OPERATION, MAINTENANCE AND INSPECTION OF ROTATING MACHINERY

OBJECTIVES

The course outlines the general technology of machines and their auxiliaries. It covers how machines work on process, the mechanical aspects, wear and tear, lubrication, and troubleshooting by vibration analysis and other techniques, thus providing participants with the necessary knowledge for inspecting machinery and making a diagnosis.

On completion of the session, the participants have in mind:

- how the machines and their components work,
- the mechanical effects of a change in operating conditions,
- the failure modes of each component,
- how to prevent unexpected breakdowns and perform machinery diagnosis,
- how to manage the machinery reliability.

COURSE CONTENT

TECHNOLOGY AND OPERATION OF ROTATING MACHINES — 5 days

General aspects of machine technology — **2 days**
Main parts of the machines: Casing, rotor, bearing, coupling
Auxiliaries: Flushing, heating and cooling, lubrication systems
Maintenance: assembly and dismantling procedures, inspection, clearance, adjustment, roughness

Operation and performance — **3 days**
Process aspect
Running parameters; head, flow, rpm, efficiency
Characteristic curves. Regulation. Start-up, routine survey
Effect of internal wear
Mechanical aspect
Stresses in machines. Influence on lifetime, on damage
Failure prevention; monitoring, repair quality

Typical troubles
Internal leakages. Unbalancing. Wear and ruptures

Practical exercises (time included in above items)
Reporting and plotting pressure or head versus flow applied to a centrifugal pump

Plant visits: centrifugal pumps manufacturer; centrifugal compressors and steam turbines manufacturer

TECHNOLOGY AND MAINTENANCE OF THE MACHINE COMPONENTS — 5 days

Lubrication — **0.5 day**
Purpose, different types of oil and grease. Practical aspect

Bearings
Antifriction bearings: types, lifetime, mounting, applications, related problems — **1.25 days**
Plain and pad bearings, thrust bearings: operation, maintenance, incidents

Coupling and alignment — **1.25 days**
Different types of couplings, related problems
Different methods of alignment using comparators, tolerances, practical aspects

Sealing devices for pumps and compressors — **1.25 days**
Mechanical pump seals, types, operation, related problems
Installation, geometrical checks
Other seals for positive displacement pumps and reciprocating compressors

Rotors and shafts — **0.75 day**
Balancing: excentricity, tolerances. Assembling on shaft: effect on balancing
Geometrical shaft controls

Practical exercises (time included in above items)
Bearing mounting and overhaul. Geometrical shaft control. Shaft alignment
Mechanical seal mounting.

Plant visit: antifriction bearing manufacturer (tooling, finishing, quality inspection)

FORECASTING BREAKDOWNS — 5 days

Study of ruptures and wear and other failures — **2.75 days**
Typical damage to machines: onset of problems and causes of failures, influences of metallurgy and surface treatments
Fatigue, wear and tear. Rupture face analysis
Case studies: rupture and wear examinations of typical machine parts, analysis of some process centrifugal pump complex breakdowns

Use of vibration surveys in forecasting — **1.75 days**
Different types of measurements and sensors
Monitoring of turbomachines rotor behaviour
Spectrum analysis applied to pumps, fans
Examples of diagnosis

Management of machinery reliability — **0.50 day**
Reliability centered maintenance
Detection of **Bad Actors**
Improving reliability through failure analysis and diagnosis
Monitoring of the maintenance activity performance

Practical exercises (time included in above items)
Measurement and analysis of vibrations
Machinery component failures, analysis on examples

FIELD OPERATIONS
Equipment & Maintenance

E-642

▲ Who should attend?

Junior graduate engineers supervisory and technical staff involved in rotating machinery maintenance and inspection.

▲ Duration

15 days

▲ Dates & Location

August 17 - Sept. 04, 2009
Lyon-Solaize

French session: F-642

▲ Registration

Fees: **€ 5,500**

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▲ Course Coordinator

IFP Training

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