Maintenance Engineering and Management

Presented by E A Bradley, Pr.Eng., M.Sc., MBA., MSAIE., MSAMA
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A four/five day course

Objective
This course is designed to equip students with the latest theory and practice in the rapidly growing field of Maintenance Engineering.

Structure of the course
The course is unique in its approach, presenting theory and related case studies in each section. This classic business school approach elevates the subject to its rightful place as one worthy of top management’s attention.

The course is international in scope, with the case studies being drawn from the UK, the USA, Australia, India, South Africa and Europe. All have been intensively researched by the course presenter or his associates, and he has been personally involved in several. The cases vary in scope from macro to micro, from those covering large systems to those that illustrate an important point at a detail design level. Several of the cases are supported by DVD material. Cases are chosen from those shown according to course length and student interest.

Finally, the course is firmly based on the relevant Reliability Engineering principles. These serve as a scientific foundation on which modern Maintenance Engineering practices can be built.

Who should attend
Managers, engineers and technicians operating in the maintenance environment.

Prerequisite
B.Sc. Eng., B.Tech, Engineering Diploma or equivalent

The presenter
Mr. Bradley is a Consultant, specializing in reliability and maintenance matters. He formerly served in this role for over 30 years in Eskom, the South African power utility. He has also lectured in these subjects at the University of the Witwatersrand over the same period. His qualifications of an MBA and an M.Sc. in Mechanical Engineering qualify him uniquely to present the subject from both a management and engineering viewpoint.

He has been elected President of the Southern African Maintenance Association (SAMA) Twice and currently serves as their Chief Operating Officer.

Mr. Bradley is the author of over thirty papers on reliability and maintenance, presented in journals and at conferences world-wide.

Outline
1. Introduction to Maintenance
   o The reason for maintenance
   o The system life cycle and life cycle costing
   o How not to maintain
     Case Study 1.1: Maintenance at Automotive Pressings
     Case Study 1.2: Bhopal
     Case Study 1.3: Flixborough

2. Semantics in maintenance management
   • Defining strategy, tactics etc.

3: Reliability Engineering Principles - I
   o Basic concepts: Reliability, Availability, Maintainability.
   o Distributions: The negative exponential, the normal and the Weibull. The bathtub curve.
   o Component reliability: Weibull analysis.
     Case Study 3.1: The Rubber Bellows at the New Era Fertilizer Plant.
     Case Study 3.2: Does the Bathtub Curve Exist? The Hillman Vogue Case

4: Reliability Engineering Principles - II
   o System availability: Availability block diagrams.
     Redundancy, storage capacity and m-out-of-n systems.
   o Monte Carlo simulation
     Case Study: 4.1: An Exercise in Availability Modelling for System Improvement.
     Case Study 4.2: An Exercise in Simulation

5. Reliability Engineering Principles -III
     Case Study 5.1: The Classic Philips Lighting Study.
     Case Study 5.2: The Classic Greyhound Bus Motor Study.
     Case Study 5.3: How not to do Weibull Analysis.

6: Maintenance Management - I
   o Strategy
   o Organisation
   o Training
   o The work order system and permits to work
     Case Study 6.1: The Piper Alpha Disaster

7: Maintenance Management – II
   o Planning and Scheduling
   o Staffing
   o Queuing Theory
     Case Study 7.1: The Backlog

8: Maintenance Management – III
   o Setting the Standards
   o Benchmarks
   o Indices
     Case 8.1: Industry Benchmarks, Company Indices
9: Maintenance Management – IV
  o Maintenance by contractors
    Case 9.1: A win-win situation? Feedpump Maintenance

10: Maintenance Management – V
  o Inventory Management
  o Inventory Models, re-order levels etc. – is all this of any use?
  o The correct way to model maintenance inventory – via the system availability model
    Case Study 10.1: Spares Levels and Availability

11: Maintenance Management – VI
  o Outage Management – Project Management techniques applied to maintenance
  o The essence of Project Management – get the job done within Specification, Programme and Budget
  o Critical Path Analysis (CPM)
  o Resource Allocation
  o Programme and Budget trade-offs
    Case Study 11.1: The Challenger Disaster

12: Approaches to Maintenance Optimisation – I
  o Reliability Centred Maintenance (RCM)
    Case Study 11.1: RCM at Dragon Peak
    Case Study 11.2: RCM at Tiger Sub
    Case Study 11.3: Guidelines for Successful RCM Implementation

13: Approaches to Maintenance Optimisation – II
    Alternatives to RCM.
      • PMO
      • RCM Lite – the dangers

14: Approaches to Maintenance Optimisation – III
  o Total Productive Maintenance (TPM)
    Case Study 12.1: TPM Implementation at an Australian Plant.
    (Used with permission)
    Case Study 12.2: Designing-out Maintenance

15: Condition Monitoring
  o Vibration Analysis
  o Oil Analysis
  o Infrared Analysis
    Case Study 15.1: The Failed Roller Bearing

16: Incident Investigations
  o Learning from our mistakes
  o Fault Tree Analysis as an investigative tool
    Case Study 16.1: The Roots Blower Case
    Case Study 16.2: The Black Rock Turbine Incident

17: The Computerised Maintenance Management System (CMMS)
  o The Heart of Modern Maintenance Management?
    Case Study 17.1: Implementation of a CMMS

18: Striving for Excellence and Recognition: The Maintenance Audit.
  o Historical precedents: The Japan Institute of Plant Maintenance
  o Audit Principles
  o Know your plant and keep it good as new (KYPAKIGAN)

19: Configuration Management
  • What it is and why it is important
  • Case: Large System Failures, inside and outside Eskom

20: Safety
  • The OHS Act and its implications for maintenance
  • Case 20:1 A legal case history

Course duration
The course may be run over four or five days