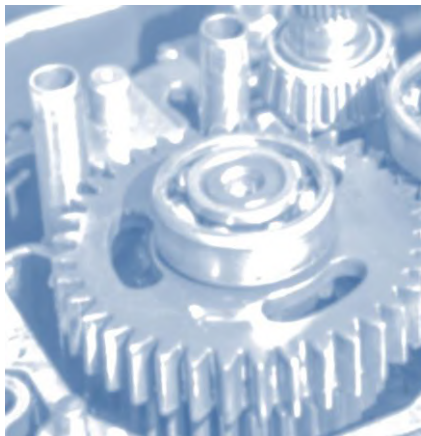




Introduction

This course shall focus on both the theoretical and functional aspects of rotating equipment maintenance and operations. The course aims to impart knowledge in the following topics;

- Basic principles of rotating equipment
- Understand the functions of installed equipment
- Installation, commissioning, alignment & balancing
- Performance, condition, vibration & lube oil monitoring
- Major maintenance, repair/overhaul/balancing of parts
- Signs of distress & identification of corrective actions to prevent/limit/contain failure
- Effect of process conditions on equipment reliability
- Process safety around rotating equipment
- Failure modes including analysis and corrective actions
- Introduce some new technologies in rotating equipment



Program Designed For

Production Operations Departments and personnel involved in rotating equipment operations

Duration

5 Days

Learning Outcome



You will be able to;

- Recognise key factors in operation that affect reliability/availability
- Understand & explain principles and functioning of major rotating equipment
- Understand the reliability/availability maintenance strategies and practices
- Recognise reliability/availability distress and identify corrective actions
- Assist in reliability/availability failure mode assessment

Minimum Pax

10 Pax

Your Instructor

Ruslan Sirin

Course Content



Day 1

General Issue 1

- Course Introduction
- Purpose & Objectives
- Overview of Rotating Equipment (RE)
- Types of RE, Pumps, Compressors, & Drivers
- Compressor Selection Exercise
- Reciprocating Compressor vs Centrifugal
- PD Pump vs Centrifugal
- HD GT vs AD GT
- Installation, Alignment, Start-up & Testing

Centrifugal Pumps 1

- NPSH, Pump Calculation
- Minimum Flow Protection
- Pump Capacity Control
- Balancing Pump Axial Thrust
- Causes of Failure

Centrifugal Pumps 2

- Mechanical Seals
- Start-up and Testing
- Syndicate Exercise



Day 2

Fracture & Fatigue

- Classification of Failures
- Brittle Fractures
- Stress Corrosion Cracking
- Ductile Fractures
- Fatigue Failures

Bearings

- Plain Bearings
- Bearing Materials
- Failure Mechanisms
- Service Problems

Anti-Friction Bearings

- Manufacture & Installation
- Failure Mechanism
- Inadequate Lubrication
- Electrical Discharge
- Failure Mode Identification

Metal Loss Mechanisms

- Erosion
- Cavitation
- Corrosion
- Wear

General Issue 2

- Maintenance Philosophies
- Troubleshooting
- Spared Unit Change-over Philosophy
- Syndicate Exercise

Course Content



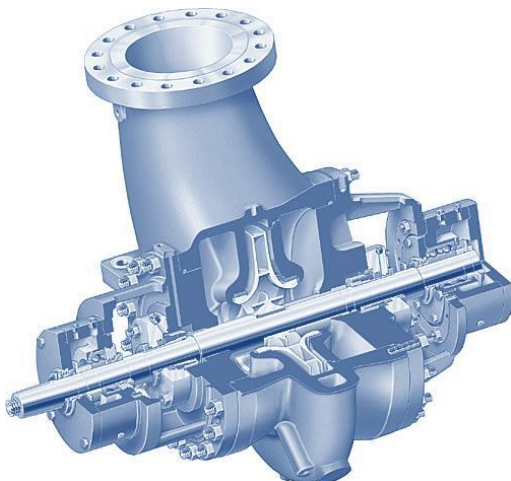
Day 2 con't

General Issue 3

- Condition & Performance Monitoring
- Rotor Dynamics
- Rotor Balancing
- Syndicate Exercise

Gas Turbines I

- Types of Gas Turbine (GT) & Power Rating
- Syndicate Exercise
- Start-up & Testing
- Overhaul Practices
- Operating Profile



Day 3

Gas Turbine 2

- Air Systems & fouling of GTs
- Fuel Types and Systems
- Syndicate Exercise
- Turbine Materials

Gas Turbine 3

- Component Parts
- Component Repairs
- Case Histories

Gas Turbine 4

- GT Problems Workshop

Centrifugal Compressors I

- Overhaul Philosophy
- Syndicate Exercise
- Compressor Performance Curve Calculation
- Compressor Capacity Control
- Anti-Surge Protection

Centrifugal Compressors 2

- Shaft Seals
- Compressor Installation
- Start-up & Testing
- Oil Systems
- Case History
- Effects of Fouling

Course Content



Day 4

Reciprocating Compressors 1

- Introduction to Compressor Types
- Overhaul Philosophy
- Suction & Discharge Valves
- Fixtures
- Alignment

Reciprocating Compressors 2

- Piston & Rings
- Piston Rods
- Piston Rod Packing

Reciprocating Compressors 3

- Capacity Control
- Gas Quality
- Condition Monitoring
- Case Studies
- Compressor Conversion

Reciprocating Compressors 4

- Syndicate Exercise
- Problems Workshop

General Issues 4

- Pump and High Performance Coupling
- Compressor Syndicate Exercise

Day 4 con't

FA Case Histories

- Compressor Change-out
- Reciprocating Compressors Bearings
- Gas Turbine Bearings
- Hot Oil Pump Failure

Exercises

- Equipment Selection Exercises & Discussion

Day 5

Fans

- Overview of Types, & Maintenance

Electric Motors

- Maintenance, Bearings, & Lubrication

Rotating Equipment Problems Discussion

- Discussion on Questions by Participants

Assessment

