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## Maintenance Error Investigation and Root Cause Analysis

### Overview

Human error plays a significant role in contributing to many mishaps. Approximately 70%-90% of accidents under complex and high technology system are caused by human error such as Chernobyl, King Cross undergrounds fire, Challenger accidents, Tenerife runway collision, and many more. Understanding and preventing human error can improve system safety and reduce safety risk caused by human error. The training course provide human error reduction practices combine with a comprehensive set of tools and techniques required to prevent and reduce human errors that occur in your maintenance environment. The interactive training workshop is intentionally designed for those who responsible for or concerned with maintenance management that aims to prevent maintenance error, increase safety level, improve maintenance quality and reduce maintenance cost. This training workshop is targeted at various industries, not a specific one. Our training course is full pack of industrial cases, hand-on exercises and various examples.


### Objectives

The 2 days interactive training workshop will enable you to learn how to

- Understand the human error concept in maintenance
- Identify the contributing factors that caused maintenance error
- Apply human factor concept in maintenance environment
- Understand the human performance and limitations applied for maintenance system
- Develop a structured approach to investigate human error in maintenance system
- Develop a proactive approach to manage human error in maintenance

### Course Outlines

1. Accident/Incident investigation process in maintenance
  - Event notification and detection
  - Data and evidence gathering
  - Data analysis (Identify casual factors and root causes)
  - Remedial actions development
  - Discussion, conclusion, and recommendation
2. Root cause analysis tools and techniques
  - Event and casual factor charting (ECF)
  - Barrier analysis
  - Cause tree method
  - 5 Why
3. Maintenance Error investigation process
  - Human Error in Maintenance System
    - Safety cases of Maintenance error contribution to many accidents in complex and hazardous systems
    - Types of Human Error
      - Types of Maintenance Error
    - Types of Human Error in maintenance
      - Skill-based, Rule-based and Knowledge-based Behavior
      - Reason Model of Unsafe Acts
      - Human Information processing error
4. Maintenance Human factor data collection
  - The SHELL Model
    - Liveware : Physical Factors, Physiological Factors, Psychological Factors, Psychosocial Factors
    - Liveware-Liveware

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- Liveware-Software
- Liveware-Hardware
- Liveware-Environment

### 5. Human Performance and Limitations approach to maintenance error analysis

- Human Information Processing
- Sensory/Vision/Hearing
- Perception
- Attention
- Memory
- Decision Making
- Response execution
- Situation Awareness
- Workload
- Stress
- Fatigue

### 6. Human System approach to maintenance error analysis

- ICAM model
- HFACS-ME
- Maintenance Error Decision Aids (MEDA)

### 7. Hand-on exercises

### 8. Practical Case Study

#### **Who should attend**

Maintenance engineer, maintenance supervisor/manager, reliability engineer, and safety engineer/manager, quality engineer, investigators

#### **Duration**


2 days

#### **Key Points about This Course**

- You will learn how to understand the application of human factor and human error concept
- You will learn how to understand the human capability and limitations and apply them to prevent maintenance error and accidents/incidents
- You will learn how to understand and apply the application of SHELL model
- You will learn how to inspect and check your safety defence
- You will learn how to identify and classify key contributing factors to maintenance error
- You will learn how to understand the human factor approach to maintenance error analysis
- You will learn how to set up a structured investigation process to maintenance error
- You will learn how to develop a systematic and proactive system to manage human error in maintenance

#### **Learning Outcomes from this course**

- You can understand and apply human factor and human error concept approach to maintenance system
- You can determine key contributing factors that caused maintenance error
- You can understand the human performance and limitations applied for maintenance system
- You can develop a structured approach to investigate human error in maintenance system

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- You can apply and utilize a comprehensive set of tools and techniques required to prevent and reduce human error
- You can develop a proactive approach to manage human error in maintenance