improvement program.

They are intended to educate and to create buy-in.

List of Topics

MB-M-1	Roadmap to Reliability (A Summary)
MB-M-2	Condition Based Maintenance vs. Preventive Maintenance
MB-M-3	Benefits of Reliability And CBM
MB-M-4	What is Classical Reliability Centered Maintenance (RCM)?
MB-M-7	Why Condition Monitoring does not Improve Reliability

[MT] Program Management

Course Overview

LearnReliability [Enterprise] “Management Training” modules are very detailed and explain the strategy used in a successful reliability program. They are ideal for the reliability team leadership, but also for planners and schedulers, supervisors and many others who need to know more than we provide in the Essential Elements and Toolbox Talks modules.

List of Topics

MT-M-1	Roadmap To Reliability Improvement
MT-M-2	Understanding Maintenance Practices
MT-M-3	KPIs, Benchmarking, and Continuous Improvement
MT-M-4	Leadership And Culture Change
MT-M-5	Building A Master Asset List
MT-M-6	Establishing The Asset Criticality Ranking
MT-M-7	Determining Your Asset Maintenance Strategy
MT-M-9	Establishing A New Vibration Monitoring Program
MT-M-10	Supercharging An Existing Vibration Monitoring Program
MT-CM-1	An Introduction To The Condition Monitoring Technologies
MT-CM-2	Vibration Analysis And Bearing Fault Detection
MT-CM-3	Airborne And Structure-Borne Ultrasound
MT-CM-4	Oil Analysis And Wear Particle Analysis
MT-CM-5	On-Line And Off-Line Electric Motor Testing
MT-CM-6	Infrared Thermography
MT-PM-1	Precision Shaft Alignment
MT-PM-2	Field Balancing
MT-PM-3	Precision Lubrication (and Contamination Control)

Online Courses

[ST] Skills Training

Course Overview

iLearnReliability [Enterprise] "Skills Training" modules are the most detailed training we offer. These modules teach your skilled tradespeople how to most effectively monitor your machines, effectively diagnose faults and apply precision maintenance techniques to maximize machine operating life.

List of Topics

ST-CM-1	Vibration Fundamentals
ST-CM-2	Accurate And Repeatable Data Collection
ST-CM-3	Diagnosing Common Faults With Spectrum Analysis
ST-CM-4	Vibration Analysis
ST-PM-1	Precision Shaft Alignment
ST-PM-2	Field Balancing

[TT] Toolbox Talks

Course Overview

iLearnReliability [Enterprise] "Toolbox Talks" provide information to people working on the plant floor (operators, mechanics, electricians, etc.) on key elements of the reliability improvement that they are likely to get involved with. The modules demystify the topics and create buy-in. They also show how they can contribute to the reliability improvement effort as well.

List of Topics

TT-CM-1	Condition Monitoring And Reliability
TT-CM-2	Vibration Analysis
TT-CM-3	Ultrasound
TT-CM-4	Thermography
TT-CM-5	Oil Analysis And Wear Particle Analysis
TT-CM-6	Electric Motor Testing
TT-PM-1	The Benefits Of Precision Maintenance
TT-PM-3	Shaft Alignment
TT-PM-6	Precision Balancing
TT-PM-7	Precision Lubrication

Need more information?

iLearnReliability (iLR) is delivered using an internet-based LMS (Learning Management System) that enables a company Administrator (HR Manager, Maintenance Manager, Reliability Manager, etc.) to assign specific lessons or groups of lessons to employees. No downloading is required and being outside the company firewall, the lessons have no IT or security implications.

Personnel can watch the lessons on a PC, a TV or in a group on a large screen on or off-site, 24/7.

The license number is the maximum number of individuals who will view any lessons within the 12-month subscription period.

Licence	Description	Price
iLR 10	iLearnReliability Enterprise Subscription Includes all modules, unlimited access from work or home. for 1 to 10 people	$4,400 Per year
iLR 15	iLearnReliability As above for 11 to 15 people	$7,000 Per year
iLR 25	iLearnReliability As above for 16 to 25 people	$10,500 Per year
iLR 50	iLearnReliability As above for 26 to 50 people	$13,500 per year
	Licenses are also available for 100, 200, 300 and unlimited users	contact SKF

Contact SKF Today!

SKF have partnered with Mobius Institute in Australasia to get you started with your iLearnReliability™ subscription.

You can reach us by email at training.australia@skf.com to confirm your interest.

Short Courses

These courses are a great way to learn and refresh your skills and knowledge with basic maintenance best practices. The courses are custom made to your requirement and generally delivered at your facility.

Short Courses

Bearing Fitting and Removal Techniques

Participants will learn to install and maintain rolling element bearings in rotating machinery.

Course Outline

- Basics of Bearings and their applications
- Shaft and Bearing Housing Fits and Tolerances
- Mounting Methods – Clearance Reduction
- Mounting Methods – Axial Drive Up
- Dismounting Methods – Hydralulic Nut Withdrawal Sleeve
- Dismounting Methods – Oil Injection
- Bearing Damages
- Practical hands on fitting

Who Should Attend

Tradesmen, Fitters, Maintenance and Mechanical / Electrical Apprentices

Course Information	
Duration	1 Day
Course Fee	$6,600 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Bearing Housings and Seals

This course covers the application and fitting of Plummer Block housings. Typical applications for these housings include conveyors and fans.

Who Should Attend

Any personnel involved with selecting, requesting, identifying and issuing housings (i.e. Engineers, Draftsmen, Purchasing, Stores, Tradesmen, Fitters, Maintenance and Mechanical / Electrical Apprentices)

Course Information	
Days	0.5 days
Course Fee	$3,750 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Bearing Damage Analysis

Course Outline

- Why do Bearings get damaged?
- Load Path Patterns in Bearings
- ISO Bearing Damage Classifications
- Understand terminology and visual appearance of damage modes
- Hands-on Analysis of Damaged Bearings (samples)

Who Should Attend

Personnel involved with Reliability and Maintenance, Reliability Engineers, Condition Monitoring, Fitters and Apprentices.

Course Information	
Days	1 Day
Course Fee	$6,600 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Fundamentals of Bearing Lubrication

Course Outline

- Grease Lubrication
- Base Oil Viscosity – Oils and Greases
- Temperature Range
- Grease Consistency, Thickeners and Compatibility
- Relubrication – Quantity and Frequency
- Oil Lubrication – Application and Methods
- Mineral Oils, EP Additives, Synthetic Oils
- Bearing Selection
- Load Carrying Ability

Who Should Attend

Any personnel involved with the reliable operation of equipment (i.e. Reliability Engineers, Maintenance Planners, Greasers, Tradesmen, Fitters, Maintenance and Mechanical Apprentices)

Course Information	
Days	0.5 days
Course Fee	$3,750 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Short Courses

Bearing Handling and Storage

Course Outline

- Identify bearings from samples
- Bearing part numbers
- Bearing types
- Where to store bearings
- How to handle bearings
- Where to find relevant information

Who Should Attend

Any personnel involved with selecting, requesting, identifying and issuing bearings (i.e. Purchasing, Stores, Tradesmen, Fitters, Maintenance and Mechanical / Electrical Apprentices)

Course Information	
Days	0.5 days
Course Fee	$3,750 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Bearings for Electric Motors

Course Outline

- Bearing Basics – Electric Motor Bearings
- Motor Dismantling and Bearing Dismounting
- Shaft and Housing Fits
- Motor Assembly and Bearing Mounting
- Lubrication
- Post Motor Service Procedures

Who Should Attend

Tradesmen, Fitters, Maintenance and
Mechanical / Electrical Apprentices

This course covers fitting techniques for Deep Groove Ball Bearings and Cylindrical Roller Bearings. These bearings are commonly used in electric motors.

Course Information	
Days	0.5 days
Course Fee	$3,750 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Practical Handling of High Precision Bearings

Course Outline

- General bearing knowledge-High Precision Bearings
- Bearing arrangement
- Journals and tolerances
- Bearing defects
- Process when bearing exchange in spindles
- Assembly preparation
- Bearing exchange in machine tool spindles
- Assembling and disassembling methods
- Lubrication of spindles
- Installation and handling
- M/T spindles

Course Information	
Days	1 Day
Course Fee	$6,600 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Short Courses

V Belts and Pulleys

Course Outline

- Identification and Types
- Handling and Storage
- Matched Sets
- Correct Fitting and Alignment
- Maintenance
- Drive design
- Upgrades for longer life
- Standardisation and Rationalisation

Who Should Attend

Any personnel involved with selecting, requesting, identifying and issuing V Belts and Pulleys (i.e. Design Engineering, Purchasing, Stores, Tradesmen, Fitters, Maintenance and Mechanical / Electrical Apprentices)

Course Information	
Days	0.5 days
Course Fee	$3,750 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

Infrared Thermography Workshop

Course Outline

- Why we use infrared – common applications
- Understanding the nature of infrared radiation
- How an infrared camera works
- How to operate an infrared camera – focus, range and palette selection, sensitivity optimisation
- Understanding the capabilities and limitations of an infrared camera
- Basic introduction to infrared theory and how it relates to practical use
- Awareness of errors such as emissivity, reflectance, emittance, distance, and target size
- Advanced Camera operation – Hands on tutorial

Who Should Attend

The Infrared Thermography Workshop is a first step for people just starting out in this field. It is aimed at inexperienced or first time users who want to gain practical experience and insight into the operation of infrared cameras and to start them on the right path for practical use of their instrument in the field.

Course Information	
Days	1 day
Course Fee	$7,500 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Identification

Application Specific Courses

Courses in this section focus on the most common types of rotating equipment, using a system approach to machinery life extension.

WE202

Bearing in Rotating Machinery Applications

Course Overview

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

Course Content

Industrial motors

- Learn advanced concepts related to rolling bearings
  - Friction and sealed-for-life bearings
- Factors effecting the performance of rolling bearings
  - Component conformance – measuring for:
    - Shaft and housing fits
    - Installation errors
    - Maintenance practices
- Troubleshooting and preventing common motor problems:
  - Stray currents
  - Improper bearing installation
  - Lubrication: large and small motor lubrication discussion
- Motor condition monitoring: methods and practice

Industrial fans

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

Industrial pumps

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

Industrial gearboxes

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

Pre-Study

E-Learning courses

Angular Contact Ball Bearings
Deep Groove Ball Bearings
Spherical Roller Bearings

Post-Study

Reading material

Rolling Bearings in Electrical Motors and Generators
Bearings for Fans
Rolling Bearings in Centrifugal Pumps

Who Should Attend

- Service, maintenance, machine repair, or plant/facility engineering staff of an industrial plant, OEM facility, public utility 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, mechanics, and maintenance supervisors.

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 Max
Category	Work Execution

WI270

Improving Crusher Reliability

Course Overview

This course provides information that will enable maintenance personnel to increase plant productivity by improving the performance and reliability of rotating equipment. Students will understand best practices in crusher selection and maintenance and the value of preventive maintenance by conducting careful maintenance practices and planning. They will understand what to look for in inspections and will be able to provide feedback on the condition of the equipment and what (if any) should be done to rectify the deficiencies that are found.

Course Content

Introduction to Crusher Selection

- General Crusher Selection based on Abrasive Index (AI) and Impact Values which helps to select the appropriate crusher for a given ore type, i.e. Hardness and Abrasiveness
- A brief description of how the crushers operate
- An understanding of the common industry terminology

The Value of Preventative Maintenance

- Monitoring and measurement
- Replacement of components due to normal wear
- Damage caused by failure to adjust or replace worn parts
- Damage caused by foreign influences
- Recording and review of data

Maintaining Primary, Secondary and Tertiary Crushers

- Crushing action comparison between Single and Double Toggle Crushers
- General arrangement of typical single toggle and double toggle jaw crusher
- Advantages of rolling end toggles over conventional socket end type
- Checklist (Daily, Weekly, Monthly)
- General rule of thumb principles
- Understanding the crusher chamber
- Types of cone and gyratory crushers, bottom and top support
- What causes Hot Spots
- Fret Corrosion
- Checking C.S.S of Gyratory and Tertiary Crushers

Maintaining Impact Crushers – Vertical and Horizontal

- Typical Problems and Solutions - Impact Crushers

Maintaining Screens

- Fundamentals of Screening
- Screen types
- Screening Media
- Troubleshooting (Inclined or Horizontal Screens, Vibrating Screens)
- Common screen cloth failures

Maintaining Feeders

- Grizzly Feeder
- Apron Feeder
- Vibrating Feeder

Maintaining Conveyors

- General maintenance checks (Belts and Rollers, Lanyard Safety Switches, Gear-box lubrication, Spillage, Visual inspection)

Bearing Types, Analysis, Lubrication and Failure

- Functions of rolling bearing
- Bearing Mounting (Tightening angle, clearance reduction, axial drive-up)
- Lubrication
- Bearing Failures

Monitoring Crushers

Specialist techniques to monitor crushers for vibration and temperature, providing early warning for plant personnel to avoid unplanned downtime and unnecessary repairs. These easy to install, cost effective kits are a proven and reliable solution for increased uptime.

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$1,495 AUD + GST
Course Type	Onsite and Public
Category	Work Identification, Work Execution

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

Improving Bearing Reliability in Conveyors

Course Overview

Whether transporting coal, iron ore or other minerals on mine sites and quarries; or bulk materials such as wheat, wood chips, sugar or alumina; bulk conveyors often endure harsh operating conditions that challenge component reliability.

These conditions range from heavy loads, to hot, cold, wet, dry, dusty, and dirty environments. Also, lubrication issues and poor installation practices, all of which can significantly reduce service life for bearings and other components.

This course provides information for the successful installation and maintenance of rolling element bearings and housings on conveyor pulley assemblies.

Course Content

Overview of conveyor pulley maintenance

- Conveyor fundamentals
- Anatomy of a conveyor pulley – bearings, housings, shaft, locking elements,
- Impact of maintenance practices on conveyor pulleys
- Bearing operating characteristics
- Typical bearing and housing configurations
- Common conveyor bearing problems and implications - contamination, lubrication issues, incorrect mounting, cross location etc.

Bearing arrangements used on conveyor pulleys

- Bearing types and designations
- Housing types and components
- Seal types
- Adapter sleeves

Teardown and bearing dismounting

- Dismounting methods
- Shaft and housing clean-up

Tolerances – shaft and housing bores

- Fits and tolerances

Mounting bearings with tapered bores

- Mounting methods - locknut tightening angle
- Mounting methods - clearance reduction
- Mounting methods - axial drive-up
- Mounting methods - SKF Drive-up

Housing assembly and lubrication

- Housing assembly procedures
- Introduction to grease lubrication

Pulley installation

- Alignment
- Re-lubrication methods
- Cross location
- In-situ bearing mounting

Introduction to bearing damage analysis

- Failure modes – ISO classification

Practical Workshop

The hands-on session will provide an understanding of the correct assembly and maintenance aspects of a typical conveyor housing arrangement. Students will learn proper handling and installation techniques, methods, and practices to minimise the opportunity for premature bearing failures:

- Where and how to measure a shaft and housing for conformance.
- How to correctly install both taconite and SKF Kobra seals.
- Various bearing fitting techniques applicable to open and sealed bearings with adapter sleeves.
- How to correctly lubricate, seal and assemble the housings and seals.
- How to check alignment of the housing and seals arrangements.
- Correct way to set up lubrication to open or closed housings.

Site Visit (optional)

A 1 hour site visit can be incorporated into the training, as an extension to the classroom learning. Trainer will walk the group through a visual inspection of the conveyors, conduct an informal audit and assess current conveyor operation and maintenance practices.

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee	$7,500 AUD + GST per class
Course Type	Onsite
No. of Attendees	8 max
Category	Work Execution

WE215

Electric Motor Maintenance

Course Overview

Electric motors are among the highest in reliability incident reports. For many companies, this leads to a continual cycle of costly repairs and unplanned downtime factors that can hurt the bottom line.

Since 40% to 70% of motor failures are related to bearings, it's no surprise that high-quality bearings are key for reliable motors. The right bearings alone won't deliver the results you need. How parts are installed, lubricated, handled, stored, aligned, and maintained is equally important

This training course will train students to disassemble, inspect, maintain, and troubleshoot AC Induction motors including a practical motor overhaul.

Key Learning Outcomes

1. An effective implementation of electrical motor maintenance will translate into savings from production availability, reduced equipment repair costs and improved energy costs.
2. Students will have an appreciation and understanding to perform optimal diagnoses and repairs.
3. Students will learn the techniques and obtain valuable information to detect motor problems prior to failure, avoiding costly downtime.

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

CONTINUES NEXT PAGE

Electric Motor Maintenance (cont.)

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

Industries that will benefit

- Food and Beverage
- Mining
- Cement
- Steel
- Mineral Processing
- Printing
- Pulp and Paper
- Oil and Gas
- Pharmaceutical
- Manufacturing
- Petrochemical
- Power Generation
- Municipal Utilities
- Motor Rewinders
- Maintenance Contractors
- Timber
- Pump Manufacturers
- Chemical

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.

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Work Execution

WE214

Improving Bearing Reliability in Paper Machines

Course Overview

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

Course Content

Review of Bearing basics

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

Shaft and journal preparation

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

Mounting and dismounting

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

Special housings

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

Fundamentals of lubrication

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

Bearing damage causes and analysis

- Identify and interpret actual bearing failures from paper machines

Who Should Attend

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

Pre-Study

E-Learning Course

Spherical Roller Bearings

Reading material

High-speed bearing system for future generations of paper machines

Post-Study

Reading material

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

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Work Execution

WE216

Machine Tool Reliability

Course Overview

This course will train personnel in the area of precision bearings and spindle repair. It will provide knowledge on how to improve the service life and the reliability of precision bearings and spindles and increase productivity.

The Machine Tool Reliability course uses a combination of hands-on training, audio visual, lecturers and discussion opportunities.

Course Content

Precision Bearing basics

- Function of precision bearings
- Fundamentals of precision bearing technology, types, nomenclature, terminology, components and materials used, and application
- Proper care, handling, and storage
- Ceramic bearings

Spindles

- Spindle types: block, cartridge, belt driven, gear driven, direct drive and motorised
- Design criteria
  - -Accuracy
  - -Stiffness
  - -Speed
  - -Preload
- Dimensional criteria
  - -Cleanliness
  - -Disassembly
  - -Shaft and housing fits
  - -Mounting and locating
  - -Balancing and shaft alignment
  - -Set preload on NN cylindrical bearings
  - -Sealing methods

Lubrication

- Grease, type and quantity
- Air-oil, type and quantity
- Run-in procedures

Failure analysis

- Identify and interpret actual samples of bearing failures
- Contamination
- Imbalance
- Misalignment
- Dimensional and handling errors

Condition monitoring

- Methods and practices

Who Should Attend

Machine tool repair personnel, machine tool builders, maintenance supervisors, maintenance personnel, spindle room personnel, plant engineers, and reliability engineers.

Pre-Study

E-Learning courses

Bearing Basics
Deep Groove Ball Bearings
Angular Contact Ball Bearings

Post-Study

Reading material

Machine tool capabilities
Lubrication solutions for machine tools
Trends in Machine-Tool Spindle Design

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Work Execution

WE211

Fundamentals of Pump Technology

Course Overview

The purpose of this course is to provide pump operational personnel with a deeper understanding of how pumps are designed, manufactured and tested to suit particular application requirements. It looks at the relationship between system design and pump performance and analyses the impact that the operating point (or points) may have on pump efficiency, energy consumption and operating reliability.

Course Content

This course seeks to improve the knowledge of operational staff with a clear understanding of different pumps types, and matching pump selection to the system requirements. It considers the utilisation of condition monitoring equipment to continuously assess pump performance in service. It also aims to achieve greater operational reliability; energy cost savings and reduced down-time.

Pump Types and Construction/Pump Standards

- Rotodynamic pumps
- Positive displacement pumps
- Centrifugal pump operating principles
- Specific speed and its implications
- European and US pump standards

Pump Terms, Suction and Discharge Conditions

- Pump Terminology
- Suction conditions
- Discharge conditions

System Curves, Pump Curves, Pump Selection

- Static head and friction loss in systems
- System resistance curves - how to determine
- Pump performance curve - how to use
- Pump selection for different system conditions
- NPSH and Cavitation

Pump QA and Performance Testing

- Pump Quality Plans
- Material tests and Non-destructive testing
- Works performance testing
- Site testing

Pump Installation Practices

- Good suction pipework design
- Good discharge pipework design
- Pumpset installation and commissioning
- Alignment techniques

Condition Monitoring and Troubleshooting

- Condition monitoring methods and systems
- Typical cause and effect trouble-shooting

Typical Maintenance Procedures

- End suction pumps
- Vertical multistage pumps
- Axially split case pumps
- Bearing and seal maintenance

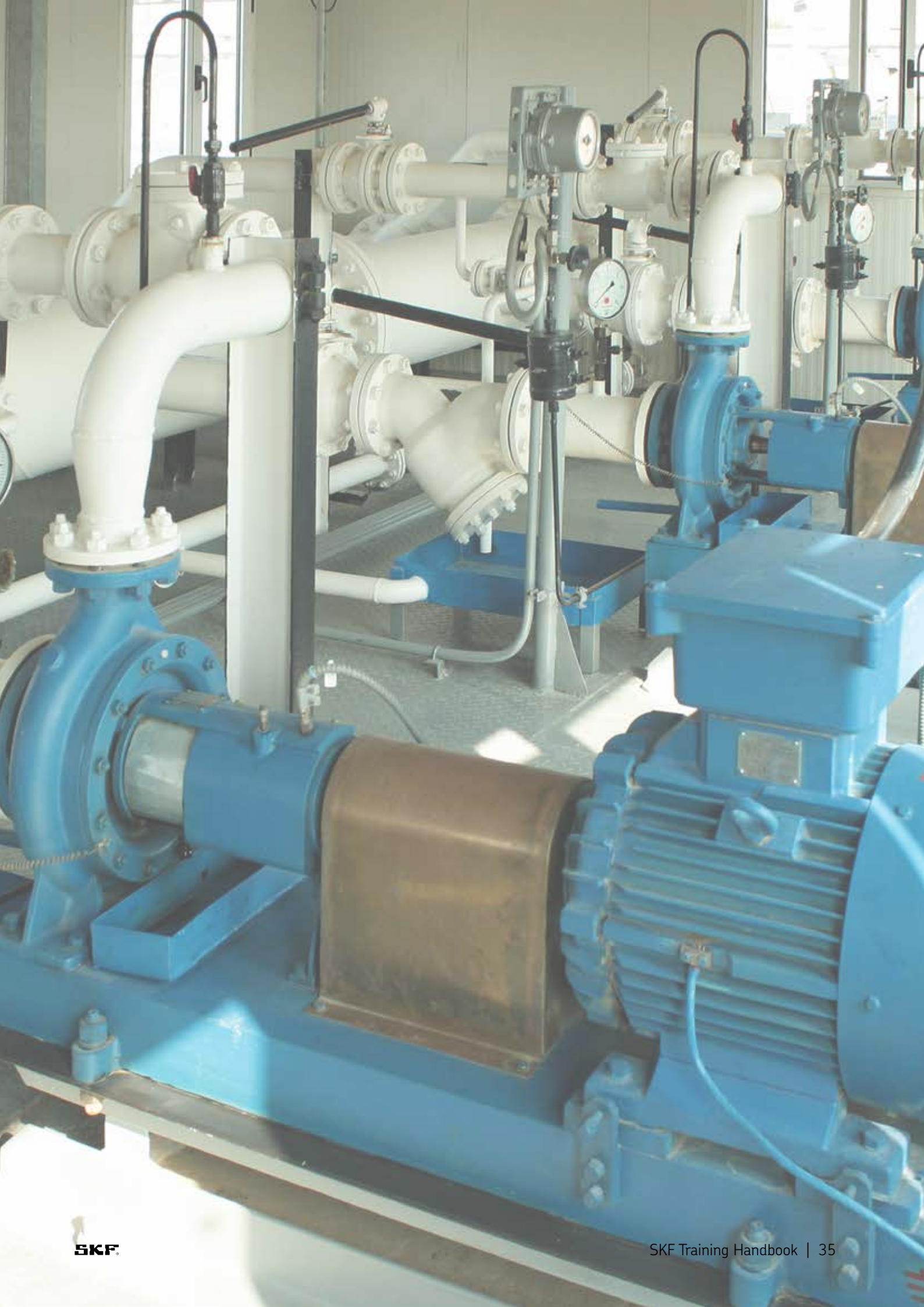
Who Should Attend

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.

Reading and Reference Material

- Pump Industry Association - Technical Handbook
- Pump Industry Association - Pipe Friction Handbook
- Europump - Guide to the selection of rotodynamic pumps

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee	$7,500 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Work Execution



Level 1 Courses

Courses in this section are intended for personnel who have limited field experience. These courses are taught using a blended learning approach with a combination of classroom training and practical workshops to improve overall learning effectiveness.

MS230

Maintenance Strategy Review (MSR) Awareness

Course Overview

Before we explore the technical details of strategy, we must know about each organisation, what their issues are, why these issues matter, and how the issues can be incorporated into a plan.

There must be a documented need to look at an existing maintenance strategy or create a new one for the right and unique business reasons. Maintenance Strategy is the key to asset reliability and availability, thus achieving overall organisational goals. How do you know if a review of your maintenance strategy is required and why?

Course Objective

The course objectives are to ensure that each participant will:

- know if a review of strategy is required and why
- recognise the importance of data structure and content before any kind of strategy work is commenced
- understand the importance of identifying and categorising assets
- understand that there are different types of criticality at various levels of maintenance
- understand what will likely be involved in total to conduct the right analysis, but then what the implications are of making the strategy work
- recognise the commonalities and differences in possible strategies
- understand that the conduct of MSR has important implications to spares
- understand that certain classes of equipment require specialised approaches to strategy review (i.e., SCS > via SIL/IPF)

Course Content

The purpose of this course is to make users aware of MSR and how they can apply it within their work. These are the topics:

Chapter 1: Conceptual models and business context

Chapter 2: Obtain a common understanding of terminology

Chapter 3: Standards, models, and excellence

Chapter 4: Understanding the current situation

Chapter 5: The essential link - failure and strategy

Chapter 6: What is strategy?

Chapter 7: Mutual understanding and readiness

Chapter 8: Can we conduct MSR?

Chapter 9: A blend of MSR types

Chapter 10: How to implement well

Chapter 11: Performance management and measurement

Chapter 12: How MSR forms the basis of Predictive and Proactive Reliability Maintenance 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 rotating equipment performance

Pre-Study

E-Learning course

Asset Efficiency Optimisation (AEO) Basics

Reading material

Maintenance Strategy Review Methods

Post-Study

Reading material

Asset register
Managing asset integrity
Business process improvement

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee	$16,250 AUD + GST per class
Course Type	Onsite
Category	Maintenance Strategy

Asset Reliability Practitioner (ARP) Cat 1

Course Overview

The Asset Reliability Practitioner [ARP] Category I "PLANT-WIDE AWARENESS" course is intended for everyone working within an organization who in any way influence the management, design, engineering, procurement, maintenance, or operation of an organization that involves critical rotating machinery and electrical equipment.

Course Content

A. Understand why improvement is desired

Introduction

- Overview of reliability and performance improvement
- What causes equipment to be unreliable or perform poorly
- The relationship between reliability improvement and asset management, operational excellence, TPM, and lean strategies
- The relationship between reliability and safety

Benefits

- How does the company benefit
  - How to quantify the benefits
  - Assessing the current state and measuring the value of the gap
- How do individuals benefit

Reliability culture

- What it means to "think reliable"
- How to contribute to the reliability and performance improvement initiative
  - How important it is that you contribute
- How you can help others to understand the benefits

Leadership

- The importance of senior management support
- The importance of leadership throughout the organisation
- The difference between leadership and management (and reluctant obedience)

Strategy

- Why it is important for everyone to understand the strategy
- The importance of the mission and vision statements
- The role of the reliability steering committee
- The importance of contributing to the strategy and offering your ideas and observations

B. Understand why failure occurs

Understanding failure

- Why does equipment fail?
  - Mechanical failures
  - Electrical failures
- Understanding equipment "failure patterns"
  - Does all equipment wear out with age?
  - What are "random failures"
  - Early age "infant mortality" failures
- Why is this so important?

C. Understand what we can do about it

Defect elimination

- Overview of the goals of defect elimination
- An overview of each of the main sources of defects and how to eliminate them
  - Design for reliability, maintainability, operability, and sustainability
  - Procurement for lowest life cycle costs
  - Transport without damage
  - Acceptance testing to reject defective equipment
  - Storage to eliminate degradation
  - Eliminating maintenance induced failures through precision installation, maintenance and commissioning
  - Eliminating operator induced failures
  - Proactive tasks that reduce the likelihood of failure and poor performance

Asset strategy

- What is the asset reliability strategy?
- Maintenance/operation options:
  - Run-to-failure
  - Condition-based maintenance
  - Interval based maintenance
- What is involved in developing the strategy
  - The need for a master asset list
  - The need for a bill of materials
  - Asset criticality ranking
- What it is and why it is needed
- In brief, how it is developed
  - Maintenance strategy development techniques (in brief)
- An overview of Preventive Maintenance Optimisation [PMO]

- An overview of Reliability Centered Maintenance [RCM]
- An overview of Failure Modes Effects (and Criticality) Analysis [FMECA]
- How can people share their knowledge to improve these processes

Work management

- The benefits of work management
- The basic flow of proper work management
- How people can contribute to improving the work requests, work orders, and work process
  - Accurate reporting of failures and work outcomes
- The opportunity to improve work efficiency (or "wrench time")
- How planning can minimise time/costs with shutdowns and outages
- The role of the computerized maintenance management system [CMMS] or enterprise asset management [EAM] system

Spares management

- The financial and work management benefit of efficient spares management
- Caring for spares
- How people can contribute to the spares management process

Precision and proactive work

- What is precision and the importance of precision work
  - The basics of precision shaft and belt alignment, soft foot correction, fastening, machine balancing, and other common mechanical and electrical tasks
  - The importance of developing and following written procedures
  - The importance of precision installation, such as bearings, seals, gears, belts, pumps, electrical equipment, and other equipment
  - The importance of commissioning
- The importance of taking proactive steps to avoid future problems, including precision lubrication, resonance correction, power quality control, and keeping equipment and workplaces clean and organised

Condition monitoring

- Overview of CM principles for mechanical and electrical equipment
- The relationship between CM and planning/scheduling and operations
- A detailed overview of:
  - Vibration analysis
  - Ultrasound
  - Oil analysis
  - Wear particle analysis
  - Electric motor testing
  - Infrared analysis
  - Non Destructive Testing [NDT]
  - Process/performance monitoring
  - Visual inspections
- The future of CM and predictive analytics

Breaking out of reactive maintenance

- An overview of the challenges
- The importance of focusing on breaking out of the reactive maintenance cycle
- Suggested techniques

Continuous improvement

- The principle of and importance of continuous improvement, Kaizen, PDCA, and Lean
- The need to reassess business conditions and what is critical
- Utilising metrics to measure and improve performance
  - Benchmarking against industry and the facilities "best day"
  - The importance of establishing the right KPIs
  - Suggested metrics and KPIs and the most effective use of KPIs
  - The importance of accurate data collection
- The importance of constant communication
- Root cause (failure) analysis [RCA and RCFA] o The importance of conducting RCA/RCFA
  - The importance of making the improvements
  - How to perform RCA/RCFA
- The need for on-going education, skills, and awareness training

Get Certified!

The ARP course structure is modelled on the ISO 18436 standards with topics mapped to ISO 55000.

The optional Certification Exam is provided by Mobius Institute Board of Certification, (MIBoC) which is ISO/IEC 17024 accredited. Students who meet the experience requirements, complete the course and pass the examination will become certified the highest recognised certification in Reliability available anywhere.

Training Partner

SKF delivers the training in collaboration with the Reliability Institute of Australia.

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$1,495 AUD + GST per class
Exam Fee	$275 AUD + GST
Course Type	Onsite and Public
Category	Maintenance Strategy
Certification*	Asset Reliability Practitioner 1

† Course fee is per person for a Public course. Contact SKF for Onsite course fee

WI202

Vibration Analysis ISO Cat 1

Course Overview

The “Entry Level” Category I course is intended for personnel who are new to vibration monitoring and analysis. This is the ideal starting place for new vibration analysts, people collecting vibration data and those who want a better understanding of vibration analysis and condition monitoring.

Course Content

The course focuses on periodic, single channel data collection and analysis for condition based maintenance programmes. A foundation is established for in-depth understanding of

spectrum and waveform relationships.

Maintenance practices

- Breakdown, preventive, predictive and RCM
- Condition monitoring
- Review of condition monitoring technologies: Vibration, oil, wear debris analysis, infrared thermography, ultrasonic acoustic emission, electric motor testing

Principles of vibration

- Motion, r.m.s./peak/peak-peak, frequency/period
- Displacement, velocity and acceleration
- Units and unit conversion
- Waveform and spectrum (FFT)
- Natural frequencies
- Basic forcing frequency calculations

Data acquisition

- Instrumentation
- Transducers and transducer mounting
- Measurement point naming conventions
- Routes/surveys: Loading and unloading the route
- Data collection
  - Following a route
  - Repeatable data collection
  - Test procedures
  - Observations: utilising your time effectively in the field
  - Recognising bad data

Equipment knowledge

- Rotating equipment types and applications
- Rolling element bearings and journal bearings
- Review of failure modes and appropriate use of condition monitoring technologies

Basic vibration analysis

- Overall level measurements
- Spectrum analysis:
  - Harmonics, sidebands and the analysis process
  - Alarm limits, trending and exception reports

Fault diagnosis

- Imbalance, misalignment, looseness, eccentricity, resonance
- Defects associated with bearings, gears, belts, electric motors

Key Learning Outcomes

You will come away from this course with a solid understanding of:

- Benefits of perfoming condition monitoring and improving reliability
- Condition Monitoring Technologies: acoustic emission, infrared thermography, oil analysis, wear debris analysis, electric motor testing
- How machines work – via supplementary self-study using the ”Equipment Knowledge” section
- Why vibration measurements can tell you about the condition of the machine
- How to collect good, repeatable measurements
- How to analyse vibration spectra, and the basics of fault diagnosis: unbalance, misalignment, looseness, rolling element bearings faults, resonance, and other conditions.
- Introduction to setting alarm limits

CONTINUES NEXT PAGE

Vibration Analysis ISO Cat 1 (cont.)

Get Certified!

The training course strictly follows ISO 18436-2 and 18436-3. The optional Certification Exam is provided by Mobius Institute Board of Certification, which is ISO/IEC 17024 accredited in accordance with ISO 18436-1 and ISO 18436-2. Students who meet the experience requirements, complete the course and pass the examination will become certified according to ISO 18436-1 and ISO 18436-2, providing the highest recognised certification available anywhere.

Who Should Attend

If you have been performing vibration analysis for less then one year, or if you have been collecting vibration readings and leaving analysis to another person, then this is course is for you. This course is also designed for reliability engineers, PdM program managers, and other maintenance staff who would like to understand condition monitoring with a focus on vibration analysis.

Course Information	
Time	8.00am – 5.00pm
Days	3 days + 0.5 day exam
Course Fee†	$2,620 AUD + GST
Exam Fee	$330 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification*	Vibration Analyst 1

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

Also Available
Vibration Analysis ISO Cat 2 (pg. 64)
Vibration Analysis ISO Cat 3 (pg. 72)

WI240

Machinery Lubrication and Oil Analysis ISO Cat 1

Course Overview

This course establishes the role of precision lubrication and oil analysis for improving machine reliability. The course will provide an overview of lubricant construction and the general principles involved in lubricant selection for common plant machinery. It will introduce appropriate methods to collect samples as the first step in lubricant based machine condition assessment.

Course Objectives

Acquire the knowledge necessary to understand the important lubricant properties and how to select the correct lubricant for each machine application. Learn how to read and understand oil analysis reports, set optimum oil analysis limits, reduce oil consumption and achieve maximum life out of lubricants.

Course Content

Maintenance Strategies – Best Practice Structuring

- Understanding maintenance strategies – reactive, preventative, predictive, proactive and optimising
- Why machines fail prematurely – understanding root causes
- The role of effective lubrication in failure avoidance
- Oil analysis and technologies to assure lubrication effectiveness

Contamination Mechanics – A Proactive Lubrication Approach to Reliability

- Proactive lubrication and contamination control – lubricant storage and use, contamination exclusion, removal and measurement
  Phase (1) – Setting goal based target limits
  Phase (2) – Employing actions and equipment to achieve goal based target limits
  Phase (3) – Measurement of results and achieving goal based target limits

Lubricant Application

- Basic calculations for determining required lubricant volume
- Basic calculations to determine re-lube and change frequencies
- When to select oil and when to select grease
- Effective use of manual delivery techniques
  - Automatic delivery systems
    - Automated deliver options
    - Automated grease systems
    - Oil mist systems
    - Drip and wick lubricators
  - Deciding when to employ automated lubricators
  - Automated lubrication systems

Lubricant Storage and Management

- Lubricant receiving procedures
- Proper storage and inventory management
- Equipment tagging and identification
- Lubricant storage containers
- Lubricant routes and scheduling
- Proper storage of grease-guns and other lube application devices
- Maintenance of automatic grease systems
- Health and safety assurance

Lubricant Conditioning and Quality Control

- Filtration and separation technologies
- Filter rating
- Filtration system design and filter selection

Basic Grease Lubrication and Properties

- How grease is made
- Thickener types
- Thickener compatibility
- Grease lubricant physical, chemical and performance properties and classifications

Costs and Benefits of Lubrication – What Others Have Achieved

- Reliability and asset tools
- Cost benefit analysis and return on investment calculations
- Case studies – proactive lubrication management and financial savings

Lubrication Theory and Fundamentals

- Fundamentals of tribology
- Functions of a lubricant
- Hydrodynamic lubrication (sliding friction)
- Elasto-hydrodynamic lubrication (rolling friction)
- Mixed-film lubrication
- Base-oils and their functions

CONTINUES NEXT PAGE

Machinery Lubrication and Oil Analysis ISO Cat 1 (cont.)

- Oil lubricant physical, chemical and performance properties and classifications

Lubrication Selection and Application Basics

- Viscosity selection
- Base-oil type selection
- Additive system selection
- Machine specific lubricant requirements
  - Hydraulic systems
  - Rolling element bearings
  - Journal bearings
  - Reciprocating engines
  - Gearing and gearboxes
- Application and environment related adjustments
- Functions of a lubricant

Oil Sampling

- Objectives for lube oil sampling
- Samping methods
- Managing interference
  - Bottle cleanliness and management
  - Flushing
  - Machine conditions appropriate for sampling

Lubricant health monitoring

- Lubricant failure mechanisms
  - Oxidative degradation
    - The oxidation process
    - Causes of oxidation
    - Effects of oxidative degradation
  - Thermal degradation
    - The thermal failure process
    - Causes of thermal failure
    - Effects of thermal degradation
  - Additive depletion/degradation
    - Additive depletion mechanisms
    - Additives at risk for depletion/degradation by the various mechanisms
- Testing for wrong or mixed lubricants
  - Baselining physical and chemical properties tests
  - Additive discrepancies
- Fluid properties test methods and measurement units - applications and limitations
  - Kinematic Viscosity (ASTM D445)
  - Absolute (Dynamic) Viscosity (ASTM D2893)
  - Viscosity Index (ASTM D2270)
  - Acid Number (ASTM D974 et al)
  - Base Number (ASTM D974 et al)
  - Fourier Transform Infrared (FTIR) Analysis
  - Rotating Pressure Vessel Oxidation Test (ASTMD2272)
  - Atomic Emission Spectroscopy

Monitoring and Analysis

- Common machine wear mechanisms
- Interpreting machine wear debris

Get Certified!

The International Council for Machinery Lubrication (ICML) will be conducting Machinery Lubrication exams, the morning following each course.*

*** Please confirm with SKF prior to the course**

Pre-Study

E-Learning course

Lubrication Management

Reading material

Lubricant Monitoring and Analysis
Oil and water

Post-Study

Reading material

Lubrication and contamination effects on bearing life Part 1

Lubrication and contamination effects on bearing life Part 2

An introduction to oil debris analysis

Course Information	
Time	7.30am – 5.00pm
Days	3.5 days + 0.5 day exam
Course Fee†	$2,450 AUD + GST
Exam Fee†	$375 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification	MLA-1, MLT-1

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

† Examination fee can be arranged directly with ICML for $275 USD per person by visiting www.icmlonline.com/apply

Also Available
Machinery Lubrication and Oil Analysis ISO Cat 2 (pg. 66)

WI230

Infrared Thermography ISO Cat 1

Course Overview

This course covers infrared theory, heat transfer concepts, equipment operation and selection, standards compliance, image analysis and report generation.

Specific applications include electrical distribution systems, mechanical systems, steam systems, refractory systems, underground piping, active thermography, building envelopes and flat roofs.

Key Learning Outcomes

On completion of the course students will be able to identify and document thermal patterns caused by improper design, workmanship for failure.

Course Content

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
  - missing and damages insulation
  - air leakage
  - latent moisture
  - pest damage
- Mould detection
- Other tools
- Verification of data
- Data recording
- Standards for inspections

CONTINUES NEXT PAGE

Infrared Thermography ISO Cat 1 (cont.)

Course Content (cont.)

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

Who Should Attend

Level 1 Certified Infrared Thermography Training Course is designed for the application of qualitative thermal imaging for Predictive Maintenance, Condition Assessment, Condition Monitoring, Quality Assurance, Forensic Investigations, and Building Sciences.

Get Certified!

Infraspection Institute

This program is compliant with international standards organisations ISO-18436 and ASNT SNT-TC-1A. This course is also approved by the International Association of Certified Home Inspectors and meets the training requirements for their Infrared Certified professional designation and logo.

Course Information	
Time	8.00am – 5.00pm
Days	5 days (including exam)
Course Fee†	$2,995 AUD + GST
Exam Fee*	Included
Course Type	Onsite and Public
Category	Work Identification
Certification*	Infraspection Institute Level 1 Certified Infrared Thermographer

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

* This course and examination can qualify you for the Level 1 certification in accordance with ASNT SNT-TC-1A.

Also Available
Infrared Thermography Analysis ISO Cat 2 (pg. 68)
Infrared Thermography Analysis ISO Cat 3 (pg. 74)

Airborne Ultrasound ISO Cat 1

Course Overview

This course covers theory and principles of ultrasound, equipment operation and selection, standards compliance, data acquisition and report generation, as well as principles of reliability and condition monitoring.

Specific Applications include: electrical distribution systems, mechanical systems, bearing lubrication, air and steam system efficiency, hydraulic systems.

Course Content

Principles of ultrasound

- Basics of sound
- Sound wave motion
- Acoustic impedance and its influence on propagation and attenuation
- Inverse distance law
- How friction, turbulence, and impacting produce ultrasound and where they apply
- Understanding the properties of the decibel

Generic equipment knowledge

- Instrument operation and function
- Airborne sensors
- Structure-borne sensors
- Heterodyne principle and application
- Sensitivity validation

Data acquisition in ultrasound

- Principles of data acquisition
- Sensor positioning
- Competing ultrasound and shielding techniques
- Measurement of ultrasound
- Capturing time domain and spectrum signals for analysis

Data storage and management

- Developing and using a database
- Managing stored data

Condition monitoring principles

- What is condition monitoring?
- Why is it useful?
- What other technologies are there?
- Why and when would ultrasound be useful?
- Acceptance testing

Applications to machine systems

- Leak Detection
  - Turbulence and flow
  - Directionality
  - Measurement precautions
  - Pressurised gases and compressed air
  - Vacuum
  - Tightness testing using the ultrasonic tone method
- Valve inspection to identify:
  - Blocked
  - Passing
  - Cavitating
- Steam Traps
  - Using ultrasound
  - Combination with temperature
  - Reporting techniques
- Electrical Inspection
  - Corona, tracking, and arcing
  - Internal partial discharge
  - Safety concerns
- Hydraulic systems inspection
  - Cylinders, valves, and pumps
- On-condition bearing lubrication
  - Trending values
  - Ultrasonic lubrication process considerations
  - Under and over-lubricated bearings
  - Bearing defect detection
  - Slow speed bearing inspection
  - Gearing inspection
  - Pump inspection - cavitation
  - Motor inspection and the effect of variable speed drives

Severity determination

- Trending decibels
- Time signal analysis
- Spectrum analysis
- Case studies

Program implementation

- Routine inspection considerations
- Routine management

Reporting and corrective action

- Key information needed
- Tracking corrective action outcome

Personal safety

Get Certified!

This program meets the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice, SNT-TC-1A, and is in accordance with ISO 18436-8.

Course Information	
Time	8.00am – 5.00pm
Days	5 days
Course Fee†	$2,995 AUD + GST
Course Type	Onsite and Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

WI201

Condition Based Maintenance

Course Overview

This course will introduce the various concepts of Condition Based Maintenance. Students will be able to understand and operate the various tools used in identifying machinery health problems and describe the machine condition to provide measurable improvements in performance.

The course will particularly emphasize the use of machinery vibration as a tool to determine machine health and identify root cause problems.

Course Objectives

Teach students how the principles of changes in health, or condition of a machine often produce changes in the machine's vibration.

- Students will be able to determine the condition of machinery as it operates, to schedule the most efficient and effective repair of problem components prior to failure.
- Ideal condition based model - detection, overall analysis, correction, verification. Examples of condition based parameters - vibration, temperature, thermography, ultrasonics.
- Introduce the concept of vibration and how it applies to bearing vibration analysis in the detection of bearing defects and faults
- Brief introduction of spectrum analysis, and an overview of how analysts recognise and analyse typical machinery problems.
- Setting up overall vibration measurement and other parameter results onto trend charts, types of condition monitoring alarms, vibration signal processing methods.

Course Content

- Common types of Maintenance
- Basics of Condition Monitoring Technologies
- What is Vibration?
- Setting up for Vibration Measurement and other measurable parameters.
- Introduction to Infrared Thermography - Cameras and Thermometers
- Introduction to Lubricant Analysis
- Introduction to Motor Diagnostics
- Introduction to Ultrasonics and Acoustics

Practical exercises using all of the tools as discussed during the course

Who Should Attend

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.

Pre-Study

E-Learning courses

Vibration Basics

Shaft Alignment Basics

Reading material

Introduction Guide to Vibration Monitoring

Post-Study

E-learning Course

Thermography Basics

Reading material

Vibration Principles

Recommended initial alarm criteria for bearing condition assessment

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee†	$895 AUD + GST
Course Type	Onsite and Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

WC200

Maintenance Planning and Scheduling

Course Overview

Planning and scheduling is one of the most important activities to increase the efficiency in a maintenance organisation and to reach "Maintenance in World Class." Surveys show that planning increases the productivity of work performance by as much as 77%.

The service technician needs to communicate and cooperate in the right way with schedulers, work management, and production/operations. This requires a clear and communicated work process among the personnel involved, and not least, knowledge and skills necessary for planning and scheduling of maintenance job plans.

Course Content

The objective of this training is to give the basic principles for planning and scheduling of maintenance work. The participants will understand the necessity of planned work and its effect on interest groups and on maintenance measurements.

Course Topics

The course contains the following topics:

- Roles and responsibilities
- Work flow
- Error notification
- Prioritising of work orders
- Planning
  - Theory
  - The process
  - Standard work
  - Planning and reservation of material
- Scheduling
  - Theory
  - The process
  - Handling of backlog
- Efficient planning and scheduling meetings
- Shutdown planning
- Improvements
- Follow up and key performance indicators (KPIs)

Key Learning Outcomes

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

Who Should Attend

Personnel from Production/Operations and Maintenance/ Planners and Schedulers and Personnel responsible for Spare Parts

Pre-Study

E-Learning course

Spares Inventory Management and Optimisation

Reading material

Spare Parts Management
Inventory Management

Post-Study

Reading material

Calculating Wrench Time
Maintenance Planning and Scheduling Fundamentals
Planning, Scheduling, and Work Orders

Course Information	
Time	8.30am – 4.30pm
Days	2 day
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
Category	Work Control

WC230

Spare Parts Management and Inventory Control

Course Overview

In a maintenance repair and operating (MRO) environment, spares and inventory management refer to those activities in an organisation that ensure at any time the optimal and timely availability of spare parts in order to meet maintenance demands. In today's competitive environment, it is important that the management and optimisation of spares inventory is always considered in the context of supporting the maintenance function to meet its operational and business goals. Simply reducing inventory is not enough. Ideally, the aim must be to maintain sufficient inventory and no more such that production is never impacted by stock-outs whilst keeping inventory costs to a minimum. In this way, inventory management and optimisation add real value to any business.

Course Objective

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, structure, and classifying spare parts on their criticality, (re)order parameters, and other spare parts characteristics
- Applying basic analysis techniques to optimise the availability of spares and cost-effectively handle obsolete spares
- Key institutes and reference material on spare parts and inventory 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.

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

Pre-Study

E-Learning course

Spares Inventory Management and Optimisation

Reading material

Spare Parts Management
Inventory Management

Post-Study

Reading material

Planning, scheduling and work orders
Tools management
Supply chain management

Course Information	
Time	8.30am – 4.30pm
Days	2 day
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
Category	Work Control

WE241

Precision Maintenance Skills

Course Overview

This course will teach the mechanic an understanding of the precision and proactive practices necessary to maintain a machine to the highest possible level. Students will learn techniques that aid in the assembly and setup of machinery that provide measurable improvements in machine performance as measured with basic vibration readings.

Students will also understand the current trends in maintenance methodologies, and how precision and proactive approaches and their direct interaction with machinery fit into an overall reliability program.

Course Content

Overview of Proactive and Maintenance

- Proactive maintenance as part of an overall maintenance strategy
- Relationship between failures and their sources
- Impact of maintenance practices on machinery

Fundamentals of Machine Condition

- Vibration as an indicator of machine health and an indicator of precision
- Introduction to condition monitoring terminology and technologies
- Indications of machinery health problems
- Basic vibration measurements
- Relationship between the components in the machine and vibration frequencies
- Fault diagnosis

Machinery Troubleshooting

- Machinery troubleshooting process
- Identification of the true root cause – cause and effect relationships
- Analysis techniques
- Resonance troubleshooting

Precision Shaft Alignment

- Need for precision
- Misdiagnosis and thermal growth correction
- Types of misalignment
- Alignment tolerances
- Precision versus manufacturer's and industry specifications
- The different alignment methods – advantages, disadvantages
- Misalignment effects on bearing loads, seals and motor load

Improving Rotor Balance through Precision Assembly

- Troubleshooting and analysis techniques
- Practical methods with basic instruments
- Examples of advanced techniques used by analysts
- Proactive and precision tolerances
- The effects of assembly on rotor balance

Belt-Driven Machinery

- Identification of common belt drive configurations
- Troubleshooting techniques
- Practical assembly methods with basic instruments
- Examples of advanced techniques used by analysts
- Belt failure modes – root cause analysis
- Pre-alignment / belt installation and inspection

Maximising Roller Bearing Life

- Introduction to proactive bearing installation
- Failure detection methods
- Basic seal types - installation and lubrication
- Progression of typical bearing failures
- Practical inspection methods with basic instrumentation
- Advanced methods used by vibration analysts
- Bearing, shaft and housing tolerances and fits
- Relationship of tolerance, clearance, and bearing precision
- Functions of lubrication

Lip and Mechanical Seals

- Maximising life
- Controlling and positioning of shafts

CONTINUES NEXT PAGE

Precision Maintenance Skills (cont.)

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.

Industries that will benefit

- Food and Beverage
- Cement
- Mineral Processing
- Pulp and Paper
- Pharmaceutical
- Petrochemical
- Municipal Utilities
- Maintenance Contractors
- Pump Manufacturers
- Mining
- Steel
- Printing
- Oil and Gas
- Manufacturing
- Power Generation
- Motor Rewinders
- Timber
- Chemical

Pre-Study

E-Learning courses

Vibration Basics
Shaft Alignment Basics

Reading material

Shaft couplings

Post-Study

E-Learning course

Proactive reliability maintenance

Reading material

Belt alignment
Roller chain drives

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee	$14,400 AUD + GST per class
Course Type	Onsite
Category	Work Execution

WE201

Bearing Technology and Maintenance

Course Overview

Learn world's best practice in bearing applications, principles of mounting and dismounting from engineers using the correct fitting and removal tools and techniques including clearance reduction, axial drive up, hydraulic nut withdrawal sleeve and oil injection methods.

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

Target Audience

Maintenance Technicians - understand how to fit and remove bearings using the correct tools and techniques, lubrication and cleanliness, bearing storage and handling

Reliability and Engineering - selection of the right bearing, lubricant and sealing arrangements for specific applications, appropriate dimension and for housings and shaft, incorporate appropriate bearing mounting and dismounting requirements into the design and work instructions.

Pre-Study

E-Learning courses

Bearing Basics

Deep Grove Ball Bearings

Reading material

Bearing Basics

Post-Study

Reading material

Bearing Dismounting Methods
Tips for Bearing Mounting
Proper bearing handling and storage

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee†	$1,695 AUD + GST
Course Type	Onsite and Public
Category	Work Execution

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

WE203

Introduction to Lubrication and Contamination Control

Course Overview

This course is designed to help students attain a solid start in lubrication, contamination control and how to look after machinery generally. This introductory course will focus on the fundamentals of lubrication, lubricant types, lubricant selection, consequences of incorrect selection, and storage, handling and cleanliness. This course is delivered with an emphasis on a practical understanding of a proactive approach to lubrication and contamination management.

Course Content

Maintenance Strategies – Best Practice Structuring

- Understanding maintenance strategies – reactive, preventative, predictive, proactive and optimising
- Why machines fail prematurely – understanding root causes
- The role of effective lubrication in failure avoidance
- Oil analysis and technologies to assure lubrication effectiveness

Contamination Mechanics – A Proactive Lubrication Approach to Reliability

Proactive lubrication and contamination control – lubricant storage and use, contamination exclusion, removal and measurement
Phase (1) – Setting goal based target limits
Phase (2) – Employing actions and equipment to achieve goal based target limits
Phase (3) – Measurement of results and achieving goal based target limits

Lubricant Application

- Basic calculations for determining required lubricant volume
- Basic calculations to determine re-lube and change frequencies
- When to select oil and when to select grease
- Effective use of manual delivery techniques
- Automatic delivery systems
  - Automated deliver options
  - Automated grease systems
  - Oil mist systems
  - Drip and wick lubricators
- Deciding when to employ automated lubricators
- Maintenance of automated lubrication systems

Lubricant Storage and Management

- Lubricant receiving procedures
- Proper storage and inventory management
- Equipment tagging and identification
- Lubricant storage containers
- Lubricant routes and scheduling
- Proper storage of grease-guns and other lube application devices
- Maintenance of automatic grease systems
- Health and safety assurance

Lubricant Conditioning and Quality Control

- Filtration and separation technologies
- Filter rating
- Filtration system design and filter selection

Basic Grease Lubrication and Properties

- How grease is made
- Thickener types
- Thickener compatibility
- Grease lubricant physical, chemical and performance properties and classifications

Note: On completion of this (1) day course, students may choose to continue with the remaining (2) days of training and sit the ICML MLT-1 or MLA-1 Certification Exam. Or, you may return at a later date to complete the final (2) days of training required for ICML Certification.

Pre-Study

E-Learning course

Lubrication management

Reading material

Lubrication management

Post-Study

Reading material

Lubricant Monitoring and Analysis
Grease life in lubricated-for-life deep groove ball bearings

Course Information	
Time	7.30am – 5.00pm
Days	1 day
Course Fee†	$925 AUD + GST
Course Type	Onsite and Public
Category	Work Execution

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

Also Available
Root Cause Bearing Damage Analysis Level 2 (pg. 69)

WE270

Sealing Solutions Technology Seals for Rotary Applications

Course Overview

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.

This comprehensive course uses a combination of hands-on training, visual theory knowledge, case study participation and discussion opportunities.

Course Objective

- 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

Pre-Study

Industrial Seals Self Study Guide (supplied on request after enrolment).

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee†	$6,600 AUD + GST
Course Type	Onsite
Category	Work Execution

WE240

Precision Shaft - Laser Alignment

Course Overview

This course focuses on steps and procedures required to obtain a precision alignment, use of precision alignment tools, and documentation and reporting procedures. Students will have a good knowledge of measurement and alignment techniques and independently be able to perform measurements and alignments with laser based systems.

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

Industries that will benefit

- Food and Beverage
- Cement
- Timber
- Pulp and Paper
- Pharmaceutical
- Manufacturing
- Oil and Gas
- Municipal Utilities
- Motor Rewinders
- Mining
- Steel
- Mineral Processing
- Chemical
- Printing
- Petrochemical
- Power Generation
- Pump Manufacturers
- Maintenance Contractors

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

Pre-Study

E-Learning Course

Shaft Alignment Basics

Reading material

Machinery mounting
Belt Alignment

Post-Study

Reading material

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

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee†	$895 AUD + GST
Course Type	Onsite and Public
Category	Work Execution

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

WE250

Dynamic Balancing

Course Overview

This course delivers hands-on balancing exercises, using demo rotor kits and instruments using optical, laser and strobe light accessories for phase reference. Proper vibration analysis techniques are reviewed to differentiate imbalance from other problems such as misalignment and resonance. Course features case histories to illustrate single plane (static), two-plane (dynamic) and the static and couple approach to balancing rotors of all types.

Key Learning Outcomes

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.

Course Objectives

- 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 out of balance equipment

Course Content

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/out of balance is determined and compared to specification requirements
- Out of balance readings are recorded to prescribed procedures

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.

Industries that will benefit

- Cement
- Food and Beverage
- Mineral Processing
- Motor Rewinders
- Petrochemical
- Power Generation
- Pulp and Paper
- Steel
- Chemical
- Manufacturing
- Mining
- Municipal Utilities
- Pharmaceutical
- Printing
- Oil and Gas
- Timber

Pre-Study

E-Learning courses

Bearing Basics
Balancing Theory: Part 1

Balancing Practice: Part 2

Reading material

Balancing

Post-Study

E-Learning course

Shaft Alignment Basics

Reading material

Precision balancing
Machinery mounting

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee†	$6,600 AUD + GST
Course Type	Onsite
Category	Work Execution

WE290

Power Transmission – Application, Assembly and Maintenance

Course Overview

Power Transmission components are vital elements in a rotating machinery system and require the same attention to detail as bearings and seals to achieve optimum life. Aspects of power transmission reliability include inspection, monitoring, correct assembly, and system optimisation to achieve maximum life.

This course shows the way to assemble and maintain power transmission components: belts, chains, and couplings.

Course Objective

- Learn the operating principles of a range of mechanical drives and transmissions
- Understand techniques, tools and equipment to measure components
- Learn to recognise 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 the fault/ failure
- Undertake appropriate testing and diagnoses of power transmission systems

Course Content

This course will focus on the installation, maintenance, troubleshooting and repair of the most common types of Power Transmission components: Belts, Chains and Couplings.

- Principles and functions of mechanical drives and mechanical transmission components
- Install and adjust mechanical drives and transmission assemblies
- 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
- Fault Diagnosis and preventative measures to avoid re-occurrence
- Repair and Troubleshoot mechanical drives/ transmission assemblies

Who Should Attend

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

Pre-Study

E-Learning courses

Balancing Theory: Part 1

Balancing Practice: Part 2
Shaft Alignment Basics

Reading material

Shaft couplings

Post-Study

Reading material

Roller chain drives
Clutches
Industrial brakes

Course Information	
Time	8.30am – 4.30pm
Days	1 day
Course Fee†	$6,600 AUD + GST
Course Type	Onsite
Category	Work Execution

WE247

Operator Asset Care

Course Overview

Operator Asset Care is considered an integral element of a plant's Total Plant Reliability strategy. This training course will teach the machine operator to perform day to day tasks of basic maintenance and fault finding, such that the operator can help prevent and/or predict potential problems, addressing them before they can impact production. And by doing so, decrease downtime and increase plant productivity.

Course Objective

- Make participants familiar with the main transmission systems
- Allow them to understand what accelerates the deterioration of transmission system, and leads to system failures.
- To teach participants about the primary inspections carried out to identify abnormalities and prevent transmission system failures.

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.

Who Should Attend

Operations, Maintenance and Lubrication staff responsible to physically inspect and verify the operating condition of work areas, processes, and plant assets.

Course Content

Introduction to Transmission Systems

- What is a transmission system?
- Safety elements
- Control elements
- Mechanical elements
- Inspection sheets

Bearings

- Scope of bearings and how bearings look
- Recognise main bearing type
- How bearings get damaged
- Importance of proper lubrication
- Importance of keeping cleanliness
- Importance of proper installation
- Bearing Failures Detection -> Inspection
- How housings look like
- Importance of proper fastening
- Inspect Housings

Couplings

- Scope of couplings and how couplings look
- Recognise main coupling types
- Importance of shaft misalignment
- Coupling failure -> Inspection

Gears/Gearboxes

- Scope of gearboxes and how they look
- How gears get damaged
- Importance of lubrication and cleanliness
- Gearbox failures detection -> Inspection

Belts/Pulleys

- Scope of belt transmissions and how they look
- Recognise main belts/pulley type
- How belt drives get damaged
- Effects of pulley misalignment
- Effects of wrong belt tensioning
- Belts failures -> Inspection
- Replace belt drive

Driven Shaft

- Examples of driven shafts/application
- Effect of unbalance

Chains/Sprockets

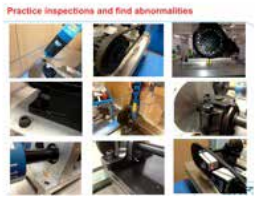
- Scope of chain transmissions and how they look
- Recognise main chain type
- Chain failures -> Inspections

Final Inspection

- Transmission bench inspection

Practical Session - SKF Transmission Demo Bench

This Transmission Bench has been made specifically for operators to understand, by visual practical tests, how an elementary transmission system runs in normal and bad condition.



Transmission Systems included in this training:

- Bearings
- Electric Motors
- Coupling
- Gears and Gearboxes
- Belt Drives
- Chain Drives

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$11,250 AUD + GST per class
Course Type	Onsite
Category	Maintenance Strategy
No. of Attendees	12 max

† Refer to Enrolment Form on page 91.

Level 2 Courses

Courses in this section relate to methods, technologies and best practices to develop, implement and sustain precision and proactive maintenance practices towards a goal of improved reliability and profitability.

MS332

Reliability Centred Maintenance (RCM)

Course Overview

The purpose of this course is to broaden the knowledge of the Reliability Centered Maintenance (RCM) process and illustrate how RCM can apply within an industry neutral application. RCM introduces basic concepts for asset management. Identify what is important, define what should be done, and change the existing programs is what RCM practitioners will possess and commune when applying the RCM process.

We will also study some techniques that will engage people to change the existing program, as well as explore general RCM project steps.

Course Content

Module I: Introduction

- Discuss RCM terminology

Module II: RCM overview and business context

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

Module III: RCM phase "what is important?"

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

Module IV: RCM phase "what should be done?"

- Know what important failure characteristics are
- Know when to decide RTF maintenance
- Know when design changes are required
- How to prescribe maintenance to critical assets

Module V: RCM customisation and requirements

- Understand RCM customisation
- Understand the use of RCM template data
- Determine what data is required for RCM
- Become aware of the asset management support tool (AMST)

Module VI: Implementation and improvement

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

Module VII: RCM project

- Know the steps in a RCM project

Module VIII: RCM project

- Understand the evolution of RBI
- Understand variations of RBI
- Understand the requirements for RBI

Course Objective

Upon completion of this course, students will have the knowledge to:

- Know how to describe RCM process flow
- Understand the differences in RCM approach
- Recognise the importance of data structure and content before performing any kind of strategy work
- Understand the importance of identifying and categorising assets
- Understand criticality and the FMECA approach in RCM
- Understand how to develop an RCM analysis as well as what the implications are of making the strategy work
- Understand why to conduct a task comparison
- Understand what work packaging is
- Understand methods needed for RCM implementation
- Recognise what a living program is
- Know the content of a RCM project plan
- Understand what risk based inspection (RBI) in the asset management support tool AMST is

Pre-Study

Reading material

Using an RCM Approach for Process Hazard Analysis Revalidation
Reliability Centered Maintenance
Risk based inspection

Post-Study

E-Learning courses

Asset Efficiency Optimisation (AEO) Basics
Assessment Basics

Reading material

Methodology SRCM

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee	$16,250 AUD + GST per class
Course Type	Onsite
Category	Maintenance Strategy

MS300

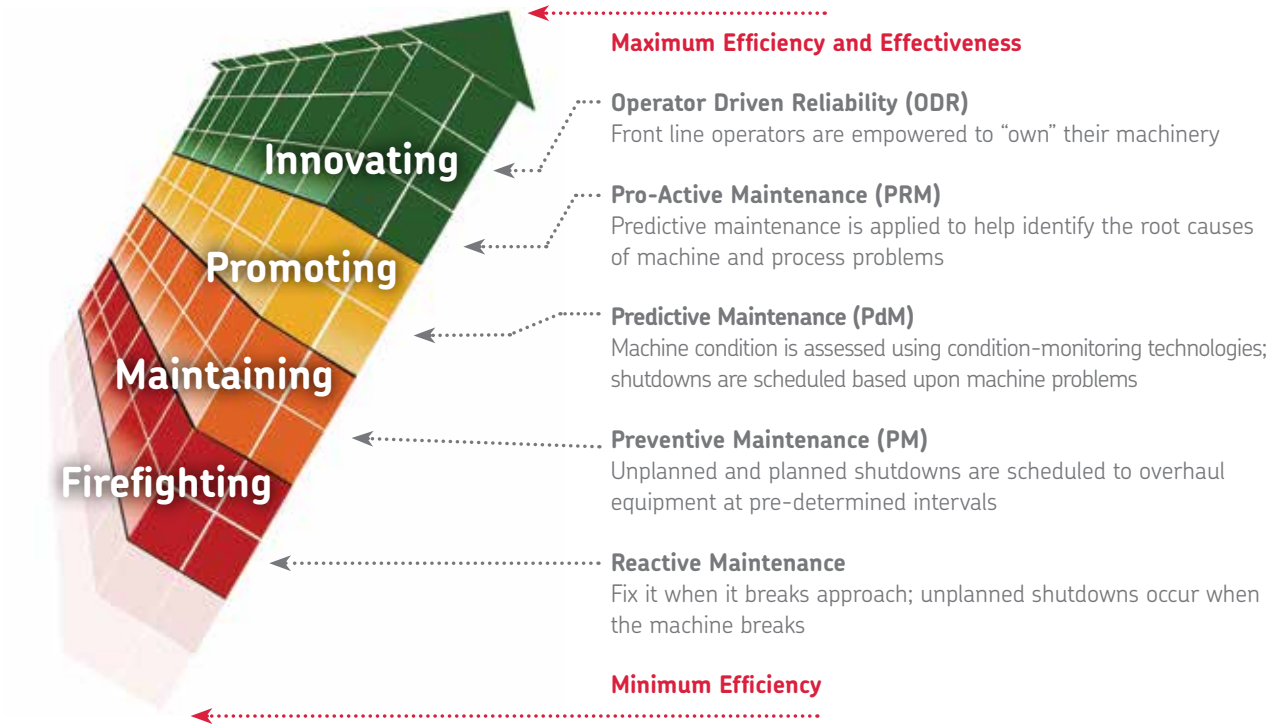
Optimising Asset Management through Maintenance Strategy

Course Overview

This course relates to methods, technologies and best practices used to develop, implement and sustain your optimised maintenance strategy and guides you to benefit from the living program for continuous improvement.

Course Objective

- To understand the spectrum of asset management
- Ability to assess the situation, maturity and needs of an organisation
- Knowledge and understanding in describing and judging 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 on Reliability Centred Maintenance (RCM), optimise spare parts requirements, develop, improve or implement the Management of Change (MoC) process



CONTINUES NEXT PAGE

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 I
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 II
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 III
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.

Pre-Study

E-Learning courses

Proactive reliability maintenance

Operator Driven Reliability

Reading material

Asset Management

Post-Study

Reading material

Asset register
Asset Efficiency Optimisation

Course Information	
Time	8.30am – 4.30pm
Days	4 days
Course Fee	$19,500 AUD + GST per class
Course Type	Onsite
Category	Maintenance Strategy

WI203

Vibration Analysis ISO Cat 2

Course Overview

The Vibration Analysis Level 2 course is intended for personnel who have at least 12 months vibration analysis experience, and who need to be able to take good data (and decide how the data collector should be set up); analyse a range of fault conditions; and understand balancing and alignment.

Do you already have an understanding of vibration fundamentals and want to become more confident and accurate in your diagnoses? Then you will enjoy this course!

Course Content

The course provides a comprehensive study of machinery faults and their associated spectrum, time waveform and phase characteristics. Additional topics covered include: signal processing, data collection, and corrective active actions.

Review of maintenance practices

Review of condition monitoring technologies

Principles of vibration

- Complete review of basics
- Waveform, spectrum (FFT), phase and orbits
- Understanding signals

Data acquisition

- Transducer types, selection, and mounting
- Measurement point selection
- Following routes, test planning, measurement errors

Signal processing

- Filters, sampling, aliasing, dynamic range, windowing
- Resolution, Fmax, data collection time, averaging

Vibration analysis

- Spectrum analysis methodology
- Introduction to timewaveform, phase and orbit analysis
- Enveloping, shock pulse, spike energy, Peak Vue

Detailed fault analysis

- Natural frequencies and resonances
- Imbalance, eccentricity and bent shaft
- Misalignment, cocked bearing and soft foot
- Mechanical looseness
- Rolling element bearing analysis
- Analysis of induction motors, gears, belts, pumps, compressors and fans
- Lots of case studies and exercises for participants

Equipment testing and diagnostics

- Impact testing (bump tests)
- Phase analysis

Corrective action

- General maintenance repair activities
- Review of the balancing and shaft alignment process

Successful condition monitoring program

- Setting baselines and alarm limits
- Report generation, reporting success stories

Acceptance testing and ISO standards

Key Learning Outcomes

You will come away from this course with a solid understanding of:

- Well designed program and the reliability centered maintenance approach (with precision balancing, alignment, lubrication and resonance control) will improve the OEE and therefore the bottom line
- Condition Monitoring Technologies: acoustic emission, infrared thermography, oil analysis, wear debris analysis, electric motor testing
- How machines work – via supplementary self-study using the "Equipment Knowledge" section
- Select the correct measurement location and axis, and collect good, repeatable measurements
- What the Fmax, resolution, averaging and other analyser setting mean, and how to select the optimum settings for a wide variety of machine types
- Analyse vibration spectra, time waveforms, envelope and phase measurements
- Diagnose a range of fault conditions: unbalance, eccentricity, misalignment, bent shaft, cocked bearings, looseness, rolling element bearings faults, journal bearing faults, gearbox faults, resonance, and other conditions
- How to set alarm limits manually and with statistics
- How to balance and align a machine, and correct a resonance condition

CONTINUES NEXT PAGE

Vibration Analysis ISO Cat 2 (cont.)

Get Certified!

The training course strictly follows ISO 18436-2 and 18436-3. The optional Certification Exam is provided by Mobius Institute Board of Certification, which is ISO/IEC 17024 accredited in accordance with ISO 18436-1 and ISO 18436-2. Students who meet the experience requirements, complete the course and pass the examination will become certified according to ISO 18436-1 and ISO 18436-2, providing the highest recognised certification available anywhere.

Who Should Attend?

If you have been performing vibration analysis for more than six months and feel that you have a good understanding of the fundamentals, then you are ready to step up to the Category II course. (Note that 18 months experience is required to be certified). Anyone who wants to be capable of confidently diagnosing a wide range of fault conditions, correcting certain conditions, and taking accurate measurements, needs to take this course.

Course Information	
Time	8.00am – 5.00pm
Days	4.5 days + 0.5 day exam
Course Fee†	$3,120 AUD + GST
Exam Fee	$380 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification	Vibration Analyst 2

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

Also Available
Vibration Analysis ISO Cat 3 (pg. 72)

WI245

Machinery Lubrication and Oil Analysis ISO Cat 2

Course Overview

Learn how to read and understand oil analysis reports, set optimum oil analysis limits, reduce oil consumption and achieve maximum life out of lubricants.

Course Objectives

Most maintenance programs achieve only 10% of the benefits available from oil analysis. Learn how to get the most out of oil analysis by attending these powerful training sessions.

Key Learning Outcomes

- Read and understand oil analysis reports
- Tell if you are using the wrong oil
- Squeeze maximum life out of lubricants
- Set optimum oil analysis limits
- Reduce oil consumption for easy, near-term savings

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.

If you have any of the following machines this training is a must

- Gear Boxes
- Motor Bearings
- Final Drives
- Paper Machines
- Steam Turbines
- Blowers/Fans
- Hydrostatic Transmissions
- Hydraulic Systems
- Compressors
- Diesel Engines
- Process Pumps
- Gas Turbines
- Rolling Mills

Course Content

Introduction to Machinery Lubrication

- Oil formulation and its importance in effective machinery lubrication
- Key functions of lubricating oils
- Primary lubrication regimes
- Introduction to base oils and additives
- Choosing the correct base-stock
- Conditions that dictate use of synthetic oils
- Antioxidant additives and their role in oil life
- Dispersants and detergents - the key to controlling soot
- Controlling wear with additive chemistry

Oil Sampling - The Very Best Practices

- Simple steps to reliable and easy oil sampling
- How to find the best sampling location
- Sampling splash- collar- and ring-lubricated systems
- How to sample circulating systems
- Safe, effective high-pressure sampling from hydraulic systems
- Using primary and secondary sampling points
- A quick method for optimising sampling intervals
- How clean should sample bottles be?
- Sampling valves and hardware recommendations

Fundamentals of Friction and Machine Wear

- Primary sources of friction in lubricated machinery
- Wear mechanisms that reduce machine life
- The most common wear modes in plain, rolling element and thrust bearings
- Understanding gear wear
- Understanding wear in hydraulic systems

CONTINUES NEXT PAGE

Machinery Lubrication and Oil Analysis ISO Cat 2 (cont.)

Machine Fault Detection and Debris Analysis

- How wear metals are measured using RDE and ICP spectrometers
- Measuring larger particles with Rotrode Filter spectroscopy
- Using ferrous density to determine the severity of a wear problem
- Using analytical ferrography for advanced fault detection
- Using ferrography for root cause analysis Fluid Properties Analysis
- Common root causes of oil degradation
- Recognising and controlling oil oxidation
- Monitoring lubricant degradation using acid number
- Monitoring lubricant health using FTIR
- Determining oil life using RPVOT
- Recognising and controlling thermal failure
- How to recognise additive depletion or degradation
- Using paper chromatography (blotter spot test) to detect additive and base oil degradation
- Ways to detect the addition of wrong oil

Contamination Control and Proactive Maintenance

- Common contaminants
- Oil cleanliness and oil life extension benefits
- Using the ISO Solid Contamination Code
- Proactive maintenance in three easy steps
- Case studies for proactive maintenance
- Oil filter and breather recommendations
- Portable filtration carts - three ways to use them
- Setting targets for oil cleanliness
- Detecting and controlling moisture contamination
- Selecting moisture removal/filtration methods
- The effects of heat on lubricants
- Controlling air entrainment and foam
- Glycol contamination
- Dealing with soot
- Understanding fuel contamination

Onsite Tests

- How to inspect vents and breathers
- Tips for effective sight glass inspection
- Getting valuable information from used filters
- Inspecting reservoirs for clues about lube trouble
- Getting visual clues from the oil sample before mailing it out
- Screening for water with a simple hot plate

Interactive Workshop

- Group participation in problem-solving exercises
- How to read an oil analysis report

Get Certified!

The International Council for Machinery Lubrication (ICML) will be conducting Machinery Lubrication exams, the morning following each course.*

*** Please confirm with SKF prior to the course**

Course Information	
Time	7.30am – 5.00pm
Days	3.5 days + 0.5 day exam
Course Fee†	$2,895 AUD + GST
Exam Fee*	$375 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification	MLA-2

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

* Examination fee can be arranged directly with ICML for $275 USD per person by visiting www.icmlonline.com/apply

Infrared Thermography ISO Cat 2

Course Overview

This course covers advanced infrared theory, equipment calibration, error sources, cross-verification with contact thermometers, advanced equipment operation, use of windows and filters, assigning temperature limits and repair priorities, and quantitative report generation.

Key Learning Outcomes

On completion of the course students will learn: Infrared Theory and Heat Transfer Concepts, Equipment Operation, Image Processing, General applications and imaging techniques, Program design and implementation, How to comply with Industry Standards, Image Analysis and Reporting

Course Content

Principles of infrared thermography (IRT)

- Heat and heat transfer
- Conduction fundamentals
- Conductivity/resistance
- Convection fundamentals
- Radiation fundamentals
- Electromagnetic spectrum
- Atmospheric transmission
- IR wavebands and lens materials
- Stefan-Boltzmann Law
- Emittance, reflectance and transmittance
- Emissivity
- Factors affecting emissivity

Thermometry Fundamentals

- Temperature scales and conversions
- Absolute and relative temperatures
- Classes and benefits of contact thermometers
- Classes and benefits on non-contact thermometers
- Identifying and reducing errors

Advanced Infrared Theory

- Units for measuring radiant power
- Relationship between power and temperature
- Planck's blackbody curves

Temperature Measurement Error Sources and Corrections

- Calibration
  - how IR sensors are calibrated
  - how to check calibration
  - calibration / accuracy specifications
- Reflectance
  - shielding techniques
  - measuring and compensating with direct and reflector methods
- Emittance
  - how emittance varies
  - using default and table values
  - how to measure Emittance
- Long Wave \ Short Wave
  - SW vs LW imagers
- Transmittance
  - filters to view through materials and atmospheres
  - filters to measure temperatures of material surfaces and atmospheres
  - measuring material transmittance
- Target Width / Distance Ratios
  - calculating target size / distance

Traceable Temperature Limits: How Hot is Too Hot

- Delta-T classifications
  - NETA, Mil Spec, and other standards
- Absolute temperature classifications
  - ANSI, IEEE, NEMA standards for electrical systems
  - correction formula for load and ambient temperature
  - other standards for mechanical systems
  - ISO18434-1
- Developing limits for your equipment

Preparing Quantitative Reports

- Data to gather
- Report procedures
- Image processing software capabilities
- Report generation software capabilities

Training Examination

- Written
- Practical

Who Should Attend

Level 2 Certified Infrared Thermography Training Course is designed for the application of qualitative thermal imaging for P/PM, Condition Assessment, Condition Monitoring, Quality Assurance, Forensic Investigations, and Building Sciences.

Get Certified!

Infraspection Institute

This program is compliant with international standards organizations ISO-18436 and ASNT SNT-TC-1A. This course is also approved by the InterNational Association of Certified Home Inspectors and meets the training requirements for their Infrared Certified professional designation and logo.

Course Information	
Time	8.00am – 5:00pm
Days	5 days
Course Fee†	$2,995 AUD + GST
Exam Fee	Included
Course Type	Onsite and Public
Category	Work Identification
Certification	Infraspection Institute Level 2 Certified Infrared Thermographer

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.* This course and examination can qualify you for the Level 2 certification in accordance with ASNT SNT-TC-1A

WE204

Root Cause Bearing Damage Analysis

Course Overview

This course is taught to the new ISO Standard 15243. Discussions include initial damage and failure causes, failure streams and visible conditions at the time of bearing removal. You will analyse actual bearings from a variety of distress, damage and failure conditions using our methodology to determine the root cause of the failure mechanism.

Key Learning Outcomes

On completion of this course, students will be able 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 knowledge

- Understand common bearing terminology
- Learn basic knowledge required for bearing damage analysis

Load path patterns in bearings

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

Methodology

- Understand why bearings fail in service
- Understand the concept of Root Cause Failure Analysis (RCFA)
- Perform bearing damage analysis including reporting

ISO 15243 – Bearing damage modes and classification

- Understand the main points that the ISO classification is based upon
- Understand the terminology and visual appearance of failure modes

Hands-on Analysis of sample bearing damages

- Inspect a series of sample bearing damages and report the findings
- Group discussion on the cases
- We encourage participants to bring a damaged bearing (and machine history) from their plant, to analyse during the workshop sessions

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
- Those interested in rolling bearing and rotating equipment performance

Pre-Study

E-Learning courses

Bearing Basics
Bearing Damage Classification

Reading material

Damage mechanisms

Post-Study

Reading material

Golden opportunities
Bearing failures and their causes
Root Cause Analysis

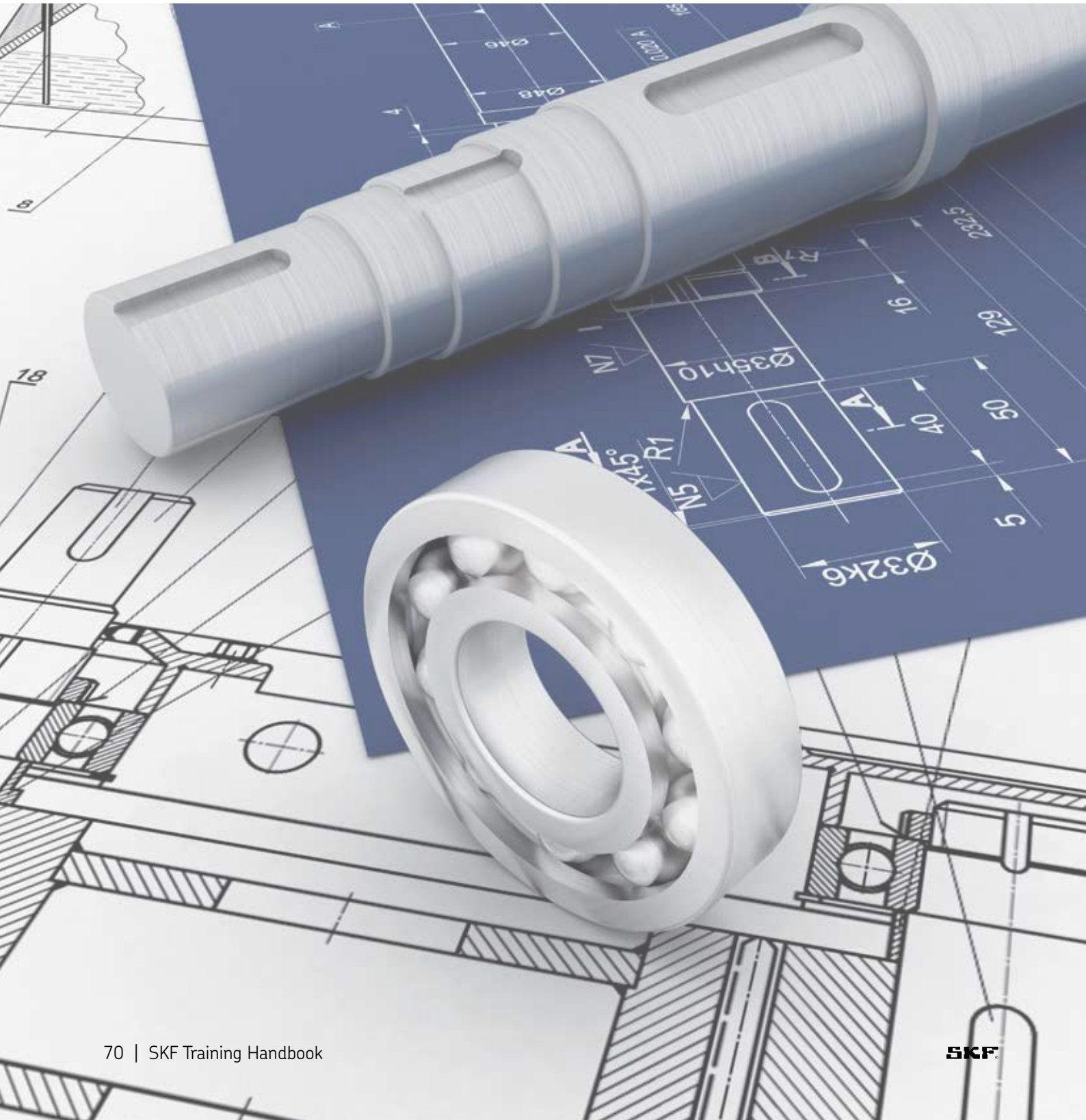
Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$1,695 AUD + GST
Course Type	Onsite and Public
Category	Work Execution

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

Also Available
Bearing Technology and Maintenance Level 1 (pg. 52)

Level 3 Courses

Courses in this section provide an advanced study in diagnosing the behaviour of rotating machinery of various types and classifications, to identify optimum required corrective actions.



OEM301

Bearing System Design

Course Overview

The Bearing System Design course is an advanced training that develops further understanding of rolling element bearing, seal and lubrication technologies and theories used in the selection process for typical industrial applications, with the ultimate objective of improving the life, functionality, and operational reliability of rotating equipment.

Course Content

Bearing theory
- Purpose of bearings
- Rolling element bearing history
- Rolling element contact behaviour

Bearing components and functions
- Rolling elements, rings and cages
- Component materials

Selection of bearing type
- Advantages and disadvantages of various bearing types
- Bearing features and functionalities

Selection of bearing size
- Determining loads and duty cycles
- Bearing life determination using:
  -Basic L10 method
  -Adjusted life method
  -Optimizing bearing life with the latest life methodologies
- Computer-based tools

Bearing dimensional tolerances
- Dimensional tolerance classes
- Internal clearances and preload classes

Friction and speeds
- Friction model within rolling element bearings
- Speed rating methodologies

Bearing system design
- Associated component design
- Locating and non-locating
- Shaft and housing fits
- Selection of internal clearance or preload
- Bearing material selection
- Mounting and dismounting considerations
- Sealing requirements
- Bearing types and integration

Lubrication
- Overview of bearing lubricants
- Selection of appropriate lubricant
- Lubricant life estimation
- Lubrication methods and applications

Machine system health
- Vibration
- Temperature
- Lubrication

Storage, shipping and handling
- Consequences
- Common failure modes

Who Should Attend

Design and application engineers directly responsible for machine design incorporating rolling element bearings or users interested in optimising performance in existing machinery.

Pre-Study

E-Learning course

Bearing Basics

Reading material

Using a friction model as an engineering tool
The SKF formula for rolling bearing life

Post-Study

Reading material

Rolling Bearings in Electrical Motors and Generators
Bearings for Fans

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Work Identification

WI204

Vibration Analysis ISO Cat 3

Course Overview

The Vibration Analysis Level 3 course is intended for personnel who have at least 2 years vibration analysis experience and a good understanding of vibration theory and terminology.

The course provides a comprehensive study of diagnostic measurement techniques, a wide range of analysis techniques, and the steps required to manage a successful condition monitoring program.

Key Learning Outcome

You will come away from this course with a solid understanding of: A well designed program and the reliability centered maintenance approach (with precision balancing, alignment, lubrication and resonance control) will improve the OEE and therefore the bottom line

- Condition Monitoring Technologies: acoustic emission, infrared thermography, oil analysis, wear debris analysis, electric motor testing
- Select the correct measurement location and axis, and collect good, repeatable measurements
- What the Fmax, resolution, averaging and other analyser setting mean, and how to select the optimum settings for a wide variety of machine types
- Analyse vibration spectra, time waveforms, envelope and phase measurements
- Diagnose a range of fault conditions: unbalance, eccentricity, misalignment, bent shaft, cocked bearings, looseness, rolling element bearings faults, journal bearing faults, gearbox faults, resonance, and other conditions
- How to use phase readings, bump tests, impact tests, negative averaging, peakhold averaging, ODS, and modal analysis to determine natural frequencies and visualise machine movement
- How to set alarm limits manually and with statistics
- How to balance and align a machine, and correct a resonance condition

Course Content

The focus of this course is on practical knowledge and understanding of machine knowledge, faults and how to recognize problems in time to plan for an outage and act before catastrophic failure or collateral damage takes place.

Principles of vibration

- Very quick review of fundamentals
- Waveform, spectrum, phase, vectors and orbits
- Signals: transients, pulses, modulation, beating, sum/difference
- Force, response, damping, and stiffness
- Cepstrum analysis

Data acquisition

- Planning routes, test locations and programs
- Signal processing
- Sampling, resolution, Fmax, averaging, windowing, dynamic range, signal-to-noise ratio
- A/D conversion: constant and variable sampling rate

Vibration analysis

- Spectral, time waveform and envelope analysis

Equipment testing and diagnostics

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

Fault analysis in detail

- Natural frequencies and resonances
- Imbalance, eccentricity and bent shaft
- Misalignment, cocked bearing and softfoot
- Mechanical looseness
- Rolling element bearing analysis
- Analysis of turbo-machinery and sleeve bearings
- Analysis of AC, DC and variable frequency drives
- Analysis of gears and belt driven machines
- Analysis of pumps, compressors and fans
- Lots of casestudies and exercises for participants

Corrective action

- Balancing and shaft alignment
- Resonance control, isolation and damping

Successful condition monitoring program

- Alarms, reports, management, finances
- Acceptance testing and ISO standards

CONTINUES NEXT PAGE

Vibration Analysis ISO Cat 3 (cont.)

Get Certified!

The training course strictly follows ISO 18436-2 and 18436-3. The optional Certification Exam is provided by Mobius Institute Board of Certification, which is ISO/IEC 17024 accredited in accordance with ISO 18436-1 and ISO 18436-2. Students who meet the experience requirements, complete the course and pass the examination will become certified according to ISO 18436-1 and ISO 18436-2, providing the highest recognised certification available anywhere.

Who Should Attend

It is expected that the participant is either the leader of the vibration team, or takes 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.

Course Information	
Time	8.00am – 5.00pm
Days	4.5 days + 0.5 day exam
Course Fee†	$3,520 AUD + GST
Exam Fee	$440 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification*	Vibration Analyst 3 Certification

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

* Certification complies with ISO 18436.2 Category 3 standard.

Infrared Thermography ISO Cat 3

Course Overview

This course covers advanced topics related to developing, implementing, and managing a successful infrared inspection program. Topics include: latest applications, hardware and software, current industry standards and specifications, OSHA and NFPA safety standards, marketing and promoting an infrared inspection program, thermography as legal documentation, heat transfer analysis software, current industry certification criteria, and how to develop and implement standards-compliant written practices and procedures.

Key Learning Outcomes

On completion of the course students will be able to understand advanced infrared theory, calibrate IR equipment to run advanced diagnoses and run quantitative reports. Students will also sit the Infraspection Institute Certified Level 3 Infrared Thermographer exam.

Course Content

Ensure a Successful Infrared Inspection Program

- Define a successful program and identify program obstacles
- Understand the requirements of OSHA, NFPA, and other regulatory agencies
- Identify and specify safe practices for performing IR inspections
- Eliminate recurring problems through application of Root Cause Failure Analysis

Explore Latest Technology

- Discover newest applications for infrared thermography
- Discuss features and benefits of new test equipment
- Utilise state-of-the-art software for data management and report generation
- Identify industry trends and business opportunities

Understand Industry Standards and Specifications

- Review current standards and specifications
- ASTM, ANSI, ASNT, Infraspection Institute, ISO, NETA, NFPA
- Examine current NDT certification programs
- Identify certification criteria
- Develop a written practice for thermographer certification using ASNT standards

Marketing and Promoting an Infrared Inspection Program

- Enlist principles of marketing to identify, position and price IR services
- Analyse best practices for effective promotion
- Discuss key elements for an effective website
- Explore e-commerce opportunities to increase revenue

Thermography and the Law

- Review importance of thermography as legal evidence
- Examine role of the thermographer as an expert witness
- Identify appropriate report content
- Learn cardinal rules for delivering testimony

Advanced Heat Transfer Theory and Applications

- Discuss heat transfer analysis software
- Learn how to quantify heat loss in structures, piping, and insulated systems
- Understand appropriate application of available software
- Recognise benefits of computer modeling for financial calculations

Integrating PdM Technologies

- Discuss role of thermography as a PdM technology
- Identify complementary PdM technologies
- Learn necessary steps to effectively implement a PdM program
- Ensure program longevity through proper planning and management

Who Should Attend

Be acknowledged at the highest level. Level III focuses on best practices for infrared thermographers. Level III Certified Infrared Thermographer® is focused on best practices for infrared inspections and associated activities. This course contains information vital to the long term success of any infrared inspection program.

Get Certified!

Infraspection Institute

This program is compliant with international standards organizations ISO-18436 and ASNT SNT-TC-1A. This course is also approved by the International Association of Certified Home Inspectors and meets the training requirements for their Infrared Certified professional designation and logo.

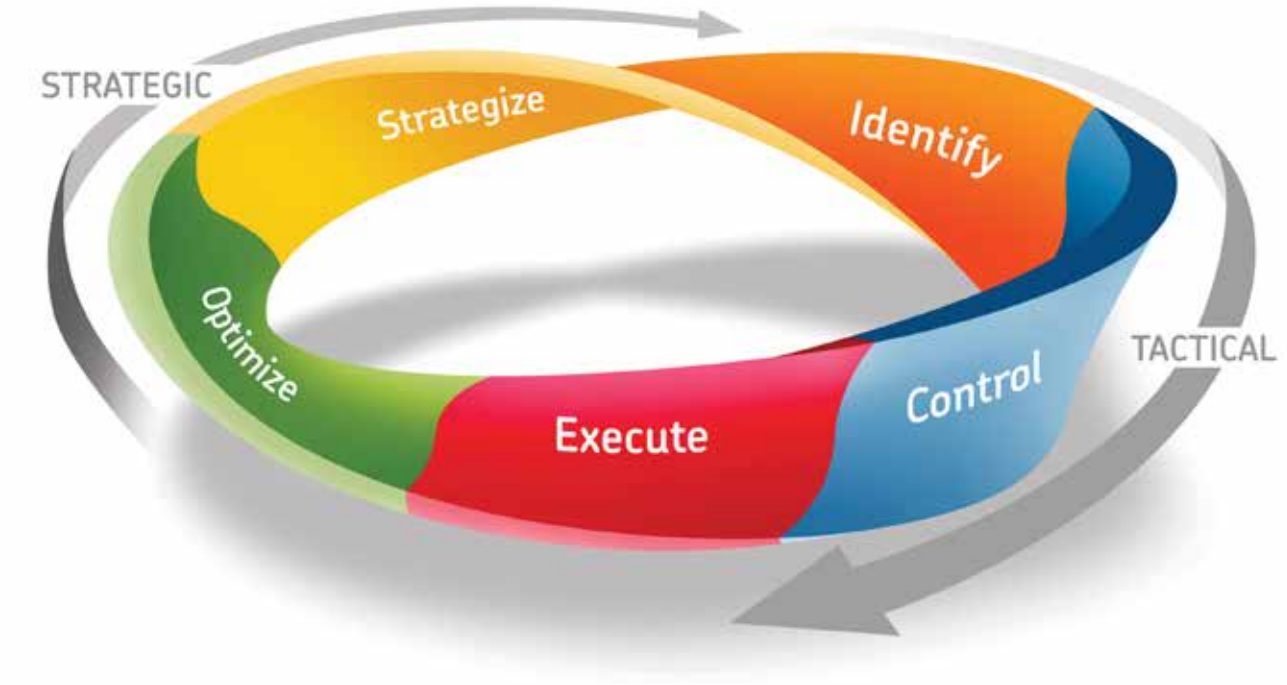
Course Information	
Time	8.00am – 5:30pm
Days	3 days
Course Fee†	$2,995 AUD + GST
Course Type	Onsite and Public
Category	Work Identification
Certification*	Infraspection Institute Level 3 Certified Infrared Thermographer

† Course fee is per person for a Public course. Contact SKF for Onsite course fee. Refer to Enrolment Form on page 91.

* This course and examination can qualify you for the Level 2 certification in accordance with ASNT SNT-TC-1A

Living Program

Courses in this section, relate to methods and technologies used to evaluate maintenance work and strategy, thereby "closing the loop" and making maintenance a continual improvement process.



LP200

Root Cause Analysis

Course Overview

This course provides a working knowledge of the Root Cause Analysis (RCA) methodology. It helps anyone to understand fundamental problem solving processes, examine the basic concepts of problem solving, how to facilitate an effective investigation and develop actionable solutions.

Key Learning Outcomes

- Understanding 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
- Becoming confident in building "why?" trees and the 7 steps of root cause study
- Students will be equipped with tools to resolve complex problems and think laterally to explore causes of a problem

Course Content

The key elements of Root Cause Analysis process discussed include:

- 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.
  - A 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 causes
  - Technical causes
  - Human causes
  - Organisational causes

Only when all three types of causes have been exposed, can the RCA be considered complete

- Propose practical actions that will address 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 KPI's

Who Should Attend

Anyone whose job involves problem solving, safety, reliability, quality control, operations and logistics, production line or anyone who wants to eliminate recurring failures and improve efficiency.

Pre-Study

E-Learning Course

Assessment Basics

Reading material

GS02003 Root Cause Analysis
GS04003_Root Cause Analysis_tcm_12-81154

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Living Program

LP240

Life Cycle Costing

Course Overview

Life Cycle Costing can be used to inform decision makers about acquiring, construction, operating, maintaining, modifying, and disposing of assets. It is a method of determining total cost of ownership of an asset. It takes the form of a structured approach that addresses all of the elements of this cost and used to produce a cash flow profile of the asset over its anticipated lifespan.

Key Learning Outcomes

Upon completion of this "Life Cycle Costing" (LP240) course, attendees will be able to:

- Understand the theory and application of Life Cycle Costing and its benefits
- Be equipped with the necessary knowledge and abilities to gather relative data and create Life Cycle Cost (LCC) models
- Develop the relevant data required for a LCC model
- Discount future cash flows using the appropriate discount factors
- Develop LCC models
- Develop sensitivity models

Course Content

Life Cycle Costing (LCC)

- What is LCC?
- Why do we need LCC Analysis?
- Benefits of LCC
- Who needs to be involved?
- Principles

The Process

- Fundamental Cost Types

The Methodology of LCC

- The Basis for LCC Analysis
- Cost Breakdown Structure (CBS)
- Cost Estimating
- Other Issues

Discounting and Its Effect

- Concept of Discounted Cash Flow (DCF)
- The Time Value of Money
- Normal, Real, and Discount Costs
- Inflation
- Discounting Future Costs – Net Present Value (NPV)
- Cash Flow Determination

Internal Rate of Return (IRR)

- Internal Rate of Return

Capital Expenditure (CAPEX) and Operational Expenditure (OPEX)

- CAPEX
- OPEX
- The Need for LCC

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee	$11,250 AUD + GST per class
Course Type	Onsite
No. of Attendees	12 max
Category	Living Program

LP300

SiteMentor Training Implementation Support

Course Overview

This course provides a solid foundation in proactive maintenance practices, which is critical to achieve maximum machine reliability and performance. SiteMentor helps you uncover problem areas and implement improvement methods. Each SiteMentor training session is custom tailored to your industry and working environment, and requires from three-to-five days on site.

Course Content

Sessions typically start with a short classroom review and demonstration on the topics being covered—then it's off to the site to learn.

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

Course Objectives:

An effective training implementation support will translate the generic knowledge gain and relate it to specific tasks.

Ideally task analysis should be performed with the use of maintenance personnel and validated by management. SKF can assist you to build a training implementation support program which could include the following:

- Development of detailed work packages for critical tasks on critical assets that include step by step work instructions, inspection criteria, specifications, fits, tolerance, spares and special tools required for the task.
- Identification of specific tooling requirement related to the tasks, assist and support team members in securing the same and facilitate training on the special tools as required.
- Train team members on task execution based on the developed work packages and the delivered technical training
- Mentor team members through audits and assessments of task execution to embed and perpetuate best practice in maintenance execution.

Who Should Attend

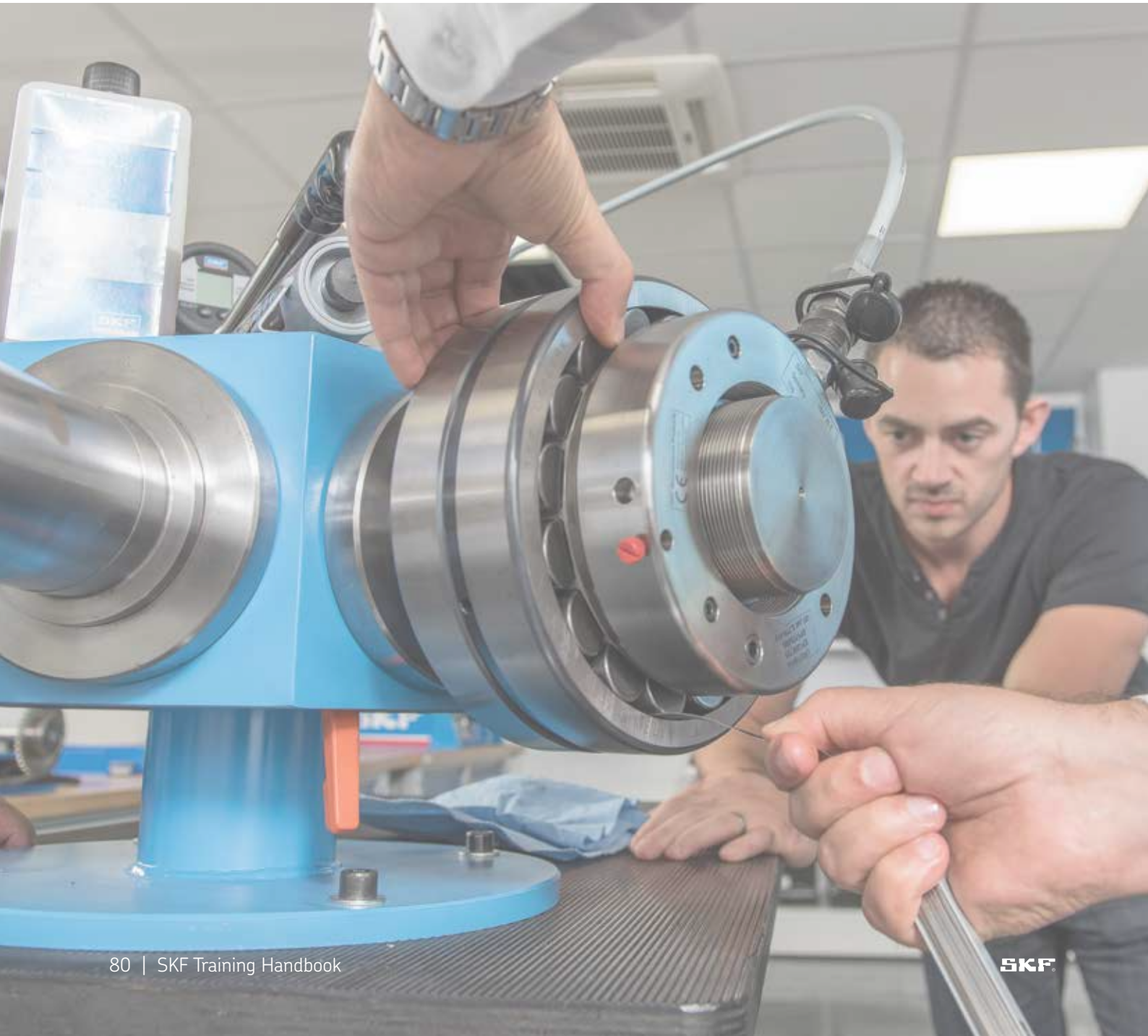
Those interested in improving maintenance practices, procedures and processes through a customised one-on-one training program. Maintenance personnel who need to better understand current technologies with condition monitoring, precision maintenance skills, bearings and lubrication.

If you've taken a public classroom course and want more hands on activity directly related to your equipment, this program is for you.

Course Information	
Time	8.30am – 4.30pm
Days	TBC
Course Fee	POA
Course Type	Onsite
Category	Living Program

Product and Software Training

This section includes various Training Products and related Workstations, designed to facilitate individual tuition with step by step instructions to perform various maintenance tasks.



MSC-TAFEKIT-1

Training Products

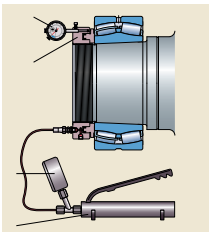
Bearing Mounting and Dismounting Demonstration Kit

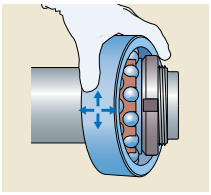
The SKF Bearing Mounting and Dismounting Demonstration Kit has been designed for use as a comprehensive teaching aid for industries in Australia.

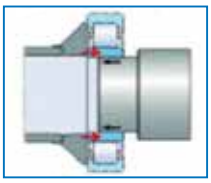
It facilitates instruction in all aspects of bearing mounting and dismounting procedures including induction heating, mechanical tools, oil injection and lubrication. All the equipment required to perform these tasks are included in the SKF Bearing Mounting and Dismounting Demonstration Kit.

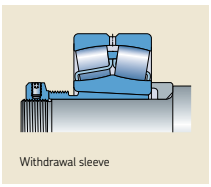
Through the construction of the various shaft, housing and sealing arrangements, students can build a working model. They can then test the different techniques they have learned.

SKF Bearing Mounting and Dismounting Demonstration Kit includes a manual with step by step instructions and exercises which allow for individual tuition for each student. It also comes in a high quality metal cabinet.







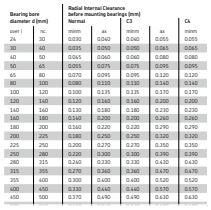


Contents

SKF Bearing Mounting and Dismounting Demonstration Kit contains

- Bearings
- Sleeves
- Housings and Accessories
- Hook Spanners
- Hydraulic Nut
- Feeler Gauge
- Bearing Puller
- Grease
- Induction Heater
- Vibration Monitoring Equipment
- Electric Motor
- Digital Thermometer
- System 24 Automatic Lubricator

Join the many Industries already using the SKF Bearing Mounting and Dismounting Demonstration Kit.



Price: $38,850 AUD + GST

Training Products
Bearing Workstations

Workstation A - Bearing Identification

8 bearings have had the designations removed. The principal dimensions of each bearing are measured. Using these measurements and the SKF General Catalogue for reference, the bearings can be identified and listed, giving the correct basic designation for each.

Price: $950 AUD + GST

Workstation B - Correct mounting of small size self-aligning bearings on adapter sleeves.

This workstation allows you to correctly mount and dismount a Self Aligning Ball Bearing and a CARB® Toroidal Roller Bearing on adapter sleeves, using the lock nut tightening angle method. The correct procedure to install V-ring seals is also practised.

Price: $2,450 AUD + GST

Workstation C - Mounting of paired Single Row Angular Contact Ball Bearings, a Cylindrical Roller Bearing and Radial Shaft Seals in to a 2-bearing housing assembly.

This workstation demonstrates how to correctly mount and dismount back-to-back angular contact ball bearings and cylindrical roller bearings. A special guide sleeve is used to prevent damage to the cylindrical roller bearing inner ring. The correct installation of radial shaft seals is also practiced. Special bearing and seal installation tools; and removal tools are utilised.

Price: $5,560 AUD + GST

Workstation D - Mounting labyrinth seals and taconite seals in split plummer block housings.

This exercise gives training in the correct procedures to install taconite and labyrinth seals.

Price: $2,140 AUD + GST

Workstation E - Mounting and adjusting Taper Roller Bearings in a 2-bearing housing.

Workstation E gives training on the correct procedures to mount bearings using a portable induction heater, as well as accurate adjusting of tapered roller bearing clearance. Installing radial shaft seals is also demonstrated. Special bearing and seal installation and removal tools are utilised.

Price: $8,270 AUD + GST

Workstation F - Mounting bearings with tapered bores using the hydraulic drive-up method.

The latest technique on mounting and dismounting medium to large bearings with tapered bores is demonstrated with Workstation F. The hydraulic drive-up method is a reliable, quick and easy method that ensures accuracy when mounting these bearings. The dismounting method shows safe, easy and quick bearing removal.

Price: $7,560 AUD + GST

Workstation G - Mounting bearings on withdrawal sleeves using the hydraulic drive-up method.

The latest technique on mounting and dismounting medium to large bearings on withdrawal sleeves is demonstrated with Workstation G. The hydraulic drive-up method is a reliable, quick and easy method that ensures accuracy when mounting these bearings. The dismounting method shows safe, easy and quick bearing removal.

Price: $8,690 AUD + GST

Workstation H - Mounting bearings with tapered bores using the radial clearance reduction method.

This exercise gives practise in mounting Spherical Roller Bearings using the traditional "clearance reduction method" utilising feeler gauges for measuring; and an Impact Spanner for safe and easy lock nut tightening. Bearing dismounting is safely and easily achieved using hydraulic injection.

Price: $6,120 AUD + GST

Training Products

Basic Condition Monitoring Kit

During operation, it is important to regularly inspect the condition of the bearing by performing basic condition monitoring measurements. These regular inspections will allow the detection of potential problems and help to prevent unexpected machine stops. This training tool kit introduces students to latest SKF technology in condition monitoring including Vibration, Temperature Sound, Visual Inspection and Electrical discharge currents.

Price: $ POA

- **Vibration**

- **Tachometer**

- **Endoscope**

- **Quick Collect**

- **Temperature**

- **Stethoscope**

- **Stroboscope**

Advanced Condition Monitoring Kit (with Balancing Module)

This kit is ideal for classroom study. The vibration analysis kit may be used to demonstrate various vibration phenomena (like unbalance, misalignment, bearing failure on demo rotor) and the results can be captured/viewed on SKF Microlog GX vibration analyser

Upgraded advance kit includes:

1. Microlog GX System
2. Microlog Advisor Pro with Balancing module
3. Optical Phase reference kit
4. Demo Roto kit
5. Vibration Diagnostic chart
6. Bearing Analysis using Acceleration
7. Enveloping Technique CD

Price: $ POA

Training Products

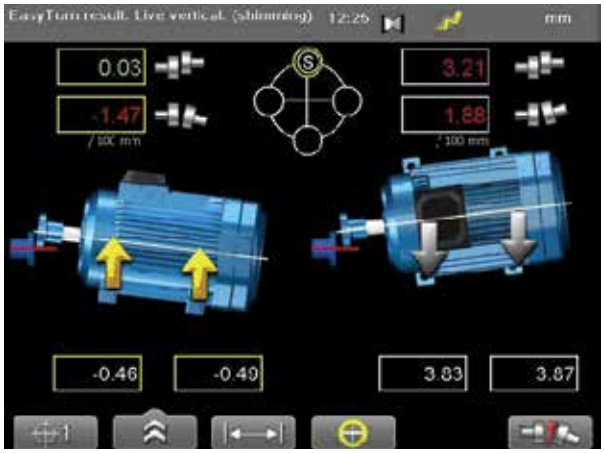
Laser Alignment is faster and more reliable

Easy-Laser Shaft Alignment Kit:

Today, most industries in Australia are using laser based techniques for shaft alignment of machinery. Easy-Laser® products are:

- **EASY to use**
- **EASY to learn**
- **Up to 5 times FASTER than dial gauges**

All calculations are carried out in the display unit then saved for documentation, and uploaded to a PC.



E710 Wireless Bluetooth Series

SKF TKSA Alignment Kit

SKF has developed a training kit for Shaft and Belt Alignment PLUS additional tools and supporting material to make your task easier. The kit includes the following options:

The Base kit includes:

- SKF TKSA 51 or SKF TKSA 71 Laser Shaft Aligment kit
- Training course in PowerPoint format
- Training CD's

Plus options:

- SKT TMEB2 Pulley Alignment kit
- Demonstation rigs for use with the TKSA and TMEB/D90
- D90 Pulley Alignment kit
- SKF Belt Frequency Meter

TKSA 51
Quick, easy and wireless.

TKSA 71
Step by step expertise guidance

SmartStart™ Technology Training

SmartStart™ on-site product start-up training

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

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

Where is SmartStart™ training conducted?

Training is conducted at your site, in your training facility, using your computers and SKF purchased hardware and/or software.

How is SmartStart™ training conducted?

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

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

What equipment do I need for this course?

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

WICM232 MARLIN /Microlog Inspector and SKF @ptitude Analyst Inspector

Course description

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

- Setup and utilise the MARLIN/Microlog Inspector Condition Detector (MCD) as a stand-alone probe to monitor overall machinery and bearing vibration and temperature
- Installation and use of MARLIN/Microlog Inspector Quick Connect studs
- Set up and utilise the MARLIN/Microlog Inspector data manager to monitor and record machinery condition and plant process data
- Use the MARLIN/Microlog Inspector data manager to review data in the field
- Build a MARLIN/Microlog Inspector measurement database using SKF @ptitude Analyst Inspector software
- Transfer data between SKF @ptitude Analyst Inspector and the MARLIN/Microlog Inspector data manager
- Display and generate trends and reports

SKF continues to add new MARLIN/Microlog Inspector hardware and software platforms. The SmartStart™ program will be tailored to match customer specific systems and requirements

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$825 AUD + GST
Course Type	Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fees. Refer to Enrolment Form on page 91.

SmartStart™ Technology Training

WICM264 AX/GX Series Microlog and SKF @ptitude Analyst

Course description

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

Condition monitoring training topics

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

SKF product training topics

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

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee†	$950 AUD + GST
Course Type	Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fees. Refer to Enrolment Form on page 91.

WICM270 Online Systems and SKF @ptitude

Course Objective

Participants will learn how to design and build an effective online system vibration measurement database, download measurements to online system local monitoring units, understand online system data collection processes, display and analyse the online system Event Log and online measurement data plots for detection and analysis purposes, and generate online system reports.

Course Description

Designed for maximum class participation, this course is divided into sections that are viewed with presentations, computers practice, and reviewed with hands-on group exercises and written reviews.

- SKF @ptitude Online Hardware System (H/W), concept, product structure, and applications
- System checkout and troubleshooting procedures Software installation and setup
- Hardware and software requirements
- Windows® system settings and installation options
- Installing SKF @ptitude Online H/W System
- Operation and theory
- Database configuration: ideology, application and best practices
- Parametric Gating and Control Points
- Online data collection process
- Measurement process and Heartbeat concept
- DAD communication and live data collection process
- Displaying Online data plots
- Generating and printing data reports

Course Information	
Time	8.30am – 4.30pm
Days	3 days
Course Fee†	$950 AUD + GST
Course Type	Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fees. Refer to Enrolment Form on page 91.

SmartStart™ Technology Training

WECM250 Balancing with an SKF Microlog

Course Objective

This course is designed to understand and practice how to successfully balance common rotating machinery in the field to precision levels using any SKF Microlog data Collector/Analyser.

Course Description

Course topics are organised according to the steps necessary to operate the product

- Understand the three common types of unbalance (static, couple and dynamic)
- Differentiate field and shop balancing tolerances
- Identify the correct approach to use based on the machine's L/D ratio, amplitude and phase readings, and response to the trail weight
- Perform single and two plane balancing
- Combine and split correction weights
- Understand lag angle and influence coefficients
- Appropriate real-world case histories will be used to illustrate balancing techniques for applications such as: fans, overhung and between bearings, paper rolls, flails, augers and hammermills, cooling tower fans, fin fans and turboprop, and multi-stage pumps

Course Information	
Time	8.30am – 4.30pm
Days	2 days
Course Fee†	$825 AUD + GST
Course Type	Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fees. Refer to Enrolment Form on page 91.

WECM245 Easy-Laser Shaft Alignment Systems

Course Content

1. Review Shaft alignment/Pulley alignment theory:
   - Angular and offset misalignment
   - Alignment tolerances.
   - Dial gauge alignment v/s laser alignment processes
2. Setting up the system:
   - Review the Shaft alignment system purchased
   - Application programs
   - Components of the system
3. Taking measurements:
   - Conducting a rough alignment
   - Alignment procedures
   - The clock method.
   - Easy turn method (not using D450 model)
   - Result evaluation and machine adjustment
   - Feet values
   - Coupling values
   - Managing the measurements in alignment software and producing a final alignment report.
   - Summary and questions.
4. Practical exercises using Easy-Laser Shaft Alignment Products
5. Introduction to geometrical measurement
   - Including flatness, straightness, squareness

Course Objective

This course focuses on the step by step procedures for using any Easy-Laser® Shaft Alignment product. Plus groove and face mounted pulley alignment products.

Course Information	
Time	8.30am – 4.30pm
Days	1 Day
Course Fee†	$825 AUD + GST
Course Type	Onsite and Public
Category	Work Identification

† Course fee is per person for a Public course. Contact SKF for Onsite course fees. Refer to Enrolment Form on page 91.

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 exercises 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 transmission products

Basic Condition Monitoring

Handheld portable tools for condition monitoring, including stroboscopes, infrared thermal cameras, vibration analyzers, ultrasounds, endoscope, belt tension tester, belt and 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 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 is composed of the following courses enhanced by the training facility set-up described above.

WE201 Bearing Technology and Maintenance

WE203 Introduction to Lubrication Fundamentals

WE204 Root Cause Bearing Damage Analysis

WE240 Precision Shaft Laser Alignment

WI201 Condition Based Maintenance

Program Customisation 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 customisable 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.

Notes

Enrolment form

Early Bird Savings
A limited number of early bird seats are available. Please ask for details.

REGISTER NOW

Complete your details and email back to training.australia@skf.com

Standard Course Fee _____

Contact

SKF Training Department:
(Australia) 61 3 9269 0763 (New Zealand) 0800 705 705
Email: training.australia@skf.com

Location: _____ Date: ____ /____ /____

Premier Plus Savings
Bring 3 or more delegates to the course and benefit from a 7% saving. (cannot be used in conjunction with any other offer)

DELEGATE DETAILS

Name _____ Job Title _____
Email _____ Contact No _____

Name _____ Job Title _____
Email _____ Contact No _____

Name _____ Job Title _____
Email _____ Contact No _____

Name _____ Job Title _____
Email _____ Contact No _____

Company Name _____
Address _____
City _____ State _____ Postcode _____
Tel ( ) _____ Fax ( ) _____

AUTHORISATION

Signatory must be authorised to sign on behalf of contracting organisation

Name of Authorising Manager

_____

Position _____
Signature _____
Date ____ /____ /____

METHOD OF PAYMENT

Cheque - Made payable to SKF Australia Pty Ltd

Mailing address - SKF Reliability Systems,
PO Box 301, Oakleigh VIC 3166

Company Order No _____

☐ VISA ☐ MasterCard ☐ American Express

Credit Card No. _____
AMEX Security Code _____
Card Holder's Name _____
Signature _____ Exp Date ___ /___

TERMS AND CONDITIONS

1. Enrolment: Enrolments will be confirmed in writing prior to the course commencement date and are subject to: (1) receipt of the completed enrolment form; (2) payment prior to course date, or receipt of purchase order from approved Corporate Accounts. Enrolment can be made by faxing the form to SKF Training Department on (Australia) 61 3 9269 0886 or (New Zealand) 64 9 273 8513.
2. Fees: Course fees are inclusive of course materials and refreshments. Contact SKF Training Department for group savings.
3. Cancellation/Substitution: Cancellation will only be accepted in writing and acknowledged by SKF. Cancellation is free of charge when received at least 3 weeks prior to course commencement. Between 1-3 weeks before the course commencement date, 50% of the training fee will be charged. Thereafter, full course fee is payable and is non-refundable. Suitable substitutes are welcome.
4. Copyright: All intellectual property rights in all materials produced or distributed by SKF in connection with this course is expressly reserved and any unauthorised duplication, publication or distribution is prohibited.
5. Important notice: SKF reserves the right to change course schedules, discontinue courses, modify course content, limit class size and cancel courses as it deems necessary without penalty.

2019 SKF Australasia Training Calendar

SKF Public Course Locations

AU1 Airborne Ultrasound

QUEENSLAND
Gold Coast
22 - 26 July

ARP Asset Reliability Practitioner L1

NEW SOUTH WALES
Sydney
6 - 7 August
QUEENSLAND
Brisbane
27 - 28 August
SOUTH AUSTRALIA
Adelaide
12 - 13 February
TASMANIA
Launceston
21 - 22 May
VICTORIA
Melbourne
12 - 13 June
WESTERN AUSTRALIA
Perth
22 - 23 October

BFR Bearing Fitting & Removal

NEW SOUTH WALES
Albury
26 February
Coffs Harbour
12 November
Mudgee
6 August
QUEENSLAND
Cairns
14 March
Townsville
12 March
SOUTH AUSTRALIA
Mt Gambier
29 August
TASMANIA
Hobart
24 September
Launceston
22 October
VICTORIA
Ballarat
28 May
Bendigo
30 May
Warrnambool
27 August

BTM Bearing Technology & Maintenance (WE201)

NEW SOUTH WALES
Newcastle
13 - 15 August
Orange
23 - 25 July
Sydney
22 - 24 October
Wollongong
19 - 21 March
NORTHERN TERRITORY
Darwin
21 - 23 May
QUEENSLAND
Toowoomba
19 - 21 February
Mount Isa
14 - 16 May
Gladstone
2 - 4 April
Brisbane
30 July - 1 August
Mackay
20 - 22 August
SOUTH AUSTRALIA
Adelaide
22 - 24 October
Whyalla
18 - 20 June
VICTORIA
Gippsland
12 - 14 February
Melbourne
3 - 5 December
WESTERN AUSTRALIA
Kalgoorlie
25 - 27 June
Karratha
9 - 11 April
Perth
26 - 28 March
24 - 26 September
Port Hedland
26 - 28 November
NEW ZEALAND
Auckland
26 - 28 March
Christchurch
15 - 17 October
Dunedin
21 - 23 November
Hamilton
13 - 15 August

BTM

Hastings
11 - 13 June
New Plymouth
23 - 25 July
Palmerston North
27 - 29 August
Rotorua
16 - 18 April
Wellington
17 - 19 September

CBM Condition Based Maintenance (WI201)

NEW SOUTH WALES
Newcastle
11 April
Wollongong
26 November
NORTHERN TERRITORY
Darwin
24 May
QUEENSLAND
Brisbane
10 September
SOUTH AUSTRALIA
Adelaide
18 June
VICTORIA
Gippsland
15 October
Melbourne
13 March
WESTERN AUSTRALIA
Perth
3 July

ICR Improving Crusher Reliability (WI270)

NEW SOUTH WALES
Sydney
4 - 5 December
QUEENSLAND
Brisbane
18 - 19 June
Mount Isa
17 May
VICTORIA
Melbourne
21 - 22 May
WESTERN AUSTRALIA
Perth
15 - 16 October

For further information on Public, Onsite or future courses:

Tel: (AUS) 61 3 9269 0763 (NZ) 0800 705 705
Fax: (AUS) 61 3 9269 0886 (NZ) 9 273 8513
Email: training.australia@skf.com
Web: www.skf.com.au/training

SKF Public Course Locations

IR1 Infrared Thermography L1 (WI230)

NEW SOUTH WALES
Sydney
2 - 6 September
QUEENSLAND
Brisbane
11 - 15 February
29 April - 3 May
Gold Coast
23 - 27 September
VICTORIA
Melbourne
1 - 5 April
7 - 11 October
WESTERN AUSTRALIA
Perth
13 - 17 May
NEW ZEALAND
Auckland
8 - 12 April

IR2 Infrared Thermography L2

VICTORIA
Melbourne
11 - 15 November

IR3 Infrared Thermography L3

VICTORIA
Melbourne
2 - 4 December

ILF Introduction to Lubrication & Contamination Control

NEW SOUTH WALES
Sydney
23 July
QUEENSLAND
Brisbane
12 March
Mackay
9 April
VICTORIA
Melbourne
17 September
WESTERN AUSTRALIA
Kalgoorlie
12 November
Perth
27 August
Port Hedland
7 May

MLA1 Machinery Lubrication & Oil Analysis L1 (WI240)

NEW SOUTH WALES
Sydney
23 - 26 July
QUEENSLAND
Brisbane
12 - 15 March
Mackay
9 - 12 April

MLA1

VICTORIA
Melbourne
17 - 20 September
WESTERN AUSTRALIA
Kalgoorlie
12 - 15 November
Perth
27 - 30 August
Port Hedland
7 - 10 May

MLA2 Machinery Lubrication & Oil Analysis L2 (WI245)

QUEENSLAND
Brisbane
3 - 6 December
WESTERN AUSTRALIA
Perth
26 February - 1 March

PSA Precision Shaft - Laser Alignment (WE240)

NEW SOUTH WALES
Wollongong
27 November
QUEENSLAND
Brisbane
11 September
Gladstone
5 April
SOUTH AUSTRALIA
Adelaide
19 June
VICTORIA
Gippsland
16 October
Melbourne
14 March
WESTERN AUSTRALIA
Perth
4 July

RCB Root Cause Bearing Damage Analysis L2 (WE204)

NEW SOUTH WALES
Newcastle
9 - 10 April
Wollongong
18 - 19 June
QUEENSLAND
Gladstone
22 - 23 October
Moranbah
28 - 29 May
Mount Isa
23 - 24 July
VICTORIA
Melbourne
26 - 27 March
WESTERN AUSTRALIA
Kalgoorlie
19 - 20 February

RCB

Perth
7 - 8 May
12 - 13 November
Port Hedland
10 - 11 September

VA1 Vibration Analysis L1 (WI202)

NEW SOUTH WALES
Newcastle
15 - 18 October
Orange
26 February - 1 March
Sydney
2 - 5 April
QUEENSLAND
Gladstone
1 - 4 July
Mount Isa
26 - 29 March
SOUTH AUSTRALIA
Adelaide
9 - 12 April
VICTORIA
Melbourne
4 - 7 June
19 - 22 November
WESTERN AUSTRALIA
Kalgoorlie
26 - 29 August
Perth
18 - 21 June
3 - 6 December

VA2 Vibration Analysis L2 (WI203)

NEW SOUTH WALES
Sydney
9 - 13 September
QUEENSLAND
Mackay
28 October - 1 November
VICTORIA
Melbourne
16 - 20 December
WESTERN AUSTRALIA
Perth
24 - 28 June
9 - 13 December

VA3 Vibration Analysis L3 (WI204)

NEW SOUTH WALES
Sydney
27 - 31 May
WESTERN AUSTRALIA
Perth
19 - 23 August

SKF Australasia - Primary Locations

SKF Australia - Head Office
17-21 Stamford Rd
Oakleigh, VIC 3166
Ph: 1300 553 386

SKF Australia - Solution Factory
463 Orrong Rd
Welshpool, WA 6106
Ph: 61 8 6258 6000

SKF New Zealand - Head Office
3/24 Bishop Dunn Place
Flatbush, Auckland
Ph: 0800 705 705

www.skf.com.au/training
Email: training.australia@skf.com

SKF Australasia - Authorised Distributors

ACT
FYSHWICK
Ph: (02) 6280 6884
Fax: (02) 6280 9884

NEW SOUTH WALES
ALBURY
Ph: (02) 6041 1744
Fax: (02) 6041 3117

COFFS HARBOUR
Ph: (02) 6652 1022
Fax: (02) 6652 6788

DUBBO
Ph: (02) 6882 5799
Fax: (02) 6884 1764

GRIFFITH
Ph: (02) 6962 1055
Fax: (02) 6962 7600

KELSO
Ph: (02) 6332 2443
Fax: (02) 6332 2941

MASCOT
Ph: (02) 9667 3770
Fax: (02) 9667 1414

MINTO
Ph: (02) 9820 1088
Fax: (02) 9820 2999

MUDGEE
Ph: (02) 6372 0600
Fax: (02) 6372 0699

NEWCASTLE
Ph: (02) 4960 9222
Fax: (02) 4960 9299

PENRITH
Ph: (02) 4731 3268
Fax: (02) 4731 3124

WETHERILL PARK
Ph: (02) 9725 9200
Fax: (02) 9609 4155

TAMWORTH
Ph: (02) 6766 2622
Fax: (02) 6766 2080

TAREE
Ph: (02) 6552 3699
Fax: (02) 6551 0474

WAGGA WAGGA
Ph: (02) 6921 7155
Fax: (02) 6921 7178

QUEENSLAND
ARCHERFIELD
Ph: (07) 3853 1900
Fax: (07) 3853 1977

CAIRNS
Ph: (07) 4040 9000
Fax: (07) 4040 9010

GEEBUNG
Ph: (07) 3265 6966
Fax: (07) 3865 1406

GLADSTONE
Ph: (07) 4972 6255
Fax: (07) 4972 2343

MACKAY
Ph: (07) 4952 4833
Fax: (07) 4952 4861

MT ISA
Ph: (07) 4743 1908
Fax: (07) 4743 1918

TOOWOOMBA
Ph: (07) 4634 9140
Fax: (07) 4632 5987

TOWNSVILLE
Ph: (07) 4779 3699
Fax: (07) 4725 1428

NORTHERN TERRITORY
BERRIMAH
Ph: (08) 8947 1855
Fax: (08) 8947 0403

SOUTH AUSTRALIA
CAVAN
Ph: (08) 8260 7555
Fax: (08) 8260 7544

MT GAMBIER
Ph: (08) 8723 0195
Fax: (08) 8723 1551

WINGFIELD
Ph: (08) 8360 1500
Fax: (08) 8360 3377

TASMANIA
BURNIE
Ph: (03) 6431 2777
Fax: (03) 6431 2711

DERWENT PARK
Ph: (03) 6273 2777
Fax: (03) 6272 6500

LAUNCESTON
Ph: (03) 6326 6377
Fax: (03) 6326 6263

VICTORIA
BALLARAT
Ph: (03) 5336 1111
Fax: (03) 5336 1153

BENDIGO
Ph: (03) 5443 8622
Fax: (03) 5443 3379

BAIRNSDALE
Ph: (03) 5152 1580
Fax: (03) 5152 1597

BRAESIDE
Ph: (03) 9587 9822
Fax: (03) 9587 9833

BROOKLYN
Ph: (03) 9318 0699
Fax: (03) 9318 0733

CAMPBELLFIELD
Ph: (03) 9308 5144
Fax: (03) 9308 5880

CRANBOURNE
Ph: (03) 5996 6300
Fax: (03) 5996 6123

DANDENONG
Ph: (03) 9794 8477
Fax: (03) 9706 7385

HORSHAM
Ph: (03) 5381 0800
Fax: (03) 5381 0801

LILYDALE
Ph: (03) 9739 6222
Fax: (03) 9739 6211

MILDURA
Ph: (03) 5023 3483
Fax: (03) 5023 8054

MORWELL
Ph: (03) 5134 4244
Fax: (03) 5134 2260

OAKLEIGH
Ph: (03) 9567 8700
Fax: (03) 9567 8733

NORTH GEELONG
Ph: (03) 5278 5722
Fax: (03) 5277 9310

SALE
Ph: (03) 5144 5988
Fax: (03) 5144 5837

SHEPPARTON
Ph: (03) 5831 8828
Fax: (03) 5831 8829

WESTERN AUSTRALIA
ALBANY
Ph: (08) 9842 1000
Fax: (08) 9842 1122

BIBRA LAKE
Ph: (08) 9494 1630
Fax: (08) 9494 1631

BUNBURY
Ph: (08) 9725 6422
Fax: (08) 9725 6424

NORTHAM
Ph: (08) 9622 2922
Fax: (08) 9277 9334

WELSHPOOL
Ph: (08) 9470 7600
Fax: (08) 9356 7574

WEST KALGOORLIE
Ph: (08) 9091 4277
Fax: (08) 9091 4267

WANGARA
Ph: (08) 9302 5607
Fax: (08) 9302 4238

NEW CALEDONIA
NOUMEA
Ph: +687 282 244
Fax: +687 282 242

PAPUA NEW GUINEA
PORT MORESBY
Ph: +675 325 1088
Fax: +675 325 0083

NEW ZEALAND
ASHBURTON
Ph: (03) 308 9917
Fax: (03) 308 1134

AUCKLAND
Ph: (09) 274 0056
Fax: (09) 579 9637

CHRISTCHURCH
Ph: (03) 341 6537
Fax: (03) 338 1334

DUNEDIN
Ph: (03) 455 5652
Fax: (03) 455 3073

HAMILTON
Ph: (07) 850 6155
Fax: (07) 850 6144

HASTINGS
Ph: (06) 879 4362

INVERCARGILL
Ph: (03) 218 6947
Fax: (03) 218 8272

KAWERAU
Ph: (07) 323 6198
Fax: (07) 323 9051

NELSON
Ph: (03) 548 3029
Fax: (03) 548 3028

NEW PLYMOUTH
Ph: (06) 769 5152
Fax: (06) 769 6497

OAMARU
Ph: (03) 433 0484
Fax: (03) 434 5901

PALMERSTON NORTH
Ph: (06) 356 9145
Fax: (06) 359 1555

ROTORUA
Ph: (07) 349 2451
Fax: (07) 349 3451

TAUPO
Ph: (07) 377 8416
Fax: (07) 377 8486

TIMARU
Ph: (03) 688 8870
Fax: (03) 688 2640

WELLINGTON
Ph: (04) 569 3159
Fax: (04) 569 3155

skf.com.au

PUB THB 2019 - 01 EN · December 2018

Certain image(s) used under license from Shutterstock.com.

SKF Six Sigma