Rotating Machinery Health and Reliability Excellence

This is a sample of slides and notes from day 4 of this course. For more samples and info please see …

http://www.feedforward.com.au/Powerpoints/Reliability/machinery_reliability_Excellence.htm

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Welcome to this course on setting-up rotating machines and equipment for a long, trouble-free operating life. The course is divided into an introduction stage and an advanced stage. During the course you will cover, and come to better appreciate, the important issues for achieving Rotating Equipment (RE) reliability. Much of our industrial machinery rotates, it uses bearings and lubrication, and is mounted onto a supporting structure. What you learn in the course to improve rotating equipment performance can be transferred and applied to all of them.

The course is brought to you by Mike Sondalini of Lifetime Reliability Solutions. Mike is an Australian equipment maintenance and reliability growth specialist who works around the world to help people and companies get outstanding reliability from their plant and equipment. His philosophy is to impart the knowledge and understanding needed to so look after all rotating equipment. Instead of focusing on specific equipment problems he provides an explanation and education that is the foundation for all rotating equipment health. To download complete 4 day course powerpoints, please see ...

http://www.feedforward.com.au/Powerpoints/Reliability/machinery_reliability_Excellence.htm

Today 4 Topics

- Risk Reduction Strategies in RE Design and Operation
- Design, Operation and Cost Total Optimisation Review
- Lifting Lifetime Reliability
- Activity 1 – FMEA exercise
- RE Root Cause Failure Analysis
- Finding the Evidence
- Applying RCFA in the Workplace
- Activity 2 – RCFA exercise
- Rotating Equipment Integrity Management
- Activity 3 – Actions to Improve Your Workplace

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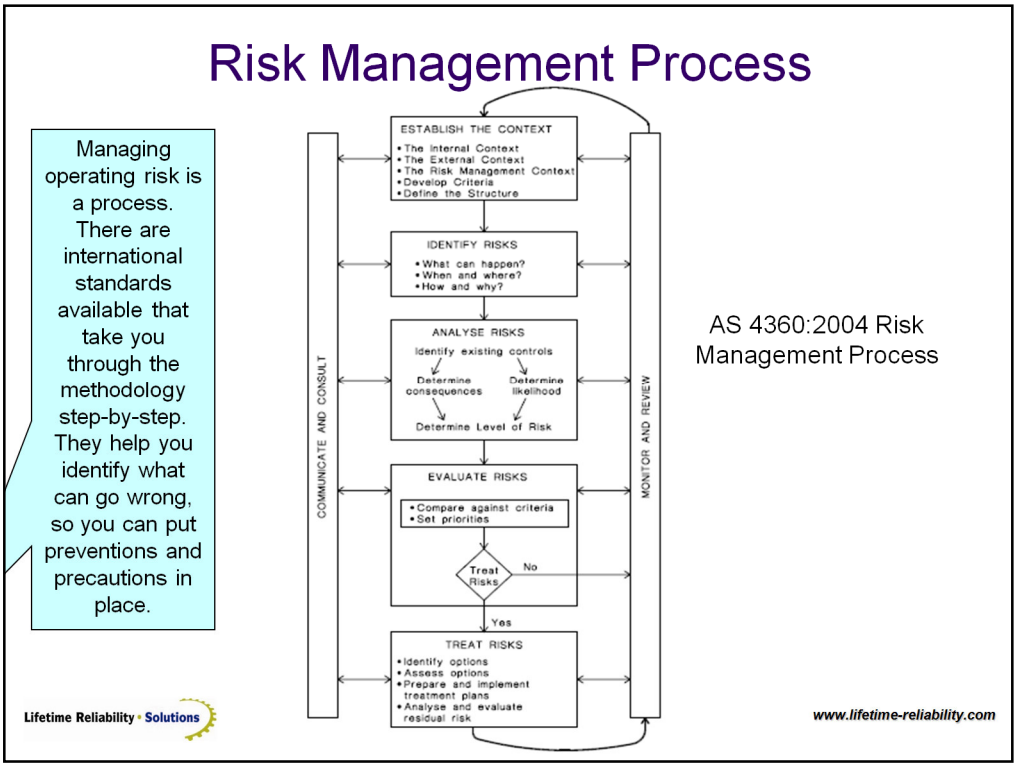
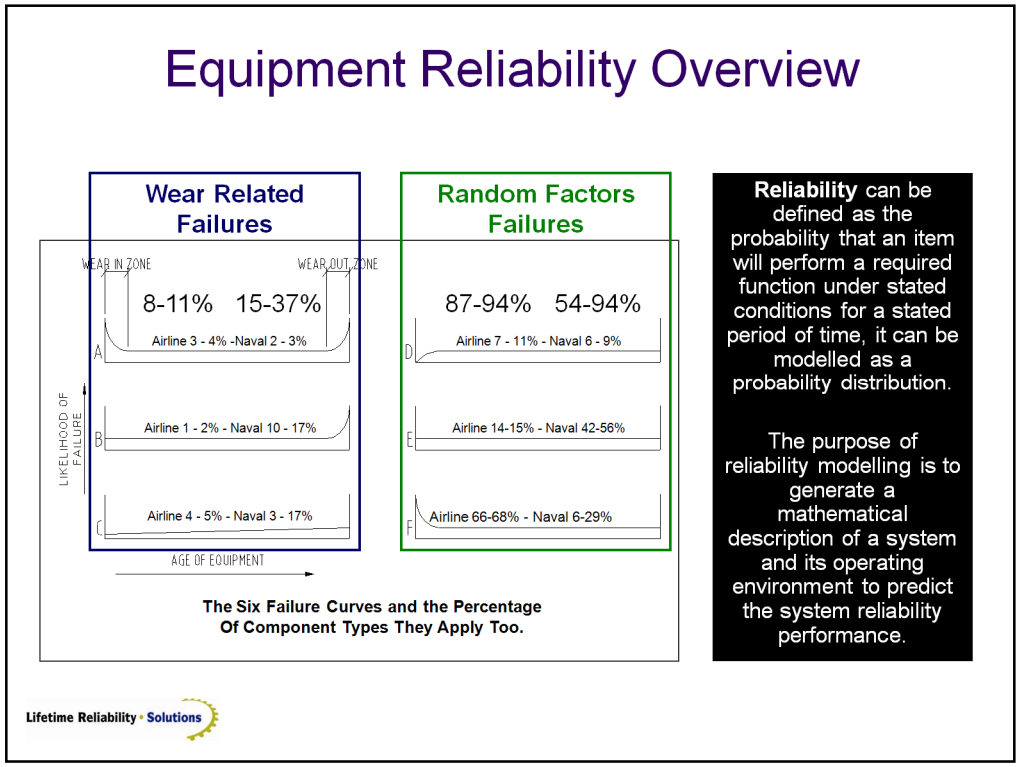
Day 4 list of topics to present and simple exercises to do. Most of the day is about systems and processes that provide and support rotating equipment excellence. The mechanics of what must be done to get RE reliability was covered in Days 1 to 3. Today you will learn how to put them into business systems that make them happen.



This is an extract from Australian Standard 4360:2004, which is a copy of the equivalent ISO standard used internationally. The diagram shows the logical process to follow in identifying, measuring and managing risk. The methodology is well founded and tested, and if applied delivers control of risk in a situation.

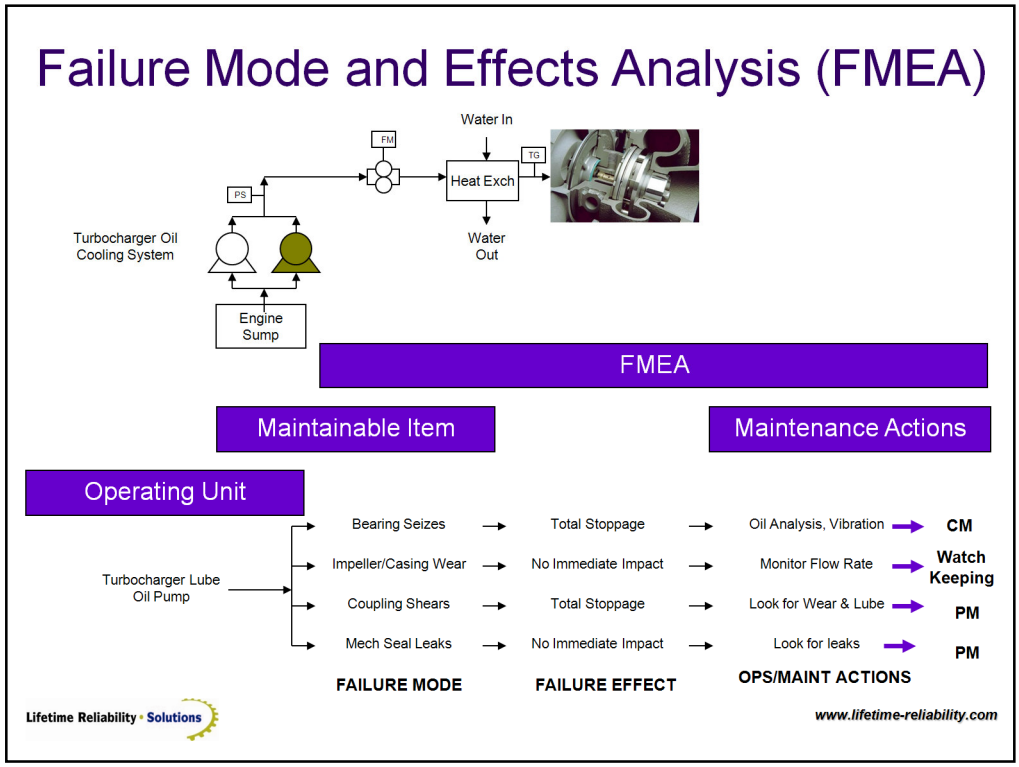
The guide to the standard is very comprehensive in explaining the risk management process and has worked examples of how to apply the various steps.

The important point is t[illegible]all situations contain risk, but no one knows which situation will go beyond normal levels of risk to become a major incident. This means that every situation must be treated as being possible to progress to disaster. The only protection is to implement a standard method of suitable risk control and ensure it is religiously followed. This includes conducting regular tests that the risk mitigation measures do work and are being followed by all parties.



The six curves in the diagram were identified by Nolan and Heap in their 1978 report 'Reliability Centred Maintenance' done in response to reducing the cost of maintaining the then new Boeing 747 Jumbo jets. They indicate the types of failures undergone by parts used in aircraft. The USA Navy did an identical study and found the same curves applied to the parts used in their vessels, but proportions varied due to the maritime duties and environments impacting them. None-the-less, both groups found two distinct categories of parts failure. Those parts whose failure were clearly usage related and failed from aging effects. These represent about 10% of parts in aircraft and up to 35% of parts used in maritime vessels, which suffered corrosion from sea water exposure. But the vast majority, 90% in aircraft and some 70% in naval craft, did not fail from usage. They instead failed from random stress related events.

These stress related events were unpredictable, but probabilistically certain to occur. Meaning that some of these parts would fail in service because they were overstressed, but it was impossible to tell which part in the total number of parts they would be.



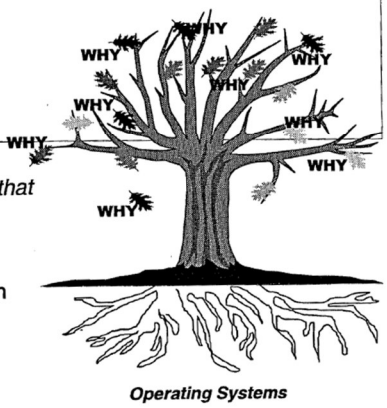
This is an overview of the FMEA team review process. It is a logical progression through each assembly and sub-assembly in an item of plant asking the question, "What can go wrong in its operation?" The team of subject matter experts identify the causes and then agree to the operating and maintenance actions to be performed to prevent a failure. These actions become maintenance and operating tasks.

For the Shopfloor – The 5 Whys method

- In order to drive root causes of a failure, whether chronic or sporadic, we use a tool known as a WHY TREE.
- It's called a "WHY" tree because we keep asking "WHY?" to get to the root causes.

What is it in the way do we do our business (Operating System) that allowed this failure to happen ?

Most **Root Causes** reside within our operating systems.



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NOTE: There is a 5 Why questionnaire in the workbook that is used.

The five whys is a form of root cause analysis. You start with a statement of the situation and ask yourself why it is happening. Then you look at your answer and ask "Why" again and again until you have done so five times. By refusing to be satisfied with just one explanation, you increase the possibility of identifying the root cause of the situation.

How does it work?

After describing the situation. You ask yourself why that situation is occurring and enter your response in the appropriate space in the tool. You then look at your first answer and ask yourself why that situation is occurring. You do this again and again until you have asked why five times, or until you can no longer answer the why question.

The Goals of the Course

(What were we here to achieve?)

- Learn to stop Rotating Equipment problems
- Learn to prevent RE problems
- Maximise RE MTBF
- Maximise RE Uptime and Availability

through …

Maintenance and Reliability Excellence

Farewell and good fortune …