Outline Content

Background and Introduction:

- The evolution of maintenance – the first, second, and third generations of maintenance management
- Traditional sources of PM programmes
- Some reliability principles including MTBF, failure rate and 'life'
- The history and development of RCM
  - Aircraft – worked, audit trail/ continuous improvement
- RCM standards including SAE standards JA1011 and JA1012
- Principles behind the RCM process
  - Technical feasibility and Worth Doing
  - Different types of failure causes and the fact that RCM is about reliability and not just about maintenance
  - The team-based approach
  - The importance of Consequences and context
- Overview of the RCM process
  - Asset Template Library and two approaches to determining a Failure Management Programme
- The Operating Context
  - What an operating context statement should include
  - Why the operating context can affect the way we maintain identical items of equipment
- Functions and performance standards
  - Primary Functions
  - Secondary functions
  - Protective Devices
  - Case Study Step 1
- The Failed State - Functional Failures
- Failure modes
  - Root causes of failure
  - At what level of detail should failure modes be described?
  - Different types of failure modes
    - Human error including training and procedural shortcomings in operations and in maintenance

Deterioration

Design/ installation errors

Failures caused by increasing demand or increased operations requirements

Criticality at the failure mode level - how is it carried out and why is it carried out

- Failure Effects

  What happens when the failure occurs – what information should be recorded and why it should be recorded

  Case Study Step 2

- The Evaluation of Failure Consequences

  Different categories of failure consequence

  Safety/ Environment Consequences

  Hidden Failures

  Economic Consequences

  The management of risk

  How to determine if a maintenance task is worth doing

  Economic Consequences

  Safety/ Environmental Consequences

  How to build a business case for investment in a new maintenance technology or a physical redesign

- Proactive Maintenance Tasks

  How to determine if a maintenance task is technically feasible

  Preventive Maintenance. What is it, and what are the criteria for it to be technically feasible

  Condition-Based Maintenance. What is it, and what are the criteria for it to be technically feasible

  Performance Monitoring. How measures of equipment performance using built-in gauges and installed equipment can be used as the basis of a condition-based task

  Product Quality Monitoring - Monitoring the quality of a product to determine the condition of machines making that product

  Overview of Condition Monitoring Techniques - The use of specialised equipment to monitor the condition of other equipment

  Dynamic Effects Monitoring including vibration monitoring

Particle effects monitoring including oil analysis
Chemical effects monitoring
Temperature effects monitoring including Thermography
Physical effects monitoring
Electrical effects monitoring
Case Study Step 3

- Default Actions (what if we cannot carry out a proactive maintenance task)
  - Redesign including physical redesign and other one-off changes such as training and improved operating and maintenance procedures
  - Redundancy and failure containment
  - Failure Finding (the testing of protective devices)
    - Requirements for technical feasibility of failure finding
    - How to determine if a failure finding task is worth doing
    - Different approaches for determining failure finding task intervals
  - Case Study Step 4
- Implementing and Applying RCM
  - Facilitation and the requirements to be a successful RCM facilitator
  - Examples of successful application of RCM
  - Selecting assets for RCM analysis (including criticality assessment)
  - Implementation of RCM findings
  - KPIs – measuring maintenance and reliability performance
  - Using RCM to drive Continuous Improvement and cultural change
  - Software in support of RCM (including software demonstration)
  - Data collection in support of an RCM analysis
  - RCM and the change management process
- Revision exercises and tests