CENTRIFUGAL COMPRESSORS MAINTENANCE & FAILURE ANALYSIS

TRAINIT ACADEMY

MUE219

Mechanical &

Utility Engineering

COURSE TITLE

CENTRIFUGAL COMPRESSORS MAINTENANCE & FAILURE ANALYSIS

COURSE DATE/ VENUE

31 August – 04 September 2020

London, UK

COURSE REFERENCE

MUE219

COURSE DURATION

05 Days

DISCIPLINE

Mechanical & Utility Engineering

COURSE INTRODUCTION

Compressors are common in almost all industrial systems and applications. Compressors represent a significant part of capital and operating costs on most plants.

Gas turbine is a major power source used in the generation of electricity, and the driver of choice for modern aircraft, pumps, compressors etc. This training course covers main topics of operation and maintenance of gas compressor and turbines and associated support systems. In addition, the course develops a background in gas turbine operation that enables participants to analyze operating problems properly and take the necessary corrective action. The course combines between the basic and practical considerations related to centrifugal compressors. The use of gas turbines in the petrochemical, power generation and offshore industries has increased considerably during the past few years. The course will cover the design, installation, operation and maintenance of these machines by highlighting characteristics features, efficiencies, reliability and maintenance

implications. Upon completion of this course, participants will gain a complete and up-to-date overview of the Gas Turbine technology.

A Vibration- Monitoring system gives warnings when vibration levels reach a preset level, and hence provides a round- the - clock watch on vital machinery. The training course aims to provide a treatment of the detection and diagnosis of faults in rotating equipment using vibration measurement and analysis.

COURSE OBJECTIVE

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

- ✓ Learn the principles of the centrifugal compressors and gas turbine.
- ✓ Familiarize with various types of centrifugal compressor & gas turbine.
- ✓ Explain operation principles of the centrifugal compressor and gas turbine.
- ✓ Discuss about maintenance procedure of the centrifugal compressor and gas turbine.
- ✓ Discuss the troubleshooting and failure analysis of the centrifugal compressor and gas turbine.

COURSE AUDIENCE

Turbine & compressor maintenance engineers of relatively short experience and senior technicians of medium experience who have the ability to improve & develop their capabilities. Members of the following departments: Engineering, Planning, Procurement, Operation, Maintenance or Inspection and those who are engaged in or intend to be familiar with compressor systems. Also senior staff should update and refresh their knowledge by attending this course.

COURSE CONTENT

DAY 1

Introduction

What is a compressor?

Compressor terminology

Compressor classification

- Centrifugal – axial – reciprocating –helical- screw, ranges of application

Compressor finite-life parts (bearings-mechanical seals-couplings)

Compressor Drivers

- Overview of maintenance function and objectives
- Maintenance job standards
- Maintenance types & strategies
- Common problems associated in the rotating equipment in general

Principles of Centrifugal Compressors

- Theoretical H-Q curve
- Theoretical Power-Q curve
- Performance curves
- Centrifugal compressor classification
- Basic components and their function
- The effect of outlet blade angle
- Function of the diffuser

DAY 2

Centrifugal Compressor Operation

- Compressor start-up and shut down
- Speed limits
- Required speed calculations
- System Resistance
- Inlet conditions Effects
- Parallel and series operation

Centrifugal Compressor Maintenance

- Maintenance strategies
- Lubrication Systems
- Inlet Filtration
- Sealing Systems
- Shaft Deflection

- Rotor Balancing
- Shaft Alignment

Centrifugal Compressor Troubleshooting and Failure Analysis

- Troubleshooting procedure
- Site inspection
- Monitoring systems
- Surge line and stonewall.
- Anti-surge control system
- Excessive vibration
- Check list of compressor problems

Predictive maintenance program

a) Building a system
    i. Equipment data
    ii. Failure data
    iii. Maintenance data
    iv. Data format
b) Failure and maintenance notations
c) Failure descriptors
d) Failure causes
e) Method of detection
f) Maintenance activity

Data requirements for various applications

DAY 3

Overview of Gas Turbines

- Industrial heavy duty gas turbines
- gas turbine theory and systems
- Major gas turbines components
- Applications

Principles of Gas Turbine

- Gas Turbine Components (Compressor-Turbine-Combustor-Ancillary & Auxiliary Systems)

Gas Turbine Components

- Axial-flow compressor
- Radial-inflow turbines
- Combustors, construction types
- Igniters
- Hot path components
- Firing concept and emission control
- Fuel nozzles

Air standard cycles and other famous cycles

Turbine performance characteristics

Main requirements of a gas turbine engine

Gas Turbine Operations

- Pre Start Checks
- Starting Sequence
- Loading/Unloading Operations

Shutdown Sequence

DAY 4

Gas Turbine Checks

- Inlet filter
- Lubricating oil
- Hydraulic and control oil
- Cooling water
- Cooling and sealing air
- Fuel system(s)
- Starting means
- Heating and ventilation
- Fire protection

Materials of Construction

- General metallurgical behavior
- Gas turbine blade materials
- Turbine wheel alloys
- Corrosion problem

DAY 5

Turbine Maintenance

- GT operating principles, components and characteristics
- Turbine operating checks & Performance monitoring
- Shaft, bearings and seals maintenance
- Blades and nozzles maintenance
- Shaft sealing system
- Hydraulic and pneumatic systems maintenance
- Cooling water system and water injection system maintenance
- Starting system maintenance
- Ducting and valves maintenance
- Turbine troubleshooting, testing and reinstallation

Vibration analysis

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

$6,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will

make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions