MAESTRO CONSULTANTS

MECHANICAL EQUIPMENTS

COURSE OUTLINE 2020

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TRAINING TITLE

MECHANICAL EQUIPMENT

VENUE

Dubai, UAE

DURATION

5 Days

DATES

23 - 27 February 2020

PRICE

US$4,000 per attendee including training material/handouts, morning/afternoon coffee breaks and Lunch buffet daily.

TRAINING INTRODUCTION

The seminar will introduce delegates to the different types of pumps, motors and drives and their associated terminology. Centrifugal and positive-displacement pumps and compressors, packing, mechanical seals and sealing systems, bearings and couplings will all be discussed.

The application of the different types of pumps and compressors will be discussed along with their suitability for different operational duties. Pump operation, troubleshooting and maintenance will be dealt with in depth.

TRAINING OBJECTIVES

At the end of this seminar participants will have:

- Have an understanding of the different types of pumps and compressors.
- Be able to operate pumps and compressors as close as possible to the design efficiency.
- Will be able to monitor pump and compressor efficiency, availability and reliability.
- Have learnt about selection, operation and maintenance strategies.
- Be able to troubleshoot pump and compressor problems.

TRAINING AUDIENCE

This seminar is directed towards Supervisors, Team Leaders and Professionals in Maintenance, Engineering and Production. It is suitable for who expects to become involved at any stage in project applications and applicable maintenance technologies. The seminar will also benefit anyone those wishes to update themselves on pump and compressor technology, judge the suitability of different types of pumps and compressors for their needs, and learn how to operate and maintain them for the benefit of their organisations.

COURSE OUTLINE

Compressors

- Compressor types: positive displacement (reciprocating and rotary), and dynamic (centrifugal and rotary), compressor operation, gas laws
- Compressor performance measurement, inlet conditions, compressor performance, energy available for recovery
- Positive displacement compressors, reciprocating compressors, reciprocating compressors, diaphragm compressors.
- Rotary compressors, rotary screw compressor, lobe type air compressor, sliding vane compressors, liquid ring compressors
- Dynamic compressors, centrifugal compressors, axial compressors
- Air receivers, compressor control, compressor unloading system
- Intercoolers and aftercoolers, filters and air intake screens

Centrifugal & Axial Compressors

- Principle of operation of centrifugal and axial flow compressors, characteristics of centrifugal and axial flow compressor
- Surging, choking, bleed valves, variable stator vanes, inlet guide vanes

Compressor Systems Calculations

- Affinity Laws for centrifugal compressors
- Calculations of air leaks from compressed-air systems, annual cost of air leakage
- Centrifugal compressor power requirement

- Compressor selection, calculations of air system requirements
- Characteristics of reciprocating compressors and blowers
- Selection of air distribution system, water cooling requirements for compressors
- Sizing of compressor system components, sizing of air receiver
- Calculations of receiver pump-up time

Pumps

- Pump definition, pump categories: dynamic and displacement reciprocating & rotary
- Centrifugal pumps: theory of operation of a centrifugal pump, casings and diffusers, radial thrust, hydrostatic pressure tests
- Impeller, axial thrust, axial thrust in multistage pumps, hydraulic balancing devices, balancing drums, balancing disks
- Centrifugal pumps general performance characteristics, cavitations, net positive suction head and requirements

Bearings & Lubrication

- Types of bearings, ball and roller bearings, stresses during rolling contacts
- Statistical nature of bearing life, materials and finish, sizes of bearings, types of rolling bearings, thrust bearings
- Used oil Analysis: proper lube oil sampling technique, test description and significance, visual and sensory inspections, chemical and physical tests, water content, viscosity, emission spectrographic analysis, infrared analysis, total base number (TBN), total acid number (TAN), particle count, summary

Positive Displacement Pumps

- Reciprocating pumps, piston pumps, plunger pumps, rotary pumps, screw pumps, lobe pump
- Cam pumps, vane pumps, metering pumps

Pump Selection

- Engineering of system requirements, fluid type, system head curves, alternate modes of operation, margins, wear, future system changes
- Selection of pump and driver, pump characteristics, code requirements, fluid characteristics, pump materials, driver type

- Pump specification, specification types, data sheet, codes and standards, bidding documents, technical specification, commercial terms, special considerations, performance testing, pump drivers
- Special control requirements, drawing and data requirements form, quality assurance and quality control, bidding and negotiation
- Public and private sector, bid list, evaluation of bids, cost, efficiency, economic life, spare parts, guarantee/warranty, simple bid evaluation

Mechanical Seals

- Basic components, temperature control, seal lubrication/leakage, typical single inside pusher seal
- Maintenance recommended on centrifugal pumps, recommended pump maintenance

- Vibration Analysis & Predictive Maintenance
- Vibration instrumentation, velocity transducer, acceleration transducer, transducer selection, time domain, frequency domain, machinery example, vibration analysis
- Vibration causes, forcing frequency causes, unbalance, misalignment, mechanical looseness, bearing defects, gear defects, oil whirl, blade or vane problems, electric motor defects, uneven loading, drive-shaft torsion

Maintenance of Motors

- Introduction to AC induction motors and their construction, rotor slip and principles of operation, equivalent circuit, torque-speed characteristics, motoring and regenerative region of operation
- Starting of induction motors and associated techniques
- Speed control methods of induction motors
- Characteristics of motors, enclosures and cooling methods, application data, design characteristics, insulation of AC motors
- Failures in three-phase stator windings, predictive maintenance, motor troubleshooting, diagnostic testing for motors

Control Valves:

- Types and Construction
- Control Valves sizing and selection

- Actuators and Control
- Safety and Relief Devices:
- Setting Pressure
- Sizing and Installation
- Maintenance and Troubleshooting

Variable Speed Drives

- Basic principles of AC Variable-Speed Drives (VSD's), constant power (extended speed) region, four quadrant operation
- AC drive applications issues, Line power factor, Cabling details for AC drives, cable details, motor, cable
- Summary of application rules for AC drives and selection criteria
- Maintenance, common failure modes, motor application guidelines
- Control systems, low performance and open loop operation, medium performance and closed loop operation, high performance and closed loop operation, current feedback control, speed control, sensor less drives, evaluation and comparison.

TRAINING CERTIFICATE

MAESTRO CONSULTANTS Certificate of Completion for delegates who attend and complete the training course

METHODOLOGY

Our courses are highly interactive, typically taking a case study approach that we have found to be an effective method of fostering discussions and transferring knowledge. Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, training videos and discussions of "real life" issues in their organizations. The material has been designed to enable delegates to apply all of the material with immediate effect back in the workplace.