Audience Profile

The book is suitable for everybody seeking to improve asset performance with designing for operability and maintainability principles. The book systematically guides you through the linked topics of ergonomics, operability, maintainability, hazard elimination and life cycle cost. It discusses the performance of HazOps analyses and the analysis of maintenance activities with the Bretby Index. In particular, Asset Owners, Managers, Engineers, Planners, Trades people, Operators, Finance Managers, Safety Officers and all those who contribute in their roles of operators and maintainers, engineering, designers, logistics, admin, workshops, etc. to the output of asset in quantity and quality.

Objectives

To equip those active in the management of productive and infrastructure assets with the knowledge, skills and attitudes needed at the various stages in the life of an asset for optimizing the quality and quantity of asset outputs, minimizing risk and use of inputs, as required by the business plan.

The course further aims to provide an understanding of:

- ergonomics, operability, maintainability, hazard elimination and life cycle cost;
- the ability to recognise when processes and assets are not well designed for operability and maintainability;
- modify the design of processes, assets or operating and maintenance procedures as a result of the HazOps and Bretby Maintainability Index analysis.

What makes our approach different?

The main difference is the introduction of the Bretby Maintainability Index analysis on which there is hardly any information available, neither in books, nor on the internet. We also promote applying designing for maintainability analysis to existing assets.

To assist in mastering the material in this manual, we include questions throughout the chapters and team exercises at the end of most chapters. The questions intend to link the material to implementation in the reader's organisation. If you have limited experience with the material, it is important to wholeheartedly embrace these questions. The team exercises further intend to 'capture' important members of the readers' work teams in the hope of promoting a wider interest in what the techniques can do for the organisation.

Contents

1. Asset Operability & Maintainability Explained
Towards best practice design for asset operability and maintainability
What is improved design for asset operability and maintainability?
What are the objectives and goals of improving asset operability and maintainability?
How do asset operability and maintainability link to asset management?
Definitions and acronyms
What are the benefits of improved asset operability and maintainability?
Why should you consider improving asset operability and maintainability?
What is the asset operability and maintainability improvement process?
How should you implement an asset operability and maintainability improvement program?
2. How to Identify Process or Asset Functions for Improvement?
Desired learning outcomes
How to identify the process or assets for analysis?
Do you know the asset hierarchy?
What are process and functional block diagrams?
What is an asset register?
Which asset register structure?
How to collect asset register data?
Who should be responsible for data collection?
Which asset to analyse first?
Pareto analysis
How to assess risk?
AS/NZS 4360 Risk management
What is the severity of fault consequences?
What is the likelihood of occurrence?
How to calculate risk?
Do you need to assess detectability?
How can you rank asset reliability costs?
How to assess assets for operability and maintainability?
How do you comprehensively describe functions?
What are process or asset functions?
Can you link functions to the current asset application?
Can you include asset policy in function description?
Can you link functions to the operator tasks?
How can you analyse maintenance procedures?
Main outcomes of Chapter Two
Syndicate Exercise 1
3. What Is the Science of Ergonomics?
Desired learning outcomes
Ergonomics as a multi-disciplined science
What are the benefits of improved ergonomics?
Anthropometry and bio-mechanics
How do you use anthropometric data?
What is a person-machine system?
How can you apply ergonomics?
Main outcomes of Chapter Three
Syndicate Exercise 2
4 What Are the General Principles of Improving Asset Operability?
Desired learning outcomes
What is asset operability?
How to optimise the man - machine interface?
What are the important factors of the physical environment?
How to improve asset safety?
What is a hazards and operability analysis?
At what times do you perform hazards and operability analyses?
How to perform the HazOps analysis?
Which HazOps analysis sheets do you use?
The standard sheet
The extended sheet
The final HazOps report
What are the benefits of HazOps?
What are the disadvantages of Hazops?
Main outcomes of Chapter Four
5. What Are the General Principles of Improving Asset Maintainability?
Desired learning outcomes
What is asset maintainability?
Relationship between reliability, maintainability, availability and life cycle costs
What are the fundamental principles of maintainability in the various life phases?
How do you predict maintainability?
How to specify maintainability?
How to verify maintainability?
How do you assess existing assets for maintainability?
How to measure maintainability?
Distribution functions for maintainability
How to (re)Commission assets?
Main outcomes of Chapter Five
Syndicate Exercise 3
6. How Can You Analyse Maintainability?
Desired learning outcomes
Which asset maintainability analysis do you use?
US Standard MIL-HDBK-472, Maintainability Prediction
SAE maintainability index
The Bretby Maintainability Index
What are the index components?
How to perform the BMI analysis?
The BMI article by S. Mason
How to apply the Bretby Maintainability Index?
Review routine maintenance schedules
Select assets with the lowest maintenance demand
Improve existing asset design
Using the method for one-off tasks
About the tables
Modifying the BMI tables
The BMI table
Example of a BMI analysis
Main outcomes of Chapter Six
Syndicate Exercise 4
7. How to Implement Improved Asset Operability and Maintainability?
Desired learning outcomes
How to implement asset operability and maintainability improvement?
Main outcomes of Chapter Seven
Bibliography