Machinery Root Cause Failure Analysis

TM130

Course Overview:

This course presents a systematic approach to fault diagnosis and failure analysis in the process, manufacturing, power generation and mining industries. A highly effective root cause failure analysis (RCFA) method is explained in detail.
This course will highlight two different approaches to fault investigation: One, addressing sporadic failures and two, solving inherent, chronic or recurring faults in equipment and systems. The course is based on the existence of three distinct levels of causes, namely immediate or physical causes, human causes or latent root causes. The course will illustrate how to perform data analysis to solve recurring failures by investigating real life equipment failure events. Participants are also encouraged to bring their own failure statistics for manual (plotting) or computerized failure pattern analysis. Finally, it will be shown how to prepare recommendations based on faultfinding investigations and assure results by organizing effective follow-up processes. By reference to specific case studies, dealing with equipment components, centrifugal pumps and reciprocating compressors, it will be demonstrated that such a systematic program can lead to significant failure reductions and thus contribute to continuous improvement.

Course Objective:

Upon successful completion of this course, the delegates will be able to:

-Gain an understanding of structured, results-oriented root cause failure analysis methods
-Learn how parts fail and why they fail in a given mode related to cause
-Approach the analysis of failures that happen either sporadically or chronically
-Set up failure analysis teams and gain a thorough understanding of the importance of failure or repair data collecting
-Gain knowledge in applying statistical techniques in the analysis of available historical failure data enabling them to formulate maintenance and operating strategies
-Practice with several techniques that they could apply right away in their daily work of failure fighting

Course Outline:

RCFA and Structured Problem Solving

-Cause analysis
-Problem Solving Sequences
-Situation Analysis
-Action Generation
-Decision Making
-Where RFCA First In
-Planning for Change

Cause Analysis

-RFCA Steps
-Failure Causes
-Benefits to RCFA
-Why We Don't Around To Doing RCFA

Two-Track Approach

-The RCFA Selection Process

Training Language:

EN / AR

Training Methodology:

-Presentation & Slides
-Audio Visual Aids
-Interactive Discussion
-Participatory Exercise
-Action Learning
-Class Activities
-Case Studies
-Workshops
-Simulation

-How to Determine the Vital Few

-Different Approaches to RCFA

-Failure Classifications

Failure Types

-Sporadic

-Chronic

-How Failure Appear

-Examples from Your Operation

The Three Levels of Cause

-Selecting the Right Failures

-Cost Spreadsheet

Collecting Failure Data

-The Five P's of Root Cause Failure

-Analysis

-Why a Logic Tree?

Parts and Position

-Sisal Agents of Failure (FRETT)

-Metallurgical Failures

-Equipment Component Failures

-Piping Failures

-Examples of Equipment

-Component Failures

The Analysis Process

-Describing the Failure Event

-Taking Failure Mode Inventory

-Building hypotheses

-Determining the Causes

-Describing the Process

Data Analysis I

-Scatter Plots

-Correlation

-Example Using Process Pump

-Failure Management Data

Data Analysis II

-Weibull Analysis (Exercise Using Process Pump and Furnace Tube Failure Data)

-Modeling and Simulation

Data Analysis III

-Operating deflection (FEA)

-Vendor Experience

Another Way

-Competing Approaches to Fault Analysis

-The KT Approach

-Example of an Elusive Centrifugal Process Pump Failure (VPS Bottoms Pump Analysis)

Human Root Causes

-Human Performance Reliability (HPR)

-Unintended Error

-Physical and Mental Limitations

-Purposeful Wrongdoing

-PR Example

Solutions

-Requirements for Good Solutions

-Purpose and Design of Computerized Maintenance Management Systems (CMMS)

-CMMS and its Role in Failure Analysis

Stewardship of RCFA Results

-Life Cycle of Recommendation and Follow Up

-Service Factor committees

-Reliability Teams

-Documentation and Reporting

-Example A Process Pump Failure Reduction Program

-Network in

Who Should Attend:

This course is intended for operating, manufacturing and equipment reliability professionals, supervisors and engineers involved in plant operating reliability and availability management. Also for personnel from process industries such as refining, petrochemical, chemical, mining, pharmaceutical, fertilizer, pulp and paper manufacturing, food processing and utilities will benefit from this program.