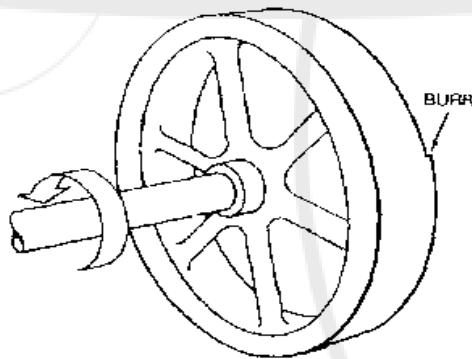
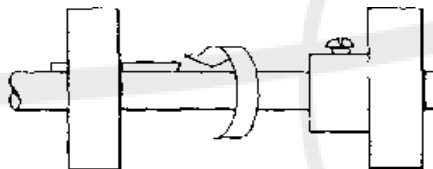


# ASSESSING AND IMPROVING RELIABILITY OF ROTATING EQUIPMENT MACHINERY

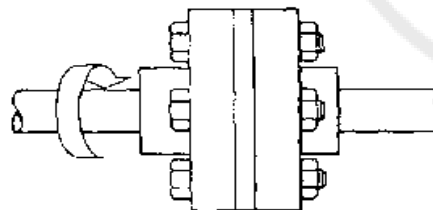
**August 11 - 15, 2019**  
**Dubai, UAE**



ROTATING PULLEY WITH SPOKES AND  
PROJECTING BURR ON FACE OF PULLEY



ROTATING SHAFT AND PULLEYS WITH  
PROJECTING KEY AND SET SCREW



ROTATING COUPLING WITH  
PROJECTING BOLT HEADS

## Early Bird Discount & Registration

Register and pay 25 days prior to the event date and get 15% discount.

Registrations will close 15 days prior to the start of the Course.

## Course Overview:

Reliable Operation of the Rotating Equipment in any plant is its life blood. Engineers must have an integrated viewpoint focusing on it through design, operation and maintenance. This course comprehensively presents from such an integrated viewpoint state-of-the-art Techniques and Methodologies for improving Reliability of Rotating Equipment.

Topics include Reliability Basics; Maintenance Philosophies and Strategies, their relationships to each other, and their effective application; machinery condition monitoring; machinery condition assessment and asset management; Effective Fault Diagnosis Techniques; Failure Mode and Causal Analysis; Life-Cycle Strategies to promote increased reliability; reliability improvement program development and implementation including structure and personnel considerations; and business ramifications of reliability improvement.

It is important to understand that the life span of rotating equipment is extremely long compared to the specification, design and installation phase. A typical installation will have a specification, design and installation phase of only approximately 10% of the total life of the process unit. Improper specification, design or installation will significantly impact the maintenance requirements, maintenance cost and availability of a particular piece of machinery. The course will comprise lectures and workshop to maximize your benefits. Additionally, an optional "Question and Answer" period is included to provide you with opportunity to get expert answers on your specific questions.

## Course Objectives:

*After completing this course, participants will be able to:*

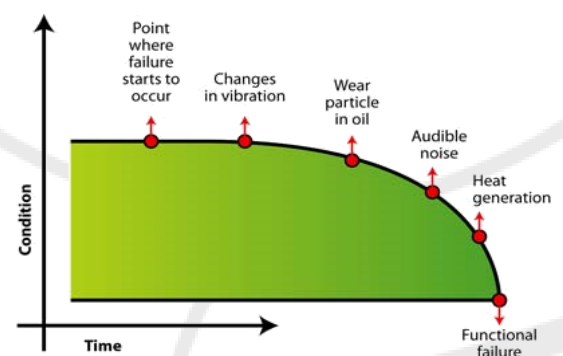
- ◆ Present the principles of Asset Management, and CBM and present the key features for successful implementation of CBM
- ◆ Review problems, faults and their causes in Rotating Mechanical and Electrical Plant.
- ◆ Present the key features of Condition Monitoring Techniques for Rotating Mechanical Plant.
- ◆ Present the key features of Condition Monitoring Techniques for Electrical Machines and Drives.
- ◆ Present the principles of vibration monitoring, analysis and interpretation of vibration data.
- ◆ Present the principles of Motor Current Signature Analysis (MCSA), Analysis and interpretation of current spectra.
- ◆ Present the principles of Partial Discharge Monitoring to detect problems in High Voltage Stator Windings of Generators and Motors.
- ◆ Illustrate the application of the above CM Techniques via industrial case studies and illustrate the importance of an integrated CM strategy for Rotating Plant.

## Who Should Attend?

The course is designed for Operation & Maintenance Engineers and Supervisors. Also Planning and Performance Engineers those involved in Rotating Equipment Machinery in the Plants.

## Course Language:

The Presentation, supplied documents, and workshop exercises of the course are in **English** however, based on the trainees' desires, oral presentation or discussion can be **Bilingual** (English and Arabic).



## Course Contents:

### Module (01) Reliability Engineering

- 1.1 Reliability Basics
- 1.2 Elements of World-Class Reliability
- 1.3 Reliability Prediction Models
- 1.4 Traditional Approach to Reliability Prediction
- 1.5 Failure Mode and Effect Analysis
- 1.6 Machinery Reliability Assessment
- 1.7 Ascertaining the Functionality and Remaining Life of Rotating Equipment

### Module (02) Maintenance Methods and Strategies

- 2.1 Breakdown, Preventive, Predictive and Proactive
- 2.2 Reliability-Centered Maintenance (RCM)
- 2.3 Precision Maintenance
- 2.4 Computerized Maintenance Management Systems

### Module (03) Reliability Improvement Program

- 3.1 Program Definition and Development
- 3.2 Structure, Objectives, Impact on Business
- 3.3 Reliability Action Teams: Structure, Training, Mandate, and Resources
- 3.4 Identify and Rank Reliability Deficiencies and associated Lost Production Costs
- 3.5 Critical Poor Performers Identification and Tracking

### Module (04) Machinery Components Failure Analysis

- 4.1 Common Causes of Component Failures
- 4.2 Design, Application, Materials, and Installation
- 4.3 Operating Practices
- 4.5 Maintenance Practices and Quality
- 4.6 Wear Failure Models
- 4.7 Troubleshooting Guidelines
- 4.8 Metallurgical Failure Analysis Methodology
- 4.9 Reliability of Standby Equipment
- 4.10 Periodic Exercising Program

### Module (05) Effectiveness of Reliability Deficiency

- 5.1 Reliability Performance Indicators
- 5.2 MTBF, MTTR
- 5.3 Lost Production Cost
- 5.4 Direct Failure Information
- 5.5 Reporting
- 5.6 Best Industry Practices, Guidelines and Tips.
- 5.7 Impact of Equipment Standby Practices on Reliability and Maintenance Costs

### Module (06) Vibration in Rotating Machinery

- 6.1 Vibration Fundamentals
- 6.2 Vibration in Condition Monitoring
- 6.3 Vibration Monitoring and Analysis Methods
- 6.4 RMS broad-band Vibration Meters
- 6.5 Shock-Pulse Technology
- 6.6 Diagnostic Screening Technology
- 6.6 Narrow Band Vibration Analysis
- 6.7 Automated Diagnostic System for Vibration Analysis
- 6.8 Intelligent Smart Machines
- 6.9 Data Interpretation

### Module (07) Industrial Lubrication

- 7.1 Lubrication Theory and Practice
- 7.2 Plant lubrication Systems and Programs
- 7.3 Wear particle analysis technology
- 7.4 Bearing Failures – Detection, Diagnosis

### Module (08) Economics of Machinery Failure

- 8.1 Improvement Performance
- 8.2 Cost Impact of Machinery Failure
- 8.3 Justification and Economic Evaluation of Reliability Improvement Projects
- 8.4 Financial Concepts: Capital Assets, Time Value of Money, Life Cycle Costs and Risk
- 8.5 Life Cycle Costs Methodology

### Module (09) Fault Causes, Detection and Diagnosis

- 9.1 Failure Evolution Process
- 9.2 Bases for the Detection of Faults in Rotating Machinery
- 9.3 Principles of Rotor Dynamics and Balancing
- 9.4 Mass Unbalance
- 9.5 Bent Shafts – thermal distortion, large unbalance force
- 9.6 Cracked Shafts – Vibration caused by Fatigue

### Module (10) Machinery Condition Monitoring

- 10.1 On-line Condition Monitoring Strategies
- 10.2 Protection Systems vs. Diagnostic Systems
- 10.3 Parameters measured and Measurement Locations
- 10.4 Typical field data collection Processes and Systems
- 10.5 Remote Monitoring and Diagnostics
- 10.6 Expert Systems – Smart Machines
- 10.7 Enhancements to CBM Technologies
- 10.8 Interpretation of Measurements, Trend Analysis

### Course Summary & Conclusion

## Registration Form:

**Please fill the information below:**

Nominee Name:			
Company Name:			
Position Title:		Department:	
Phone:		Mobile:	
Email:			
Company Address:			
Do you want to request this to be conducted as an <b>In-House</b> Course?		NO <input type="checkbox"/>	YES <input type="checkbox"/>
		<i>Please fill the required additional information below</i>	
Date Required:		No. of Participants:	
Preferred Venue:		Other Requirements:	

## Course Fees:

The amount of **3500 USD** will be charged for the course fee and Full Payment is required prior to commencement of the course.

## Payment Methods:

A confirmation will be sent upon your registration. Note that full payment must be made prior to the event. Only those delegates who have paid in full will be admitted to the event. All payments should be to APEX Account:

Bank Name : Emirates NBD

Branch : Jebel Ali Branch, Dubai, UAE

IBAN No : AE260260001024622899402

Swift Code : EBILAEADJAZ

## Cancellation:

If you are unable to attend the course you may send a substitute delegate.

Cancellation should be made 15 days prior to the course conduction. Failure to cancel within 10 days will be to pay the course fee in full amount.

## Registration Methods:

**Email** : info@apex-dubai.com

**Fax** : +971 4 454 2910

**Website** : www.apex-dubai.com

## General Information:

- ◆ Closing of Registration will be two (2) weeks prior to the course date.
- ◆ APEX can assist and provide corporate rates for the hotel accommodation.
- ◆ Course fees will cover Course Materials, Certificate of Participation, Coffee Breaks and Lunch.
- ◆ In-House course is also available upon request and can be customized as per client's needs.

## Contact us:

**Tel** : +971 4 445 8567

**Fax** : +971 4 454 2910

**Email** : info@apex-dubai.com

**Website** : www.apex-dubai.com