

Centrifugal Compressor Design, Operation, Maintenance & Troubleshooting

Mastering Centrifugal Compressor Design, Operation, Maintenance and Troubleshooting from a proven expert !

Course Level : Intermediate

14th – 18th December 2026 at Kuala Lumpur, Malaysia

Master API 617
Standard from
Practical Case
Studies &
Engineering
Exercises !



Petrosync Distinguished Instructor Mamdouh Motea Youssef

Rotating Equipment's and Condition Monitoring Consultant

- ▶ 43+ years of experience, in Oil & Gas Industries in Machinery Maintenance and Vibration Analysis. Compressors, pumps, Vibration Measurements & Analysis Specialist
- ▶ Consulting engineer in the vibration & conditioning monitoring in Egypt, Syria, Libya, Abu Dhabi, Oman, Qatar & KSA.
- ▶ Root Cause Failure Analysis Investigator in Egypt & Arab Gulf

Who Should Attend?

This course is intended to be of direct use by persons in staff positions (e.g., Senior Technicians, Operators, Supervisors, Superintendents) and corporate engineering, plant planning and design, systems design, equipment selection and evaluation, and equipment maintenance areas.

PROGRAM SCHEDULE

08:00	Registration (Day1)
08:10 – 10:00	Session I
10:00 – 10:15	1 st Tea Break
10:15 – 12:00	Session II
12:00 – 13:00	Lunch Break
13:00 – 14:45	Session III
14:45 – 15:00	2 nd Tea Break
15:00 – 16:00	Session IV
16:00	End of Day

*Schedule may vary for each training

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Course Overview

Upon completion of this course, participants will have gained a thorough understanding of the various centrifugal (i.e. turbo) compressor configurations available to virtually every industrial user. Items discussed include mechanical design features, sizing and application criteria, maintainability, reliability, vulnerability and troubleshooting issues. Participants will:

- ▶ Learn simple techniques and short-cut methods of machinery selection, which can take the place of tedious hand calculations and will serve as rapid means to determine sensitivity or influence of parameter changes on equipment performance.
- ▶ Be able to determine the most appropriate and efficient matching of compressor to driver.
- ▶ Also acquire knowledge of operating and maintenance issues by getting to know mechanical design, machinery components, piping design, as well as proven approaches to monitoring, troubleshooting and maintenance of compressor.

Course Objectives

Centrifugal Compressors of several types, which have widely varying configurations and applications, are used extensively in the process industries. These compressors represent a significant part of the capital and operating costs of most plants, so that optimizing their selection is of major economic importance.

- ▶ The course is devoted to design features, efficiencies, operating characteristics, reliability and maintenance implications of centrifugal compressors.
- ▶ This course will cover the operating principles of centrifugal compressors, specifications, their design, thermodynamics, effects of efficiency on operating costs, energy usage, effect on plant costs, special materials of construction, selection, troubleshooting and maintenance.
- ▶ The course will also cover plant run-length extension surveys, organizing for successful turnarounds and ongoing reliability improvement, and preventive vs. predictive maintenance strategy decisions.
- ▶ The course will provide the participant with a basic, as well as advanced, centrifugal and reciprocating compressor technology inventory required to successfully select, apply, troubleshoot and maintain compression equipment.



WHY YOU SHOULD ATTEND PETROSYNC'S EVENTS

- To ensure that all objectives of the course matches yours, all PetroSync programs are developed after intensive and extensive research within the industry
- PetroSync programs focus on your immediate working issues to ensure that you are able to apply and deliver immediate results in real work situations
- Application and implementation of industry knowledge and experience are the drivers for our course design, not theoretical academic lectures
- PetroSync training focuses on practical interactive learning tools and techniques including case studies, group discussions, scenarios, simulations, practical exercises and knowledge assessments during the course. Invest a small amount of your time to prepare before attending the course to ensure maximum learning
- PetroSync follows a rigorous selection process to ensure that all expert trainers have first-hand, up-to-date and practical knowledge and are leaders of their respective industrial discipline

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Course Agenda

Day 1

Overview

- ▶ Compression Methods
- ▶ Positive-Displacement And Rotodynamic Compressors

Introduction To Aerodynamics and positive displacement compressors

- ▶ Definition Of Compressor
- ▶ Compressors selection and sizing.
- ▶ Comparison between positive displacement and Rotodynamic compressors.
- ▶ Types Of positive displacement Compressors
 - ▶ Reciprocating compressor
 - ▶ Labyrinth compressor
 - ▶ Diaphragm compressor
 - ▶ Screw compressor
 - ▶ Lobe compressor
 - ▶ Slide vane compressor
- ▶ Relative Compressions Of Various Compressors Types

Consideration in Compressors Selection

- ▶ Discharge pressure required.
- ▶ Capacity required.
- ▶ Power supply characteristics.
- ▶ Availability and cost of cooling water.
- ▶ Space required for compressor.
- ▶ Compressor weight.
- ▶ Type and size of foundation required.
- ▶ Type of control required.
- ▶ Maintenance costs
- ▶ Budget

Case Study for Reciprocating Air Compressor

Day 2

Centrifugal Compressor Fundamentals + API

- ▶ API 617 9th Edition - purpose, scope and four-part structure
- ▶ API terminology and datasheets
- ▶ Purchaser/vendor responsibilities
- ▶ API 617 mechanical-design philosophy

Case Study : Selecting an API 571 Centrifugal

Principles of centrifugal compressors

- ▶ Type of Turbo machinery
- ▶ The Eulers' Equation
- ▶ The degree of reaction
- ▶ Theoretical H-Q Curve
- ▶ Theoretical Power-Q curve
- ▶ The effect of outlet blade angle
- ▶ Function of the diffuser

Centrifugal Compressors Technology

- ▶ Basic Components and their function
- ▶ Centrifugal Classification
- ▶ Compressors Arrangements
- ▶ Performance Curves
- ▶ Surge line and Stonewall
- ▶ Speed limits
- ▶ System Resistance
- ▶ Inlet Conditions Effects
- ▶ Required Speed Calculation
- ▶ Parallel and Series Operation

Centrifugal Compressor Design and Construction

- ▶ Function of Compressor components
- ▶ Compressor Casing
 - ▶ Casing
 - ▶ Diaphragms
 - ▶ Nozzles
- ▶ Compressor Rotor
 - ▶ Shaft
 - ▶ Impellers
 - ▶ Balancing Piston
 - ▶ Thrust Collar

Case Study For LNG Centrifugal Compressor

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Course Agenda Continue

Day 3

Compressor arrangements

- ▶ Auxiliary Systems
 - ▶ Compressor Seals
 - ▶ Compressor Bearing
 - ▶ Lubrication Systems
 - ▶ Loop Oil Systems

Centrifugal Compressor Performance & Control

- ▶ The Performance Curves
 - ▶ Compressor map
 - ▶ Limits of Flow rates
 - ▶ Surge line and Stone line
 - ▶ Limits of operating speed
 - ▶ First and second critical frequency
 - ▶ Effect of speed variation
 - ▶ Effect of inlet conditions
 - ▶ Effect of gas molecular weight
 - ▶ Volume ratio effect
 - ▶ Performance of different types of compressors
 - ▶ How compressor components affect performance
 - ▶ Performance estimation

Case Study For VRU centrifugal Compressor

Day 4

Compressors Control System

- ▶ Capacity Regulation System
- ▶ Anti - Surge control system
- ▶ Alarm and trip System
- ▶ Vibration control system
- ▶ Bentley Nevada system
- ▶ Vibration instrumentation
- ▶ Velocity transducer
- ▶ Accelerometer
- ▶ Proximity probe

Compressors shaft alignment and dynamic balancing

Compressors operation (start up and shutdown)

- ▶ The compressor permissive to start
- ▶ Typical compressor valve arrangement
- ▶ Prestart valve positions
- ▶ Purge cycle
- ▶ The anti surge control valve position
- ▶ Normal start up
- ▶ Normal shut down
- ▶ Emergency shut down

Case Study for Refrigeration Compressor

Day 5

Troubleshooting and Maintenance

- ▶ Non Destructive Inspection Troubleshooting
 - ▶ Principles of troubleshooting
 - ▶ Lubrication systems
 - ▶ Seals System
 - ▶ Cleaning and Flushing
 - ▶ Alignment and Balancing
 - ▶ Condition monitoring systems
 - ▶ Pressure and temperature measurements
 - ▶ Effective Diagnoses systems
 - ▶ Vibration Analysis
 - ▶ Auxiliary System monitoring

Case Studies & Discussions, Last Day Review will be carried out.

The support tools four video movie about the principle and maintenance of the centrifugal compressors.

IN-HOUSE SOLUTIONS

SAVE COST • IMPROVE PERFORMANCE • REDUCE RISK

PetroSync understands that in current economic climate, getting an excellent return on your training investment is critical for all our clients. This excellent training can be conducted exclusively for your organization. The training can be tailored to meet your specific needs at your preferred location and time. We will meet you anywhere around the globe.

If you like to know more about this excellent program, please contact us on +65 3159 0800 or email general@petrosync.com

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Instructor Profile



Petrosync Distinguished Instructor

Mamdouh Motea Youssef

Rotating Equipment's and Condition Monitoring Consultant

- ▶ He has 43+ years of experience, in Oil & Gas Industries in Machinery Maintenance and Vibration Analysis.
- ▶ Consulting engineer in the vibration & conditioning monitoring in Egypt, Syria, Libya, Abu Dhabi, Oman, Qatar & KSA.
- ▶ Root Cause Failure Analysis Investigator in Egypt & Arab Gulf.

Mamdouh Motea Youssef is a Rotating Equipment's and Condition Monitoring Consultant with 43+ years of experience in the upstream oil and gas industry, in Machinery Maintenance and Vibration Analysis and 30 years experience in training field. He began his career in 1981 as a Mechanical Maintenance Engineer at Egyptian Army. He has extensive hands-on experience in centrifugal compressor installation, alignment, commissioning, operation, maintenance, troubleshooting, and condition monitoring. His career includes leadership roles in major refinery and LNG projects, as well as machinery inspection, RCFA, vibration analysis, and predictive maintenance. Since 1998, he has been actively involved in technical training and OJT, and has delivered training across Egypt, Saudi Arabia, UAE, Kuwait, Oman, Iraq, Syria, and Libya. From 2016 to 2018, he served as Chairman's Assistant for Engineering Affairs at Ameria Petroleum Refining Company (APRC), Alexandria, Egypt. Since 2018, he has worked extensively as a Mechanical Instructor, Consultant, and Troubleshooting Engineer, delivering training in reliability and condition monitoring, including vibration analysis, thermography, oil analysis, and related disciplines. He also works as a Consulting Engineer for major oil and gas companies in Egypt and the Gulf region, supporting the diagnosis and resolution of complex issues involving rotating equipment.

Project list

- ▶ Performed erection, installation, alignment, & pre-commissioning of rotating equipment (Centrifugal, Reciprocating and Screw compressors, gas turbines, air coolers, & pumps) for Train 1 & Train 2 (2004 - 2006)
- ▶ Commissioning & start-up of the Gas Plant: Four Nuovo Pignone Compressors Type 4hm/2 & 2shh/1 coupled with driver Gas Engine (Waukesha) Model L7042gsi (2000 - 2001)
- ▶ Serve as a member of the APRC Risk Assessment Committee, contributing to risk evaluation & emergency response preparedness (2006 - Now), and many more.

Partial Client List

- ▶ ARAMCO-BTS
- ▶ Gupco
- ▶ ADNOC-SOS
- ▶ Schlumberger
- ▶ National Consulting Bureau / Gascomore and more.

HYBRID TRAINING SOLUTIONS

FOCUS TRAINING • REDUCE COST • ENHANCED RESULTS

Over the years, there has been a growing demand for hybrid training programs. It is an excellent option to maximize your training dollar for your specific training needs. We make it possible to run a training program that is customized totally to your training needs at a fraction of an in-house budget!

If you like to know more about this excellent program, please contact us on +65 3159 0800 or email general@petrosync.com

INVESTMENT PACKAGES

Please checklist the package that you are attending!

Centrifugal Compressor Design, Operation, Maintenance & Troubleshooting SCHEDULE	LOCATION	PRICE
☐ 14 th – 18 th December 2026	Kuala Lumpur, Malaysia	USD 3,450

* All prices are subject to change without notice and are not guaranteed, except that prices for an order that have been accepted by PetroSync is not subject to change after acceptance

* Price is nett excluding Withholding Tax if any and will be quoted separately. Please send us the withholding tax payment receipt.

DELEGATE DETAILS

1st Delegate Name _____ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: _____ Email: _____

Mobile Number: _____ Job Title: _____

Department: _____ Head of Department: _____

2nd Delegate Name _____ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: _____ Email: _____

Mobile Number: _____ Job Title: _____

Department: _____ Head of Department: _____

3rd Delegate Name _____ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: _____ Email: _____

Mobile Number: _____ Job Title: _____

Department: _____ Head of Department: _____

4th Delegate Name _____ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: _____ Email: _____

Mobile Number: _____ Job Title: _____

Department: _____ Head of Department: _____

*Please fill all the details including mobile number. This help us to contact participant if they are late in class or if there is any urgent update (through whatsapp/call)

INVOICE DETAILS

Attention Invoice to: _____

Direct Line Number: _____ Fax: _____

Company: _____ Industry: _____

Address: _____ Postcode: _____

Country: _____ Email: _____

Please note:

- Indicate if you have already registered by Phone ☐ Fax ☐ Email ☐ Web ☐

- If you have not received an acknowledgement before the training, please call us to confirm your booking.

PAYMENT METHODS

☐ By Credit Card

☐ By Direct Transfer : Please quote invoice number(s) on remittance advice

PetroSync Global Pte Ltd Bank details:

Account Name : PetroSync Global Pte Ltd

Bank Name : DBS Bank Ltd

Bank Code : 7171 • Bank Swift Code : DBSSSGSGXXX • Branch code : 288

Account No : 0288-002682-01-6-022 (USD)

Bank Address : 12 Marina Boulevard, Level 3. Marina Bay Financial Centre Tower 3. Singapore 018982

All bank charges to be borne by payer. Please ensure that PetroSync Global Pte Ltd receives the full invoiced amount.

COURSE CONFIRMATION

I agree to PetroSync's payment terms and cancellation policy.

Signature : _____

Date : _____

PAYMENT TERMS : Payment is due in full at the time of registration. Full payment is mandatory for event attendance.

PROGRAMME CONSULTANT

Contact: Cay Aagen

Email : registration@petrosync.com

Phone : +65 3159 0800

TERMS AND CONDITIONS

DISCLAIMER

Please note that trainers and topics were confirmed at the time of publishing; however, PetroSync may necessitate substitutions, alterations or cancellations of the trainers or topics or location (classroom / Virtual). As such, PetroSync reserves the right to change or cancel any part of its published programme due to unforeseen circumstances. Any substitutions or alterations will be updated on our web page as soon as possible.

DATA PROTECTION

The information you provide will be safeguarded by PetroSync that may be used to keep you informed of relevant products and services. As an international group we may transfer your data on a global basis for the purpose indicated above. If you do not want us to share your information with other reputable companies, please tick this box ☐

CANCELLATION POLICY

Delegates who cancel after the training is officially confirmed run by email, are liable to pay the full course fee and no refunds will be granted. You may substitute delegates at any time as long as reasonable advance notice is given to PetroSync.

In the event that PetroSync cancels or postpones or change the trainer or change the training location (classroom / virtual) of an event for any reason and that the delegate is unable or unwilling to attend in on the rescheduled date, you will receive a credit voucher for 100% of the contract fee paid. You may use this credit voucher for another PetroSync to be mutually agreed with PetroSync, which must occur within a year from the date of postponement.

PetroSync is not responsible for any loss or damage as a result of the cancellation policy. PetroSync will assume no liability whatsoever in the event this event is cancelled, rescheduled or postponed due to any Act of God, fire, act of government or state, war, civil commotion, insurrection, embargo, industrial action, or any other reason beyond management control.

CERTIFICATE OF ATTENDANCE

80% attendance is required for PetroSync's Certificate of Attendance.

DETAILS

Please accept our apologies for mail or email that is incorrectly addressed.

Please email us at registration@petrosync.com and inform us of any incorrect details. We will amend them accordingly.

Find us on Social Media:

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CHARGES & FEE(S)

- For Payment by Direct Telegraphic Transfer, client has to bear both local and overseas bank charges.

- For credit card payment, there is additional 4% credit card processing fee.