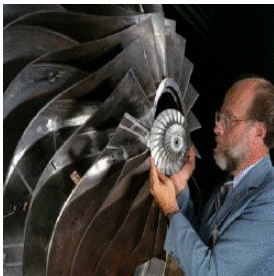
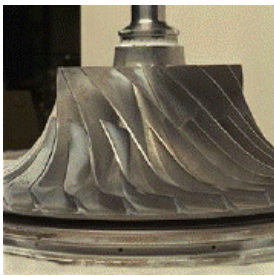




**MIDWEST OIL & GAS
ENGINEERING**



Root Cause Failure Analysis In Rotating Machinery

-Causes & Avoidance-

“A must course to understand the process
of machinery failures, help with the job
and add value to the business”

Abu Dhabi
16 – 20 March 2008

... helping to grow your business and reduce your costs

Unwanted and untimely equipment failures are the most common causes of plant downtime, production loss and sometimes compromising safety.

The Facts

An industry survey has shown that premature failures are responsible for:

- Up to 30% of maintenance time
- Up to 25% restriction in equipment lifetime
- An increase in production unit cost by up to 5%
- Lost time injuries and even fatalities

If you consider the consequences and lost opportunities on account of sub-optimal equipment availability, a small investment to prevent it could save you a lot of money.

How can we help?

This course presents a systematic approach to fault diagnosis and failure prevention in a broad range of machinery used in the petrochemical, process, manufacturing, power generation, utility and mining industries. The key routes to preventive maintenance are demonstrated through both overview and the study of examples in metallurgical failure analysis, vibration analysis, and a sequential approach to machinery troubleshooting and problem-solving.

Equipment failure events will be reviewed and you are encouraged to bring relevant assembly drawings or such components as failed bearings, gears, mechanical seals and similar machine elements for failure analysis discussion. The course explores a systematic approach to successful failure analysis and troubleshooting programs, including the determination of goals, use of checklists and setting up a failure analysis team. By reference to specific case studies, especially dealing with centrifugal pumps, turbine and compressors it will be shown that such a systematic program can lead to significant failure reductions in many types of machinery. Through examples dealing with equipment familiar to all, guidance is given on vendor selection and methods for reliability review.

A matrix approach to machinery troubleshooting uses illustrative examples in pumps, centrifugal compressors, blowers and fans, reciprocating compressors, engines and gas turbines. Next, a systematic approach to generalized machinery problem-solving is described in terms of situation analysis, cause analysis, action generation, decision making and planning for change. Finally, a highly effective shortcut root cause analysis method is explained in detail.

Component failure diagnosis workshops

Our workshops enable delegates to identify the correct remedial steps to prevent component and machinery part failure. This results in more efficient plant maintenance, increased operational efficiency, lower operating costs and improved plant availability.

“A small investment to better manage your asset integrity and increase productivity”

Who is the course designed for?

- Project and design engineers
- Plant maintenance engineers/supervisors
- Managers and technical staff involved with the diagnosis of component failures
- Equipment and plant inspectors
- Peoples responsible for equipment reliability

“The course should be a must for all maintenance and lubrication engineers”

Course aims & objectives

- To familiarise participants with the use of root cause analysis as part of the overall diagnostic process
- To provide attendees with sufficient understanding to be able to recognise key features on failed components taken mainly from rotating equipment and machinery parts
- To make judgements about the cause of failure

At the end of the course participants will be able to:

- Recognise key features of failed components
- Make judgments about the cause of failures
- Identify the correct remedial steps required to prevent such failures occurring again

“The best way you can add sustained value to your business is by transferring skills to your personnel”

Benefits

Attendees will have the opportunity to develop personal competencies and build up expert knowledge of failure processes in a range of equipment. They will have the opportunity to learn:

- Systematic approach to fault diagnosis
- key routes to preventive maintenance
- Use of checklist and setting up of failure analysis team
- Guidelines on vendor selection and methods for reliability review
- Matrix approach to machinery troubleshooting, problem solving, action and planning
- Improve the failure diagnosis process
- Avoid costly failures and improve plant availability
- Reduce operating cost

"The programme will help to demonstrate the value of failure analysis and failure prevention"

Course programme

Day1

Overview of machinery and their respective problems:

- Definition of a turbo-machine
- Turbines, compressors, pumps, fans
- Applications
- Reciprocating machines

Why failures occur:

- Mechanical
- Thermal
- Chemical
- Fluid flow

Design to avoid failure:

- Component and material selection
- Interaction with associated equipment
- System stability
- Foundations and grouting

Day2

Bearings, Gears and lubrication systems:

- Types
- Applications
- Failures
- Avoidance of failures

Day2 (continued)

Seals:

- Types
- Applications
- Failures
- Avoidance of failures

Fatigue:

- Overview
- Its relevance to failure
- Material characteristics

Day3

Rotor dynamics and vibration:

- Overview of rotor dynamics
- Influence on bearings
- Vibration of components and influence on life
- Fatigue life of components

Problems associated with vibration:

- Causes of vibration
- Acceptable levels of vibration for different machines
- How to recognize the cause of vibration
- How to solve vibration problems
- Alignment & thermal expansion
- Condition monitoring

Examples of failures due to vibration

Day4

Overview of reciprocating pumps and compressors:

- Types and construction
- Applications
- Specific problems related to this type of machinery
- Fluid flow issues
- Pulsation damping
- Torsional vibration

Typical failures:

- Blading
- Bearings
- Vibration
- Seals
- Cavitation
- Temperature
- Liquid ingress
- Gears
- Lubrication systems
- Poor maintenance

Day5

Failure Investigation:

- How to investigate failures
- Investigating individual failures
- Methodology of failure investigation
- Condition monitoring

Weibull analysis of multiple failures

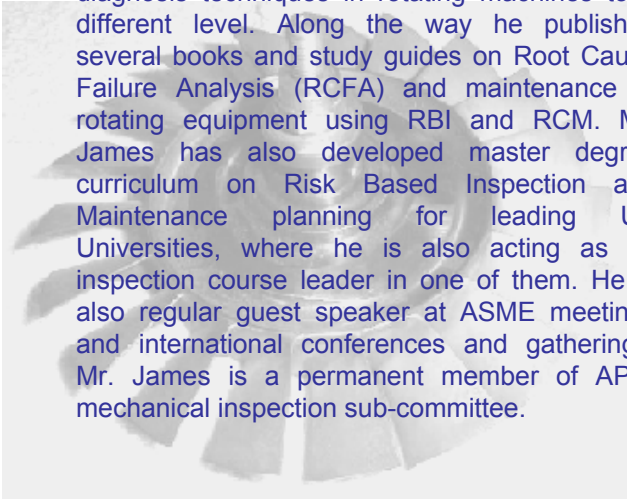
- When to use it
- How to do it

Examples and causes of some major process failures



Course leader

This course is delivered by Mr. W. James who has an unrivalled experience in advanced fault finding and maintenance planning and scheduling. His expertise has been accumulated over a period of 40 years in the oil, gas, chemical and power industry where he has progressed from a floor-shop technician to a senior reliability engineer then a senior advisor to major machinery manufacturers. Mr. James techniques in fault diagnosis are based on Shell's Risk Based Inspection Technology and approved by the American Society of Mechanical Engineers (ASME).



Mr. James has taken inspection and fault diagnosis techniques in rotating machines to a different level. Along the way he published several books and study guides on Root Cause Failure Analysis (RCFA) and maintenance of rotating equipment using RBI and RCM. Mr. James has also developed master degree curriculum on Risk Based Inspection and Maintenance planning for leading UK Universities, where he is also acting as an inspection course leader in one of them. He is also regular guest speaker at ASME meetings and international conferences and gatherings. Mr. James is a permanent member of API's mechanical inspection sub-committee.

*This course can be tailored
and delivered in-house*



**Registrations are accepted on a first come,
first served, basis**



www.midwestoilingas.com

REGISTRATION FORM

Please use a separate form for each attendee

Machinery Failure Diagnosis & Prevention

Register Now

Limited Number of Seats Available per session

Registration Closing Date: 2nd March 2008

Dedicated Registration FAX LINE

Get 10% discount for second and subsequent attendees from same company

00 44 (0)7075707602

Course fee : USD 2950

Paid on registration

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Cancellations

For written cancellations received at least 2 weeks before class start a credit for future courses will be offered, less USD 240 processing fee. Substitutions are welcomed. Full fee is charged for cancellations less than two weeks before the starting date.

Accommodation is not included in the course fee, but MWO&G Engineering negotiate a discounted rate for a limited number of rooms. If you require this service, please check the box

Schedule

Course registration will be at 08:00 on first day with course start at 08:30 prompt. Refreshment breaks will be at appropriate times with lunch served after day conclusion at 15:30

Course fees will cover for faculties, tuition, complete course materials, practice exercises & workshops, evening consultations and daily refreshments & lunches.

MWO&G reserve the rights the change faculty or/and venue