

The Use of (RCA) and Condition Monitoring in the Preventive Maintenance Techniques

CONTENT

PART I

What is Root cause analysis (RCA)?

- Systems Failure Analysis
- What is the problem?
- Defining the problem
- The nature of a problem
- Problems versus symptoms
- Clearly define problem and analysis boundaries
- Product and process nonconformance
- Differences between Root Cause Analysis and Root Cause Failure Analysis (RCFA)

Introduction to Root Cause Failure Analysis

- General Analysis Techniques
- What is Root Cause Analysis?
- Root Cause Analysis Techniques
- Root cause failure analysis methodology
- Safety-related issues
- Regulatory compliance issues
- Process performance
- System and component considerations
- Change and barrier analysis
- Events and causal factors analysis
- Structured Root Cause Analysis techniques
- Problem identification
- Problem description
- Cause analysis
- Determine Root Cause
- What are the types of causes?
- Causal factor category list

- Determine causes of event
- Solution development
- Practical Problem Solving
- Tools for Root Cause Analysis
- Right tool and method
- Manufacturing Case
- Methods to define and verify root causes
- Tools for developing practical solutions
- Techniques for implementing corrective action
- Assessment and assignment matrix
- Failure Modes and Effects Analysis (FMEA) techniques (DFMEA and PFMEA)
- Fault tree analysis (FTA) as a top down, deductive failure analysis
- Effect Fishbone (Ishikawa) diagram

Introduction to Fault Tree Analysis (FTA)

- Design of experiments and systems failure analysis
- Nature Of cause
- Identify, collect, and evaluate relevant data
- Brainstorming and mind mapping
- Human and system reliability
- Analysis pitfalls
- Team assignment
- Common root cause analysis tools
- Select/tailor analysis tools and techniques
- Taguchi fractional factorial
- Corrective action
- Conduct interviews and small-group brainstorming sessions
- Identify major contributors to problem occurrence
- Tools & Techniques - Flowcharting
- Develop ranked list and rationale for potential root causes
- Document and review results
- Evaluate each major contributor using a hierarchical structure of root cause categories
- Allocate performance measure losses to root cause categories
- Failure classification

Failure modes and effects analysis (FMEA)

- FMEA
- Design and Process FMEA

- Ordering the analysis team
- Analyze the data: Introducing the logic tree
- Identification of Root Cause Failure Analysis and Cause
- Fault tree analysis
- Failure cause evaluation and statistics

Fishbone (Ishikawa) Diagram

- Cause-and-Effect Diagram
 - Ishikawa Diagram
 - Cause enumeration diagram, process fishbone, or time-delay fishbone
 - CEDAC (cause-and-effect diagram with the addition of card)
 - Desired-result fishbone
 - Reverse fishbone diagram
- Possible causes for an effect or problem
- When and how to Use a Fishbone Diagram
- Identifying possible causes for a problem or problems
- Effect of Methods, Machines (equipment) and People (manpower)
- Effect of Materials, Measurement and Environment
- Fishbone Diagram examples
- How to create a Fishbone Diagram
- Analyze process dispersion
- Result and Analysis of Causes and Effects

People, Processes and Organizations

- The role of people and processes
- Role of Management Systems
- Understanding the roles that people typically play in problem solving
- Define new roles
- An introduction to the process
- When, where, why, and how to apply the process effectively

Process for Finding Root Failure Cause

- The Framework
- Methods of data collection
- Reliance on expertise
- Clues for finding root cause
- Testing and verification of causes

- Assignable Cause and Root Cause Analysis
- The Importance of Establishing Codes for Tracking and Trending of Investigations
- Link between system and component
- Formulating and amplifying the problem
- Identifying solutions
- Failure Mode and Effect Analysis (FMEA)
- Writing Troubleshooting guides

Root Cause Failure Analysis (RCFA) Process

- RCFA as a simple, yet disciplined process
- Why did it happen?
- Could it have been avoided?
- How can it be prevented in the future?
- Investigate, rectify and eliminate equipment failure
- Chronic breakdowns
- How to find the latent roots responsible for the breakdown
- Latent roots and the management system weaknesses
- Preserving Failure Data
- Ordering the Analysis
- Analyzing the Data
- Communicating Findings & Recommendations
- Tracking for Success
- Stating the Failure Event
- Stating the Failure Modes
- Hypothesizing
- Verifying Hypotheses
- Determining Underlying Causes (Physical, Human and Latent)

Corrective Action

- Criteria for event description
- Cause and effect analysis corrective action definitions
- Corrective action order of precedence
- Advantages and disadvantages of design modifications, process modifications, procedural modifications, requirements relaxation, screening, and other potential corrective actions
- Evaluating corrective action effectiveness. Inspection caveats
- Corrective action class exercise.
- Corrective Action Requirements.
- ISO 9001 root cause identification and corrective action requirements

- The ISO 9001 Management Review
- Pareto analysis
- Material review, disposition, and corrective action
- Material review, disposition, and corrective action class exercise

Conducting a Cost-Effective Root Cause Failure Analysis

- Root Cause Failure Analysis facilitator
- Root Cause Failure Analysis team leader
- The process expert on conducting a root cause analysis
- The content matter expert pertaining to the event
- Develop a root cause analysis reporting
- Contributory Factor
- Corrective Action
- Person(s) Responsible
- Action Due Date
- Measurement Technique
- Establishing A Value Criterion
- Pick a Cause
- Grab-bag Analysis
- Criteria to compare root cause analysis systems
- Completeness
- Comparability
- Cost-effectiveness
- Growth potential
- Practice Description
- Opportunities for Impact
- Evidence for Effectiveness of the Practice
- Potential for Harm
- Costs and Implementation
- Automating Root-cause Analysis
- Requirements for Analyzing Failure Modes and Their Effects
- Analysis Capabilities in Event Management Systems
- Event Filtering
- Rule-Based Event Analysis
- Model-Based Event Analysis
- Codebook Correlation

Strategies and Solutions for Root Cause Analysis

- Process is the key
- Tools and techniques are essentials
- Technique and tools to develop and implement effective and efficient Root Cause Analysis programs
- Tools and techniques to identify manufacturing errors
- Tools and techniques to trouble shoot
- Addressing the challenges of t Root Cause Analysis investigations
- Tools and techniques for identifying common Root Causes and implementing corrective actions
- Manufacturing investigations techniques
- Managing corrective action and preventive action

PART II

INTRODUCTION TO MACHINERY VIBRATION

- Vibration: sources, uses, effects
- Definitions, terminology, measurements; demonstrations
- Measures, analysis, natural frequencies; demonstrations
- Data collection demonstration
- Machine knowledge
- Vibration testing
- Basic spectrum analysis
- Common machine faults
- Vibration severity

BASIC MACHINERY VIBRATION

- Basic vibration concepts and terminology
- Use of electronic data collectors for monitoring and analysis
- Machine monitoring principles
- Selection and location of transducers
- Data acquisition for monitoring and analysis
- Fault and condition analysis
- Calculating machine frequencies
- Operating speed fault analysis
- Machine acceptance testing

ADVANCED MACHINERY VIBRATION

- Advanced vibration concepts
- Single-plane balancing
- Use of single-channel FFT analyzers and data collectors
- Using data collectors and tape recorders for data storage
- Setting alarms for efficient predictive maintenance
- Determination of natural frequencies, resonance, and critical speeds
- Identification of machine forces and frequencies
- Vibration correction techniques
- Isolation and damping of installed equipment

Spectral, time waveform, phase, and orbital analysis machine specific analysis—motors, fans, pumps compressors, engines, presses, turbines

FUNDAMENTALS OF MACHINERY LUBRICATION TRAINING

- How Lubrication Affects Machine Reliability
- Lubrication Fundamentals
- Understanding Additives, Base Oils and Grease Thickeners
- Lubricant Performance Properties
- Food-grade and Environmental Friendly Lubricants
- Lubricating Grease Application Methods
- Lubricating Oil Application Methods
- Journal Bearing Lubricants
- Rolling-element Bearing Lubricants
- Gear Lubricants
- Automotive & Mobile Equipment Drive-line Lubricants
- Compressor Lubricants
- Steam & Gas Turbine Lubricants
- Hydraulic Fluids
- Contamination Control
- Oil Drains, Flusing & Reservoir Management
- Storing, Handling and Managing Lubricants
- Design & Inspect of Lube Excellence
- Used Oil Sampling and Analysis Fundamentals
- Essential Field Inspection

MACHINE RELIABILITY & CONDITION MONITORING

Module 1 – World of FFT

Module 2 – Basic Balancing Of Rotating Machinery - Possible causes of imbalance - Mass unbalance – Diagnosing unbalance – Balancing tolerance/methods – Rotor critical speed –

Advanced Step
for Technical Training



الخطوة المتقدمة
للتدريب الفني

Correction to imbalance – Balance demo single plane – Setup – Bearing Fault Analysis - Practical

Module 3 - Laser Shaft alignment - Introduction to laser shaft alignment - Different Industries Application - Alignment Methods - Tolerances etc - Shaft Alignment - Practical

Module 4 – Airbourne Ultrasound Predictive Maintenance - Sound & Sound Property - Type of Ultrasound - Different Ultrasonic Detector - What is an Ultrasound Detector - Why Ultrasound

Module 5 – Basic Principle & Application for Lubrication - Why lubrication is needed - Grease Definition / Principles - Grease Selection - Grease Re-Lube Frequency