



# MU294: Rotating Equipment Fundamentals

## Training Description:

This training course will provide a comprehensive understanding of the various types of rotating equipment including centrifugal pumps, centrifugal and axial compressors, and motors. This training course will focus on maximizing the efficiency, reliability, and longevity of this equipment by providing an understanding of the characteristics, selection criteria, common problems and repair techniques, preventive and predictive maintenance.

This intensive training course is essential for anyone who is involved in the selection, applications, or maintenance of rotating equipment because it covers how this equipment operates, the latest maintenance techniques, and provides guidelines and rules that ensure the successful operation of this equipment.

In addition, this training course will cover in detail the basic design, operating characteristics, specification, selection criteria, advanced fault detection techniques, critical components and all preventive and predictive maintenance methods in order to increase reliability of the equipment and reduce the operation and maintenance cost.

## Training Objectives:

**By the end of the training, participants will be able to:**

- ✓ Understand different types of pumps, compressors and turbines
- ✓ Operate pumps, compressors and turbines close to the design efficiency
- ✓ Monitor pump compressor and turbine reliability and availability and cost effectiveness
- ✓ Select the best operation and maintenance strategy
- ✓ Troubleshoot pump, compressor and turbine problems

## Training Designed for:

This course is intended for Engineers and managers of all disciplines, technicians, maintenance personnel, other technical personnel.

## Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request.”

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

## Training Program:

### DAY ONE:

- ❖ Introduction
- ❖ Pumps
  - Different types of pumps, applications in the process industry
  - Operating principle and technology of positive displacement pumps
  - Performance curves of a centrifugal pump: head, efficiency, absorbed power, NPSH

- Technology of centrifugal pumps, different architectures
- Mechanical seals: different arrangements, related ancillary systems
- Operating limits: cavitation, hammer shock, priming issues, case of 2 pumps running together
- Start-up and operation monitoring: specific case of hot pumps, LPG pumps, vacuum pumps
- Troubleshooting and common failures

#### DAY TWO:

- ❖ Reciprocating & Rotary Positive Displacement Compressors Different types of positive displacement compressors
  - Reciprocating compressor architecture: number of stages, cylinders, overall layout, typical applications. Technology of main components and ancillaries
  - Influence of process conditions on compressor performance: suction or discharge pressure, suction temperature, gas composition
  - Flow control, specific safety devices. Start-up philosophy
  - Troubleshooting

#### DAY THREE:

- ❖ Centrifugal compressors
  - Description of a multi-stage centrifugal compressor
  - Technology of main components and ancillaries
  - Pressure increase process for a compressor stage
  - Performance curves, influence of suction conditions and gas composition
  - Operating window: low and high-speed limits, stonewall, surge, typical anti surge protection systems
  - Flow control: throttling valve, speed variation, inlet guide vanes. Specific precautions for start-up
  - Troubleshooting

#### DAY FOUR:

- ❖ Steam turbines
  - Description of a steam turbine, different families, standard applications
  - Operating principle, classification and technology: number of stages, exhaust conditions, expansion process through the machine
  - Operation: start-up and performance monitoring. Speed control, safety devices

#### DAY FIVE:

- ❖ Gas turbines
  - Gas turbine design and performance, main types, industrial and aero derivative engines, pressure and temperature profiles through the machine
  - Influence of environmental conditions: temperature, elevation
  - Impact of suction and exhaust friction losses on turbine performance
  - De-rating from ISO conditions
- ❖ Course Conclusion
- ❖ POST-ASSESSMENT and EVALUATION

## Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

## Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

## Training Fees:

**TBA as per the course location** - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01<sup>st</sup> of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

## Training Timings:

### Daily Timings:

|               |                               |
|---------------|-------------------------------|
| 07:45 - 08:00 | Morning Coffee / Tea          |
| 08:00 - 10:00 | First Session                 |
| 10:00 - 10:20 | Recess (Coffee/Tea/Snacks)    |
| 10:20 - 12:20 | Second Session                |
| 12:20 - 13:00 | Recess (Prayer Break & Lunch) |
| 13:00 - 14:00 | Last Session                  |

### For training registrations or in-house enquiries, please contact:

**Aisha Relativo** - Training & Career Development Manager

[aisha@cmc-me.com](mailto:aisha@cmc-me.com) / [training@cmc-me.com](mailto:training@cmc-me.com)

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615