Condition Monitoring, Maintenance & Reliability (Overview) – 3 Days

1) Maintenance Strategies: Run to Break, Preventive Maintenance (PM), Condition Based Maintenance (CBM): Predictive Maintenance
2) Reliability Centered Maintenance (RCM): Overview
3) Principle of Condition Monitoring
4) Condition Monitoring of Machineries (Rotating and Reciprocating, etc.)
5) Prognostic & Health Management (PHM): Data Acquisition/Data Processing/ Condition Assessment/ Diagnostic/Prognostic/Decision Making/HMI & Information System
6) Condition Monitoring Techniques: Vibration Analysis/Thermography /Ultrasonic /Oil Analysis/…), Performance Monitoring
7) TPM & RCM
8) Overview of Standards
Vibration Analysis (Basic) – 3 Days

1) Principle of Vibration & Signal Characteristics
2) Vibration Based Condition Monitoring & Corrective Actions
3) Data Acquisition & Data Processing (Basics)
4) Vibration Assessment
5) Introduction to Machine Defects
6) Case Studies & Standards

Vibration Analysis (Advanced) – 3 Days

1) Review of Basic Vibration Analysis
2) Data Acquisition, Data Manipulation e.g. Signal Processing & Signal Analysis (Professional)
3) Health Assessment & Fault Detection e.g. Unbalance, Misalignment, Mechanical Looseness, Hydraulic & Aerodynamic Problems, Bent Shaft, Problems Associated with Electrical Motors, Gearboxes, Bearings, Belt Drives, etc
4) Prognostic Assessment
5) Advisory Generation for Machineries
6) Case studies & standards
### Vibration Transducers & Calibration – 1 Day

1) Introduction to Acceleration & Velocity Sensors  
2) Introduction to Displacement Sensors  
3) Practical Training of Features of Portable Devices (Offline Systems)  
4) Practical Training of Features of Online Devices  
5) Introduction to API670 Standard  
6) Test & Calibration of Vibration Measurement Devices

### Balancing – 2 Days

1) Basics of Vibration Analysis  
2) Diagnosis of Unbalance  
3) Balancing Fundamentals  
4) Rigid Balancing (Theoretical Training)  
5) Flexible Balancing (Theoretical Training)  
6) Field Balancing  
7) Balancing Practical Considerations  
8) Case Studies & Standards
Modal Analysis – 2 Days

1) Modal Testing: Basic & Theory
2) Applications of Modal Testing
3) Measurement Methods & Disciplines
4) Modal Analysis Process
5) Test Procedures
6) Experimental Modal Testing Considerations
7) Model Updating
8) Case Studies

Alignment – 2 Days

1) Misalignment Diagnosis/ Soft Foot
2) Alignment Tolerance
3) Component Alignment/ Coupling Types
4) Measuring Misalignment/ Bar Sag Calculations
5) Alignment Tools
6) Alignment Methods
7) Rough Methods
8) Reverse Indicator
9) Rim and Face Alignment
10) Laser Alignment
11) Case Studies & Standards
Rotating Machinery Analysis (Rotordynamics) - 3 Days

1) Rotor Dynamic Modeling: Analytical / Numerical
2) Bearing Dynamics: Ball/Roller, Journal Bearings
3) Stability Analysis
4) Run up & Coast down Tests
5) Unbalance Response
6) API 684: Lateral Rotor Dynamics/ Torsional Rotor Dynamics
7) Orbit Analysis
8) Time Transient & Nonlinear Rotordynamics

Customized Training on Machinery Components

1) Bearings
2) Pumps & Fans
3) Turbines (Hydro- Gas- Steam-Wind)
4) Electrical Motors
5) Generators
6) Compressors
7) Gearboxes
8) ...
Thermography – 2 Days

1) Maintenance & Thermography
2) Electromagnetic Spectrum & Infrared Waves Analysis
3) Introduction on Infrared Pictures Analysis & Instruments
4) Experimental Thermography Techniques and Consideration
5) Case Studies & Standards

Current Analysis – 2 Days

1) Review on Stator Malfunctioning in Motors
2) Motor Diagnosis Method Involving any kind of Signals
3) Introduction on Current Analysis Tests and Required Instrumentation
4) Proper Test Execution & On-site Practical Considerations
5) Important Indicators in Current Spectrum
6) Misalignment, Rotor Bar fracture, Bearing, Electric Error, Load & Gearbox Frequency Analysis, Eccentricity, Air Gap Leakage, ...
7) Case Studies & Standards
### Partial Discharge – 2 Days

1. Review on the Dielectrics Used in Electrical Machinery and Their Fatigue & Failure Factors
2. Offline Testing of Insulation Resistance (IR) & Polarization Index (PI)
3. Offline Testing of Capacity of the Capacitor & Dielectric Dissipation Factor (DF) and Tip-up
4. Study on Modern Offline Polarization & Depolarization Current Analysis (PDCA) Testing
5. Study on the Modern Online Partial Discharge (PD) Testing
6. Case Studies & Standards

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### Ultrasonics – 2 Days

1. Ultrasonic Fundamentals
2. Gas Leakage Detection
3. Transmission Lines, Transformers & Substations Fault Detection
4. Roller Bearings Fault Detection
5. Valves and Steam Traps Fault Detection
6. Reciprocating Compressor Valves Fault Detection
7. Condenser & Heat Exchanger Fault Detection
8. Case Studies & Standards
Research Lab.                                      http://smsrl.iust.ac.ir

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