Engineering Training Programs

Part 1

Power Engineering Programs

ENERGY CONSERVATION

COURSE OBJECTIVES:

Equips participants with skills to identify the energy conservation opportunities and consequently reduce energy losses.

COURSE CONTENTS:

- Energy conservation methodology.
- Energy audit.
- Energy conservation opportunities in boilers.
- Energy conservation opportunities in industrial furnaces.
- Energy conservation opportunities in compressed air pressure system.
- Energy conservation opportunities cost analysis.
- Energy measurements and instrumentation.
- High efficient lighting.
- Power factor improvement.
- Petroleum refinery industry.

TARGET PARTICIPANTS:

Engineers, chemists, supervisors, technicians and foremen responsible for energy conservation and maintenance in industrial plants and references.

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

STEAM SYSTEM EFFICENCY IMPROVEMENT

COURSE OBJECTIVES:

Provides participants with information, considerations and recommendations on how to design, install and check steam systems to identify where energy waste exists.
Enhances participant's capabilities to modify the systems in order to reduce fuel and operation costs.

COURSE CONTENTS:

- Steam distribution system.
- Steam traps.
- Selection, checking and maintenance of steam systems.
- Practical energy conservation in steam system.
- Steam condenses return system.
- Thermos compression system.
- Heat transfer and insulation, to reduce heat losses.
- Checking steam system operation.
- Application diagrams for efficient steam system.

TARGET PARTICIPANTS:

Plant engineers, chemists, planning engineers, supervisors, technicians and foremen.

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

SWITCHING FUELS FORM LIQUID TO NATURAL GAS

COURSE OBJECTIVES:

Familiarizes participants with the types of fuels and their chemical physical and heating properties.
Enhances participants understanding on the cost reduction associated with fuel switching and environmental protection.
Develops participant's capabilities to switch fuel from liquids to natural gas by providing them with the methods of switching fuels and the feasibility of switching.

COURSE CONTENTS:

- Types of fuels :
    1. Fuel properties.
    2. Calorific values.
    3. API specifications.
- Natural gas :
    1. Sources of N.G.
    2. Reserves of Natural gases.
    3. Properties and Calorific value.
- Methods of N.G. transportation and handling. Switching fuels in boilers: (required modifications). Switching fuels in furnaces: (required modifications).
- Switching fuels in fertilizer industry :
    1. Use of N.G. as Fuel.
    2. Use of N.G. as Catalyst.
    3. Compressed natural gas in vehicles.
    4. Economics consideration in switching fuels.
    5. Environment protection associated with switching fuel to N.G.
    6. Case study.

Power Engineering Programs

SWITCHING FUELS FORM LIQUID TO NATURAL GAS

TARGET PARTICIPANTS:

Engineers, technicians and foreman working in steel engineering, chemical and fertilizers industries also Diesel vehicle engineers and technicians.

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

BOILERS OPERATION AND MAINTENANCE

COURSE OBJECTIVES:

Provides participants with full understanding and solid scientific background on the design. Operation and maintenance of steam boilers. Provides participants with information, considerations and recommendations on how to design, install and check steam systems to identify where energy waste exists.

COURSE CONTENTS:

- The importance of boiler maintenance: General discussion on types of maintenance work applied to boilers.
- Boiler Descriptions :
- Type and construction.
- Important parts: (Preheated - Economizers - Combustion chambers - Superheats.
- Insulation.
- Auxiliaries.
- Strip Down :
- (Isolation - Refractors - Burner - Piping - Combustion chamber - Economizer - Preheated - Superheated - Steam drums).
- Auxiliaries : (Pumps - Burners - Draft fans - Instrumentation).
- Repairs:
  Replacement of parts.
  Repairs of parts.
  Closing up.
  Commissioning and testing.

- Steam distribution system :
- Steam traps: selection, checking and maintenance.
- Practical energy conservation in steam system.
- Steam condenses return system.
- Thermos compression system.
- Heat transfer and insulation, to reduce heat losses.
- Checking steam system operation.
- Application diagrams for efficient steam system.

TARGET PARTICIPANTS:

Plant engineers and qualified technicians responsible for the operation and maintenance of steam boilers in different types of industries.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

Provides participants with full understanding of the different types of gas turbines, their design features components and characteristics. Also familiarizes participants with the efficient operations and maintenance schemes of gas turbines that reduce losses to the minimum.

COURSE CONTENTS:

- Introduction: Open cycle single shaft and twin shaft arrangements.
- Compounding.
- Closed cycles.
- Aircraft propulsion.
- Applications.
- Gas turbine design procedure.
- Shaft power cycles:
- Ideal cycles.
- Methods of accounting for component losses.
- Design points performance calculations.
- Comparative performance of practical cycles.
- Compressors:
- Centrifugal compressors.
- Axial flow compressors.
- Combustion systems:
- Form of combustion system.
- Some important factors affecting combustion chamber design.
- The combustion process.
- Combustion chamber performance.
- Some practical problems.

GAS TURBINES

- Prediction of performance of simple gas turbines:
- Component characteristics.
- Off-design operation of the single-shaft gas turbine.
- Equilibrium running of gas generator.
- Off-design operation of free turbine engine.
- Off-design operation of the jet engine.
- Methods of displacing the equilibrium running line.
- Incorporation of variable pressure losses.
- Prediction of performance:
- Methods of improving part-load performance.
- Matching procedures for twin-spool engines.
- Some notes on the behavior of twin-spool engines.
- Matching procedures for turbofan engines.
- Transient behavior of gas turbines.

TARGET PARTICIPANTS:

Maintenance, design, operations engineers as well as technicians working in industrial plants, refineries, petrochemical plants and power stations.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

This course gives a thorough overview for experienced engineers, new engineers to familiarize them quickly in the rotating equipment field.
It also gives basic principles of failure causes and diagnosis to develop participants skills of problem solving and failure reporting.

COURSE CONTENTS:

- Failure analysis and troubleshooting system.
- Causes of machinery failure.
- Machinery design properties.
- Metallurgical failure.
- Bolted joint failures.
- Shaft failures.
- Wear-related failures.
- Rolling element bearing failure.
- Journal and tilt-pad thrust bearings.
- ring failure.
- Gear failure.
- Coupling failure.
- Mechanical seal failures.
- Mechanical seal selection.
- Lubrication of pump reliability improvement.
- Machinery reliability audits and reviews.
- Machinery troubleshooting.
- Problem solving sequence.
- Failure reporting.
- Cases study.
- Failure reduction programs.

TARGET PARTICIPANTS:

Maintenance, design, operations engineers as well as technicians working in industrial plants, refineries, petrochemical plants and power stations.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

This course AIMS AT providing participants with solid technical background on the design criteria and standards for pipelines; and enables them to select the best pipe material, fittings, supports and equipment connected with the duty of the line to guarantee safe and economic operation.

COURSE CONTENTS:

- Design Considerations: The accumulation of associated pipeline data - Cooling water - Storage tanks - Main pipe runs - Associated processes - Instrumentation and cable runs - Site grade level variations.

- Engineering Studies:
  Engineering standards - Equipment spacing - Pipe spacing - Racking - Engineering codes of practice.
  Installation - Inspection - Testing - Documentation.

- Standard Specifications:
  Line designing - Line approval by process engineering - Valve selection Pipeline Instrumentation.

- Construction And Testing:
  General piping arrangements - Structures - Foundations - Bund walls - Equipment plinths - Cable routes - Switch gear - Control layouts .

- Operation, Protection and Maintenance:
  The metallurgy of pipelines - Failure modes - Corrosion - Protection - Flow patterns - Loss of pressure head.
  Pipeline flow patterns - Loss of pressure head - Equations of flow - Moody diagrammed - Use of nomagrams.
  Pipeline solutions using computerized software, "MATHCAD".
  The pipeline systems: Pumps - Surge and surge protection - Sendoff pressures versus flow rate.
  Analysis of a pipeline control system - Simulated startup and shutdown.

TARGET PARTICIPANTS:

Senior engineers, engineers, supervisors and senior foremen involved in the design, material selection, operation, inspection and maintenance of pipelines in oil and related industries, power plants, civil and agricultural engineering applications.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

operate and maintain equipment in industrial projects, power plants, refineries and oil field installations.

COURSE CONTENTS:

- Pumps:
    1. Classification and function.
    2. Theory and head capacity curves.
    3. Selection.
    4. Drive for industrial pumps.
    5. Operation and control.
    6. Instrumentation.
    7. Applications.
    8. Trouble shooting and maintenance techniques.

- Compressors:
    1. Classification and function.
    2. Theory and head capacity curves.
    3. Selection.
    4. Applications.
    5. Trouble shooting and maintenance techniques.
    6. Frame and running gear, bearings and bearing faults, fitting bearings and bearing maintenance.
    7. Cylinders, cylinder maintenance, piston and piston maintenance, packing theory and packing maintenance.
    8. Valves, types, maintenance and failure analysis.
    9. Capacity control and regulation, methods, unloaders, clearance valves.
    10. Frame and cylinder lubrication systems and operation.
    11. Cooling systems and operation.

- Maintenance:
    1. Maintenance safety and position rod run out.
    2. Start-up and break - in.
    3. Instrumentation.

TARGET PARTICIPANTS:

Maintenance, personnel and process engineers.

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

BEARING: SELECTION & MAINTENANCE

COURSE OBJECTIVES:

Provides participants with global overview on the bearing maintenance strategies. Enables participants: to determine the possible causes of the bearing failures, to interpret the trouble condition and select their solution, to review rolling bearing monitoring techniques, to set up a vibration monitoring program.

COURSE CONTENTS:

- Classification and selection of rolling bearing.
- Radial and trust bearings.
- Special design of rolling bearings.
- Main (Journal) bearings.
- Material and design.
- Maintenance and replacement of rolling bearings.
- Working conditions in assembly area.
- Shaft and housing preparation.
- Basic mounting methods and faulty mounting practice.
- Bearing maintenance checklist and service records.
- Inadequate bearing lubrication.
- Effective and ineffective seals.
- Failure analyses and their causes.
- Trouble conditions and their solutions.
- Overheated bearings.
- Noisy bearing and vibration.
- Replacement are too frequent.
- Unsatisfactory Performance.
- On- condition monitoring of rolling bearing.
- Computer applications.

TARGET PARTICIPANTS:

Engineers, technicians and foremen whose work involve: vibration measurement and analysis, maintenance system of machine parts and structure, field service and machinery start-up, quality control and incoming inspection.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

Provides the participants with thorough understanding of the design of heat exchangers. Also to develop their capabilities in operating and maintaining heat exchangers units in their plants.

COURSE CONTENTS:

- Basic Concepts:
- Need for heating and cooling in industry:
- Temperature and heat energy.
- Ways of heat transfer and heat balance.
- Factors affecting heat transfer.
- Types of heat transfer equipment.
- Heat Exchangers Design & Configuration:
- Fixed tube sheet heat exchanger.
- Floating head heat exchanger.
- U. Tube heat exchanger.
- Main Components of Heat Exchangers:.
- Tube bundle: pattern (square, triangular, diagonal).
- Tube sheets-Baffles and baffle spacers- Exchanger shell.
- Channel head - Shell cover - Fluid paths.
- Material Construction for:
- Shell - Flanges - Channel and channel cover - Tube sheets - Baffles.
- Tubes - Tie rods - Spacers - Nozzles.
- Air Fin Coolers and Condensers:
- Configuration.
- Types of tube headers, fins, fin tube materials and Size range.
- Operation and Maintenance:
- Putting on line - Isolation - Shut down - Specific uses.
- Types of deposits on surfaces - Cleaning of heat exchanger.
- Inspection of heat exchangers.
- Case Studies.

TARGET PARTICIPANTS:

Plant engineers, qualified technicians, supervisors and foremen whose work is related to the use of heat exchanges in different types of industrial plants.
Participants are encouraged to bring with them any additional cases.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

This course aims at providing participants with the theoretical and practical aspects of operation and maintenance of all types of rotating equipment.

COURSE CONTENTS:

- The Gas Turbine Engine and Components:
    1. Operating principles.
    2. Pressure and temperature gradients.
    3. Centrifugal and axial compressor.
    4. Combustion systems and turbine .
    5. Equipment Systems:
    6. Air cooling and pressurization system - Lubrication, servo oil system.
    7. Gas and liquid fuel system - Ignition and starting system .
- Gas Turbine Operations:
    1. Prostrate check and start -up and shut - down procedure.
    2. Monitoring normal operations.
    3. Electronic control and Governors.
    4. Safety and Operation Limits:
    5. Fire detection and suppression.
    6. Fire system maintenance.
    7. Gas leakage, noise and heat emission.
- Gas Turbine Maintenance:
    1. Types of inspections and condition monitoring.
    2. Safety requirements and maintenance equipment.
    3. Compressors Reciprocating and Duplex Compressors:
    4. Classification of volumetric displacement and dynamic compressors.
    5. Principles and types of reciprocating compressors.
    6. Automatic alternation - Duplex compressors.
    7. Controlling reciprocating compressor output.
    8. Rotary and Dynamic Compressors:
    9. Sliding van, Lobe, Axial and Centrifugal.

TARGET PARTICIPANTS:

Operators, maintenance, engineers and technicians of rotating machinery who are working in the field of rotating equipment .

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

BALANCING MACHINERY COMPONENTS

COURSE OBJECTIVES:

Provides participants with full understanding of the types of machines unbalance and their causes, and equips them with skills to correct unbalances and measure tolerances using computer.

COURSE CONTENTS:

- Purpose of balancing.
- Causes of unbalance.
- Types of unbalance.
- Static unbalance.
- Couple unbalance.
- Quasi- static unbalance.
- Dynamic unbalance.
- Balancing machines: Gravity, centrifugal and field balancing machine.
- Unbalance correction methods: Addition and removal of masses - Mass centering.
- Balance tolerances and quality grades.
- Computer - Aided balancing.
- On-condition monitoring of rotating equipment .
- Case studies.

TARGET PARTICIPANTS:

Engineers, technicians, and foremen in industrial plants and workshops.

LOCATION:

DURATION: One week

DATE:

MACHINERY ALIGNMENT

COURSE OBJECTIVES:

Provides participants with skills required to identify and measure misalignments in different machines and their causes and how to correct or monitor them.

COURSE CONTENTS:

- Installation of rotating machinery.
- Alignment tolerances.
- Choosing an alignment measurement setup:
- Two or three indicators.
- Close - coupled Face and Rim.
- Reverse indicator methods.
- Laser - optic Alignment.
- Leveling curved surfaces.
- Interpretation and data recording.
- Aligning close-coupling machinery.
- Alignment correction.
- Vibration due to alignment.
- Condition monitoring of machinery alignment.

TARGET PARTICIPANTS:

Engineers, technicians and foremen in industrial plant and workshops.

LOCATION:

DURATION: One week

DATE:

COURSE OBJECTIVES:

Provides participants with understanding of different types of steam turbines and their properties.
Develops participants skills in controlling losses in turbines and to operate and maintain steam turbines efficiently.

COURSE CONTENTS:

- Introduction:
    1. Principle of action of steam turbine.
    2. Types of steam turbines.
    3. Properties of steam.
    4. Entropy diagram.
- Steam turbine cycle:
    1. Definition of cycle- and actual steam turbine cycle.
    2. Ranking cycle.
    3. Thermal efficiency ratio.
- The flow of steam:
    1. The flow of steam through nozzles:
    2. Impulse turbine blade - Impulse reaction turbine blades.
    3. Vortex flow in steam turbines.
- Internal losses in steam turbines:
    1. Disc friction.
    2. Partial admission losses.
    3. Gland leakage losses.
    4. Flow of steam through labyrinth packing.
    5. Hydraulic glands.
    6. Advantages and disadvantages of hydraulic glands.
    7. Residual velocity loss.
    8. Turbine performance at varying loads.
    9. Mixed - pressure turbines.
    10. Back - pressure and pass-out turbines.

- Construction:
    1. Construction of : Nozzles
    2. Diaphragms - Blades and blades attachment
    3. Rotors.
    4. Stresses in turbine rotors.
    5. The critical speed of turbine rotors .
    6. Construction of: Cylinders, Glands and packing devices.
    7. Bearing and Lubrication.
    8. Materials for steam turbines.
    9. Governors and governor gears:
    10. Types of governor and the rattle value.

TARGET PARTICIPANTS:

Engineers, supervisors,technicians and foremen in industrial installations.

LOCATION:

DURATION: One week

DATE:

Power Engineering Programs

TROUBLE SHOOTING PROCESS
CONTROL LOOPS

COURSE OBJECTIVES:

To give participants better and deep understanding of practical control loops problems.
To provide participants with the most accurate diagnosing methods to identify and to solve their difficult control loops problems.

COURSE CONTENTS:

- Practical problems in process control loops:
- Understanding characteristics of control loop elements :
    1. Real process characteristics.
    2. Control characteristics.
    3. Final control element characteristics.
- Difficult control loop problems:
    1. Excessive hystersis.
    2. Sticky control valves.
    3. Noisy measurement signals.
    4. Control loop interaction.
    5. Practical case study.
- Control loop analysis :
- Diagnosing difficult control loop problems:
    1. Damping characterization.
    2. Cycling period.
    3. Process classification.
    4. Noise evaluation.
    5. Dynamic coupling evaluation.
- Tools of control problem diagnosis:
    1. " As found" control loop analysis .
    2. Closed loop testing and analysis.
    3. Set-input testing and analysis.

TROUBLE SHOOTING PROCESS CONTROL LOOPS

- Remedies to difficult control loop problems:
- Selecting the proper valve characteristics.
- Using valve positions.
- Tuning PID controllers.
- Hands-on demonstration of process control systems troubleshooting and simulation software (PCSTS).
- Identification of heat exchanger loop under different problems.
- Tuning of heat exchanger loop.
- Tuning of thermal process under PID control.

TARGET PARTICIPANTS:

Instrumentation and process engineers, qualified maintenance staff and technicians.

LOCATION:

DURATION: One week

DATE:

COMPUTER APPLICATION IN PROCESS CONTROL

COURSE OBJECTIVES:

Enables participants: to solve general control system analysis and application problems: to recognize basic industrial loops associated with complex industrial systems.

COURSE CONTENTS:

- Process Automation System Engineering :
- Basic concepts of process control - Feedback control - Combination types of process control - Potential problems in control systems.
- Analysis of Common Industrial Loops:
- Flow control loops - Pressure regulation Liquid level control loops - temperature control loops - Control of composition .
- Experimental Work Part I :
- Identification of common industrial process.
- Tuning P,PI and PID controllers installed on flow and level process.
- Applying cascade control on level/flow processes.
- Analysis of Complex Industrial System:
- Distillation control systems.
- Industrial boilers and other energy transfer systems.
- Gas turbines control systems.
- Burner management systems.
- Effective control of centrifugal and axial compressors.
- PH control.

- Experimental Work Part II:
- Investigation of performance of specific industrial systems under different control schemes (Simulation package on a PC).
- Heat exchanger - Industrial boilers-Distillation tower.
- Implementation of different automation schemes on real industrial processes.(As well as distributed control system is used in this experiment).

TARGET PARTICIPANTS:

Supervisors who desire to improve their knowledge and understanding of practical control systems; and whose current or future job responsibilities require them to work in the area of automation systems engineering.

LOCATION:

DURATION: One week

DATE:

MEASUREMENT AND PROCESS CONTROL

COURSE OBJECTIVES:

Provides participants with full understanding of industrial measurements and control in different types of industrial plants.

COURSE CONTENTS:

- Applied Mechanics:Forces - Pressure - Stress - Strain - Load/Extension Diagram - Extension Diagram - Elastic Limit - Yield . point - Ultimate - Load point - Fracture point - Hook's Law.
- Pressure: Manometers- Barometers - Bourbon Tube Gauges - Application of Gauges - Diaphragms - Calibration and Installation precautions.
- Level: Dip Sticks and Dip tapes - Sight Glasses .
- Flow: Variable flow meter - Positive displacement Flow meter - The construction and Operation of a tank type meter - Construction and operation of liquid flow meters- Inferential flow meters-Calibration of flow meter.
- Temperature.
- Rotaring Frequency.
- Classification of Systems.
- Block Diagram.
- Control Modes.
- Control valves and valves positions:
- Self actuated controller operating in the context of air supply pressure regulation.
- Bellows operated - Temperature controller - Ball float level controller
- Motion balance generation by: P,PI,P+I+D.
- Complex Control Systems:
- Cascade control systems - Ratio control .
- Use of Alarm Annunciating Systems.

- Data Handling.
- Data loggers - Scanner - Signal conditioner - Analog to digital - Converter alarm setting - Comparator - output devices - Alarm devices.
- Computer Control.
- Programmable logic controller -P.L.C. and Conventional analogue controllers.

TARGET PARTICIPANTS:

Instrumentation and process engineers and qualified technicians in different industrial organizations

LOCATION:

DURATION: One week

DATE: