

Zero Breakdown Maintenance Strategies Training Course Content

1-Day Course on the Life Cycle Strategies that Cause Zero Breakdowns

Zero Breakdown Maintenance

Course Coverage

1) Introduction to Reliability Growth Concepts

Understand How Machines are Designed and the Limits They Must Live Within

The Unforgiving Nature of Machine Design

Strength of Materials Limitations

Effect of Internal Clearance Variation on Bearing Life

Repeated Over-Stressing Causes Fatigue

Know the Limits of Your Parts

The Overload Cycle

The Degradation Cycle

Condition Monitoring the Degradation Cycle

Cause of Wear-out Failures

Stress and Fatigue are Optional

Building for the Physics of Failure

What is Reliability?

Activity 1 – What is the Reliability of this Glass?

How do you Measure Reliability of a Glass?

Measuring the Number of Failures

Measuring the Rate of Failures

Converting to Chance of Failure

Drawing the Failure Curve for a Glass

No Maintenance for Random Failures

Random Failures are Preventable

What is the Reliability of a Car Tyre?

Preventive Maintenance for Wearing Parts

Reliability Mathematics in 'Random Failure' Zone

Failure Rate and Reliability Curves

Using Weibull Curves for Failure Prediction

Reliability of Processes

A Machine is a Series System of Parts and Components

Machine Failure Rate is the Sum of Its Parts Instantaneous Failure Rate

Reliability Properties for Systems

Reliability Properties for Series Systems

Reliability Properties for Parallel Systems

Activity 2 – Reliability of Processes

Reliability of Machines in Series Process

Reliability of Machines in Long Series Processes – *The Never Ending Challenge*

Reliability of Machines

Improving the Reliability of Machines

Financial Benefits of Reliable Machines

Meeting The Reliability Challenge

Risk – Reduce Chance or Reduce Consequence?

Modelling Machine Reliability

Machine Reliability Block Diagram

Best Practice Reliability Engineering Application

Quality Function Deployment – The Voice of the 'Customer'

Failure Cause Identification and Removal

Failure Mode and Effects Analysis

Failure Modes and Functional Loss

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Course Content Continued

Failure Modes and Evidence of Failure
Identifying failure modes and functional failures in a pump installation
Failure Mode and Effects Analysis (FMEA)

Reliability Growth

Reliability Growth Plot of Systems
Crow – AMSAA Reliability Growth Plotting

2) Introduction to Profit Centred Maintenance

Maintenance Vision

The 6 Purposes of Maintenance
Benefits Reliable, Productive Equipment
Make Maintenance Profit Focused
Turning Maintenance into a Profit Centre
Develop a Plan to Reach Mastery
Turn Objectives into Systematic Activities
4 Pillars of Quality Management Systems
What Are the Critical Success Factors?
The Benefits of Profit Centered Maintenance Organization and Control
Make Maintenance a System of Processes
Today's Best Practice Maintenance Methodology (still misses the target!)
Choice of Maintenance Types

Risk Management with Maintenance

Maintenance Strategies for Risk Reduction
Opportunity Maintenance Explained
Match Maintenance Strategies to Risk
Move from Reactive... to Proactive... to Risk Reduction
Failure Prediction Mathematics – Weibull Reliability of Parts and Components
Reliability of Systems of Parts and Components i.e. Machines
Equipment Reliability Strategies

The Need for Precision and Accuracy

Precision Operation Extends Productive Life
Precision Maintenance of Machinery is ...
Typical Standards for Precision Maintenance Program
Precision Maintenance Delivers Big Savings
Precision is a Serious Opportunity
Using Precision Maintenance Everywhere
Precision Maintenance and CBM used Together Effectively Reduce Failure

Risk and Equipment Criticality

Strategies for Reliability Improvement
Classical Risk Analysis Method
What Risks Are Out There?
Equipment Criticality
Recognise Size of Equipment Risk
Equipment Criticality
Risk Influences Maintenance Type

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Base Maintenance on Operating Risk Matrix
Match Maintenance and Operating Practices to Equipment Criticality
Activity 3 – Match operating and maintenance requirements to criticality
Maintenance Strategy Selection

Determine Component-Based PM Frequency by Statistical Analysis
Collecting Data for Component Statistical Analysis
Selecting PM frequency depends on ...
Selecting PdM Frequency
Activity 4 – Imbedding good practice PM and PdM into organisations

Business Systems and Processes

Each Process is Part of a Series of Processes
The Process Chains the Bind Us
Reliability Properties for Series Systems

Defect Elimination and Failure Prevention

Benefits of Failure Elimination
Root Cause Failure Analysis (RCFA)
How RCFA Contributes To Improvement
Root Cause Failure Analysis Process
Root Cause Failure Analysis Example
Risk Identification and Removal Worksheets
Getting a measure on reliability...
Journey from Repair-focused to Reliability-focused Culture
How do You get a Reliability Culture?
Tools on the Journey to Reliability

Practical Performance Indicators

Improving Reliability by Setting Maintenance KPIs and Measuring Outcomes
Meaningful Maintenance and Reliability Performance Measures

3) Maximum Life Cycle Profit Maintenance

When You Design a Plant You are Designing a Business
When Operating Costs are Committed
The Design Process Limits Reliability
Design and Operating Cost Totally Optimised Risk (DOCTOR)

Life Cycle Implications

Life Cycle Risk Management Strategy
Why You Need Defect Elimination and Failure Prevention
Problems Waste Time, Money and Resources
Eliminate Defects to Prevent Problems
Count the Failure Modes Defects Cause (553)
Function of Business is to Wisely Profit

Identify Defect and Failure True Costs

Defects and Failures True Costs
Failure Costs Surge thru the Company

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Defect and Failure True (DAFT) Costs go Company-wide
And clearly, repeated plant and equipment failures and stoppages totally destroy the profitability of an operation.

Effects of DAFT Costs

Calculate DAFT Costs on Spreadsheets

Benefits of Reducing Operating Risk

Implications of DAFT Costs to Risk

Quantify the Financial Cost of Risk

Failure and Risk Boundary

Determine Your Acceptable Failure Domain

Identify What Risks You WILL NOT Carry

Reduce Risk with Chance Reduction and Consequence Reduction Strategies

Precision Operation and Maintenance

Precision Maintenance:

Precision across entire 'equipment system'

Machines fail but we replace parts...

Typical Precision Maintenance Program Content

6 Mechanical Equipment Care Standards to Set, Use and Keep Using

Typical Standards for a Precision Maintenance Program

The Accuracy Controlled Enterprise

Accuracy Controlled Enterprise (ACE) Procedures

The Accuracy Controlled Enterprise is...

Accuracy Controlled SOPs Remove Variation with Proactive Statistical Control

Set Standards and Standardise their Use

Train Operators and Trades in Precision

Quality Management System for Continual Maintenance Improvement

Plant and Equipment Wellness Defined

Plant and Equipment Wellness

Remove variation ... by setting standards and measuring accuracy

Prevent failure ... by defect elimination

Prevent failure ... by proactive precision maintenance

Risk control ... by chance reduction risk management

Accuracy control ... by precision domain practices

Accuracy control ... by precision systems

Measure/Monitor/Improve Performance ... by process step value contribution

The Continuous Improvement Journey

Effect of System Failures Across Life Cycle

Reliability Growth Cause Analysis

Reliability Growth Cause Analysis

Activity 5 – Do a RGCA Activity

Reliability Growth Cause Analysis of a Bearing

Zero Breakdown Maintenance Process

Maintenance Management Best Practice – Profit-Focused, Ultra-High Reliability