Electronically, navigate by clicking on the titles.

Above all, Sifoee offers custom training tailored to your needs.

For all inquiries, please contact us at **+33 (0)4 82 53 96 77** or at **contact@sifoee.com** .

Thermic & Gas Turbines

Diesel

Hydroelectric

Technology

Operation and Management of Industrial Gas Turbines

OBJECTIVE

Know how to operate a type 5000 industrial combustion turbine with supervision

Length of the course: 5 days for initial training

People concerned: Maintenance and operations technicians

PEDAGOGY

- Theoretical and practical training on the clients installations
- Individual testing of knowledge at the end of the course
- A certificate attesting the participation in the course will be sent to the employer

PROGRAM

- The description and the characteristics of the GT
- The management of TAC
- The roles and operation of auxiliary circuits
- Normal values for the operating parameters
- Start-up and shutdown sequences, with descriptions of the main steps
- Checks to be made before, during and after starting the CT
- The description of the DCS (distributed control system)
- Modes and conditions of the load setting
- The mechanical and electrical protections of the unit and a description of their role
- The alarm thresholds and trips
- Synchronisation in manual mode
- Monitoring of the main parameters
- Maintenance of the CT

Underlying Principles of a Combined Gas and Fuel Cycle

OBJECTIVE

Understand the functioning of a combined cycle and the various parts that make it up.

Length of the course: 4 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industrial examples
- Individual testing of knowledge at the end of the course

PROGRAM

- The presentation and the characteristics of a combined cycle
- The major economic balances for a combined cycle
- The simplified flow diagram of a combined cycle
- Identifying key materials (KKS and ECS)
- The operating principles and technology of the main equipment involved (GT, HRSG, ST, wet tower, cooling system, auxiliary circuits, etc.)
- Normal values for operating parameters
- The two thermodynamic cycles for a combined cycle
- The various transformations of energy present in a combined cycle
- Variation in performance and efficiency of the unit and its main components
- The different start-up and shutdown and behaviour of key equipment
- Operating principles
- Electricity production / consumption balance
- Environmental constraints subject to different operations of the unit
- The risks of failure of the major components
- Maintenance principles

Thermodynamic Cycles
Combustion and Vapor Turbine

OBJECTIVE

Understand the thermodynamic principals and functions (air/smoke and water/steam) necessary for the operation of a cimbined cycle

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industrial examples
- Individual testing of knowledge at the end of the course

PROGRAM

- Combined cycle: thermodynamic
- The principles of thermodynamics
- Main thermodynamic units and their uses
- Thermodynamics in a combined cycle
- The T.S and Mollier diagrams for water and steam
- The psychometric charts and T.S for air
- The operation of the equipment constituting the thermodynamic cycle of a combined cycle
- The energies of the transformation process
- The different values of pressure, temperature and flow of air / smoke operation in diagram form
- Changing parameters during transient phases
- Pressure readings, temperature and water hardness in the different exchangers of the thermodynamic cycle according to diagrams
- The power of the CT and compressor
- The power of the exchangers
- The power of ST
- The efficiency of a combined cycle
- Check the drift of the installation by monitoring the thermodynamic parameters
- Heritage preservation through the optimization of thermodynamic parameters

Equipment Technologies Used for Water and Air in a Combined Cycle

OBJECTIVE

Understand the workings and technologies of pumps and compressors.

Know the physical properties of water and air in the plants and the associated load losses.

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industrial examples
- Individual testing of knowledge at the end of the course

People concerned:

Operating technicians

PROGRAM

- The different kinds of pumps (displacement and centrifugal), compressors (CT and auxiliaries) used in a combined cycle
- The values and calculations of pressure and flow
- load losses of a hydraulic circuit
- The application of Pascal's theorem
- The main components of a centrifugal pump
- The pressure and the velocity of a fluid at any point in a circuit (Bernoulli's theorem)
- Hydraulic power and electric pump
- The flow control means in a hydraulic circuit
- The main dysfunctions involving centrifugal pumps (water hammer, cavitation, vortex, etc.)
- The main compressor of the CT
- The different kinds of auxiliary compressors
- Compression ratios
- The power of a compressor
- Changing parameters during transient phases
- Values and calculations of pressure and flow
- The monitoring of process parameters
- Heritage preservation by process parameter optimization

Technologies of the Different Parts of a Gas and Fuel Combined Cycle

OBJECTIVE

Know how to operate a combined cycle thanks to a comprehensive understanding of

- the technologies of the different parts of the machine
- the monitoring of process parameters
- the safety of the operation

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industrial examples
- Individual testing of knowledge at the end of the course

Length of the course: 5 days

PROGRAM

- The suction box (air filters, anti-icing, fogging, bleed heating, security clappets, etc.)
- Air filters (characteristics, mesh, monitoring, cleaning, etc.)
- The IGV (operation, maintenance, specifications, etc.)
- The compressor (lubrication, anti-surge valves, cooling, etc.)
- The combustion chamber (different types of combustion chamber and burners, environmental, etc.)
- The expansion turbine (lubrication, bearing, cooling, etc.)
- The recovery boiler (different types, post-combustion, economizer, drum, spray, heaters, reheaters, desuperheater, vents and drains, security organs, etc.)
- The steam turbine (inlet valves, different body, sealing, lubrication, turning gear, control and security of oil, clutch, condenser, cooling system etc.)
- The alternator (rotor, stator, excitation, lubrication, sealing circuit, cooling, etc.)
- The transformer (cooling, security organs, etc.)
- the electrical supply (main supply, secondary and emergency, emergency diesel, breaker, switchgear, etc.)

Control Loop Principles Applied to Combined Cycles

OBJECTIVE

Understand the principles and the control parameters of a combined cycle that allow for manual operation of the plant.

Length of the course: 3 days

PEDAGOGY

- Theoretical training
- Practical training on images and schemes
- Practise manual operation
- Practical training on a simulator

PROGRAM

- The control loop principles
- The characteristics of a stable or unstable state
- Operating in an open and closed loop
- The role of the enslavement loop
- The role of the different components of a closed or open loop
- The behaviour of the different actions of a PID controller
- The different types of control and examples (speed, flow, heat, level, etc.)
- Different regulations of the combined cycle (speed turbines, electric power,exhausttemperature, combustionturbine, conditioning temperature, fuel temperature, superheated steam temperature,reheated steam temperature, bypass HP/MP/LP, boiler levels, boiler flow, drum levels, smoke temperature, etc.)
- Analysis of operation of these control loops
- Reading control diagrams
- Operating manually rather than automatically
- Sharing feedback

Operating Principles Fuel Oil, Coal and Biomass Power Plants

OBJECTIVE

Understand the functioning of a fuel-oil, coal and biomass-fired power station.

Understand the functioning of the various hardware components.

PEDAGOGY

- Theoretical and practical training on the client's installations
- Use of videos and industriel examples
- Individual testing of knowledge at the end of the course

Length of the course: 4 days

PROGRAM

- The presentation and the characteristics of a thermal power plant
- The major economic balances for a thermal power plant
- The simplified flow diagram of a thermal plant
- Identifying key materials (KKS and ECS)
- The operating principles and technology of main materials (fuel processing, combustion chamber, boiler, steam turbine, condenser, cooling system, heater stations, air-smoke circuit, auxiliary circuits, etc.)
- Normal values for the operating parameters
- The thermodynamic cycle of steam and extractions steam
- The different energy transformations
- Fluctuations in performance and efficiency of the installation and its main components
- The different start-up and shutdown and behaviour of key equipment
- Operating principles
- The production / consumption balance
- Environmental constraints subject to different operations of the facility
- The risks of failure of major components
- Maintenance principles

Fossil-fired
Thermodynamic Cycle of a Steam Turbine

OBJECTIVE

Understand the thermodynamic principles and functions necessary for water/steam transformers in fuel-oil, coal and biomass-fired power stations.

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industriel examples
- Individual testing of knowledge at the end of the course

PROGRAM

- The principles of thermodynamics
- Main thermodynamic units and their uses
- Thermodynamics in a thermal power plant
- The T.S and Mollier diagrams for water and steam
- How material components of the thermodynamic cycle of a power plant work
- The technology of the steam turbine
- The transformation process of energies
- Pressure readings, temperature and flow of air / smoke during operations in diagram form
- Changing parameters during transient phases
- Pressure readings, temperature and water hardness in the different exchangers of the thermodynamic cycle in diagram form
- The combustion power
- The power of the exchangers
- The power of the steam turbine
- The efficiency of a thermal power plant
- Measuring the drift of the installation by monitoring the thermodynamic parameters
- Heritage preservation through the optimization of thermodynamic parameters

Fossil-fired Power Plant
Combustion Equipment Technology

OBJECTIVE

Understand the physical and chemical principles of combustion in a fossil-fired fuel-oil, coal and biomass-fired power station.

Understand the working and technology of all of the boiler's parts (combustion chamber and heat exchanger).

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industriel examples
- Individual testing of knowledge at the end of the course

Length of the course: 5 days

PROGRAM

- The principles of the combustion
- The different types of fuel, their advantages and disadvantages
- Fuel preparation (crushers, heating station, drying, filtration, etc.)
- Treatment of combustion residue (removal of slag, ash management, etc.)
- The different types and operation of combustion chambers and their technologies
- The technology of burners and heating type
- The combustion chemistry
- The redox combustion
- The upper and lower heating value
- The comburivore power
- The fumigant power
- The behaviour of the boiler
- The management of excess air
- The different heat transfers (convection, radiation and conduction)
- The optimization of process parameters
- The various exchangers and their technologies
- The power and performance of the exchangers
- Maintenance and cleaning of the boiler
- The main reasons for boiler failure
- Changing parameters during transient phases
- Smoke treatment
- The monitoring of process parameters
- Preservation facilities by optimizing process parameters

Fossil-fired Power Plant
Steam Turbine Equipment Technology

OBJECTIVE

Understand the physical and chemical principles of a steam turbine, auxiliaries and water stations in a fossil-fired fuel-oil, coal and biomass-fired power station.

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos and industrial examples
- Individual testing of knowledge at the end of the course

PROGRAM

- The operation of steam turbines
- Different types of steam turbines used in a thermal power plant
- Elements for admission
- Steam turbines (rotor, stator, fixed points, abutments, bearings, sealing, mobile and fixed blades, etc.)
- Auxiliary (lubrication, bearings, turning gear, security, sealing steam, expansion etc.)
- Condensers (water boxes, tube expansion, cold spots, vacuum equipment, cleaning, explosion membranes, leakage treatment, etc.)
- The various types of condenser cooling circuit (open circuit, closed circuit with cooling tower, etc.)
- The extraction pumps
- Extraction reheating by steam
- Deaerator and feedwater tank
- Feedwater pumps
- Types of corrosion and their consequences
- Water chemistry (pH, conductivity, silica, TAC, oxygen, etc.)
- The injection points and the treatment in the water circuit
- The water treatment of cooling towers
- Changing parameters during transient phases
- The monitoring of process parameters
- Preservation of known data by process parameter optimisation

Fossil-fired Power Plant
Control Loop Principles

OBJECTIVE

Understand the principles and the control parameters of a fossil-fired, fuel-oil, coal and biomass-fired power station.

Length of the course: 3 days

PEDAGOGY

- Theoretical training
- Practical training on images and schemata
- Practise manual operation
- Practical training on a simulator

PROGRAM

- The principles of the control loop
- The characteristics of a stable or unstable system
- Operating in open and closed loops
- The role of an enslavement loop
- The role of the different components of a closed or open loop
- The behaviour of the different actions of a PID controller
- The different types of regulation and examples (speed, flow, temperature, level, etc.)
- The different regulations of the unit (speed turbine, electric power, inlet pressure, fuel temperature, superheated steam temperature, steam temperature reheated,HP/MP/LP bypass, drum levels, steam flow boilers, tank levels, air flow, pressure or depression combustion chamber, etc.)
- Analysis of operation of these control loops
- Reading control diagrams
- Operating in manual mode rather than in automatic mode
- Sharing feedback

Fossil-fired Power Plant
Operating a Thermal Power Plant

OBJECTIVE

Know how to start, operate and stop a fossil-fired, fuel-oil, coal and biomass-fired power station while respecting respecting the safety of personnel, how to operate equipment and the quality of the network.

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training on the clients' installations
- Use of videos, industrial examples and client feedback
- Individual testing of knowledge at the end of the course
- Summary of the course animated by a manager

PROGRAM

- The principles of operating the installation of a power plant
- The tools and the ergonomics of the operating position
- Types of start-up
- The start-up of the unit (preparation the auxiliaries and circuits, electrical supplies, fluids and fuel, commissioning of control loops, lubrication, turning gear, etc.)
- The different starting phases (ignition, synchronization, target load)
- The engagement of the start-up phases associated with the permissive
- Constraints and threshold limits
- Operating at steady load (control and monitoring of process parameters, monitoring of demand, optimizing the parameters and yield, economic controls, etc.)
- Regulatory measures
- Anomalies and failure management (detection, risk assessment, possible actions, resolution of incidents with search root causes)
- The types of shut-down, their different stages as well as the known and accepted procedures
- Constraints and threshold limits
- The specific provisions and procedures after shutdown
- Consignments installation
- The plant maintenance
- Management and organization of the team
- The role and responsibility of each member of the team (manager, control room operator and field operator)
- Management with maintenance team and subcontractors
- Company procedures
- Personnel safety

Chemistry of Water/Steam Circuits for Conventional Fired Power Stations

OBJECTIVE

- Acquire the principles and understand the importance of having a good chemistry in water/steam circuits of conventional and Heat Recovery Steam Generator (HRSG) power stations
- Understand the operating constraints related to chemical parameters
- Enhance life expectancy and performance of plants by taking into account a better chemistry

PEDAGOGY

- Theoretical training in the classroom
- Expertise and visits of customer site
- Team feedback on the management of past incidents
- Individual testing of knowledge at the end of the course

Length of the course: 5 days

PROGRAM

- Purpose of chemistry for power plants
- Basic knowledge in chemistry
- Units used in chemistry
- Metallurgy notions
- Corrosion in nuclear power plants (types, process, consequences...)
- pH, characteristics and measurement
- The impact of pH on corrosion
- The conductivity of water and its influence on corrosion
- Conductivity measurement principles
- Total and cationic conductivity
- Water demineralisation production
- Chemistry and monitoringparameters of circuits in operation
- Conditioning chemicals used against corrosion, handling and storage
- Chemical contamination and their origins
- Behaviour in case of contamination
- Conditioning during outages and their monitoring
- Water/steam circuits chemical cleaning and their monitoring
- Technology, maintenance and calibration of chemical measuring devices

Electrical Drawings and Systems of a Power Plant

OBJECTIVE

Reminders on the running of the various electric systems comprising the installations of the power plant in order to realize operating acts.

People concerned: operators and technicians

PEDAGOGY

Theoretical and practical training based on:

- Installations of the power plant itself
- Drawings of the electric systems
- Files of the installations

Length of the course: 5 days.

PROGRAM

At the end of the course, the trainees must be able to:

Electric systems in direct current 125 V and 48 V:

- Understand the global functioning of the system
- Recognise the various components of this system, their features and place them within the installations of the power plant
- Describe the various configurations and functions of each element from the electrical drawings
- Refresher module on the prerequisites concerning every operations on elements during the electrical lockouts

Emergency LV power sources:

- Understand the permutation automatism of the electric sources

Mechanical and electrical protections of the generator, the alternator and the energy grid:

- Quote the mechanical protections of generating sets, explain their principles of action and quote the limit values of alarm and engine stop, as well as the behaviour in case of defect

The electric parameters of the alternator:

- Refresher module on the main electric parameters which determine the functioning of the alternator
- Reminder on the normal conditions necessary for the manual coupling of a synchronous machine
- Explain the notion of statism and its effects on the production/consumption balance

Transformer / Alternator
Understanding Electrical Engineering

OBJECTIVE

- Understand the constraints linked to operating an alternator/transformer
- Identify the characteristics of the power transformer (isolation, protection, components, and peripherals)
- Describe alternator technology
- Monitor and implement altenator and transformer maintenance checks

People concerned: mechanics

PEDAGOGY

- Theoretical and practical training
- Practice on a simulator
- Handout provided by the trainer
- Individual testing of knowledge at the end of the course
- A certificate attesting to the participation in the course will be sent to the employer

Length of the course: 10 days

(5 days minimum)

PROGRAM

Altenator

How it works:

- What it consists of and its environment
- the operating principles
- the operating diagram (real and reactive power)

Technology:

- Technologies that make up alternators
- excitation systems including reverse alternators

Maintenance of an alternator:

- The relevant checks as part of preventive maintenance
- The various types of faults

Transformer

How it works:

- What makes up a power transformer
- the operating principles of a transformer

Technology:

- Elements on the identification plate
- Technologies that make up transformers
- Setup and Environment
- Technologies that make up insulators

Maintenance of an alternator:

- The relevant checks as part of preventive maintenance
- The various types of faults

Transformer / Alternator Operation Technology and Maintenance

OBJECTIVE

- Understand the constraints linked to operating an alternator/transformer
- Identify the characteristics of the power transformer (isolation, protection, components, and peripherals)
- Describe alternator technology
- Monitor and implement altenator and transformer maintenance checks

People concerned: technicians and engineers with a good understanding of electrical engineering

PEDAGOGY

- Theoretical and practical training
- Practice on a simulator
- Handout provided by the trainer
- Individual testing of knowledge at the end of the course
- A certificate attesting to the participation in the course will be sent to the employer

Length of the course: 12 days

PROGRAM

Altenator

How it works:

- What it consists of and its environment
- the operating principles
- interpretation of the operating diagram (real and reactive power)

Technology:

- Technologies that make up alternators
- excitation systems including reverse alternators

Maintenance of an alternator:

- The relevant checks as part of preventive maintenance
- Implementation of relevant controls during disrupted conditions

Transformer

How it works:

- What makes up a power transformer
- the operating principles of a transformer

Technology:

- Elements on the identification plate
- Technologies that make up transformers
- Setup and Environment

Maintenance of a transformer:

- The relevant checks as part of preventive maintenance
- Implementation of relevant controls during disrupted conditions

Operate a Power Plant on a Simulator Under Normal and Disturbed Circumstances

OBJECTIVE

- Training on how to operate a diesel power plant connected to the network under normal circumstances
- Put the trainees in accident situations during operation. With the main faults in the engine and on the network to understand the interactions during abnormal operation
- Understand the physical phenomena and the auxiliary circuits encountered in the same type of plants

PEDAGOGY

- Theoretical and practical training on the simulator
- Simulation hosted and managed by an instructor who introduces faults in real time in order to put trainees in real life situations
- Team role play and sharing of feedback

PROGRAM

- Normal operation (preheated engine start-up: hot or cold, coupling, socket load, load change and stop)
- Operation under accident or disturbed circumstances
- Operating in the presence of faults that cause an evolution of fixed-charge or blocking parameters for a start-up or stop sequence
- Operating in the presence of faults resulting in automatic fuel oil / gas oil change, or automatic trigger of the group or islanding
- Operate during a motor trip
- Operation in an environment with faults outside the plant that cause sudden changes in voltage or power
- Operation with partial lack of information (e.g. lost logbook)
- Understand all the physical parameters and control loops of the plant through the analysis of educational images animated in real-time (alternator P/Q diagram, droop line, heat balance, operating point of the turbocharger, regulating speed and load, generator excitation control, etc.)
- Assistance in fault diagnosis by analysing the impact on the process of different types of electrical or mechanical defects
- Understand the constraints and demands of the electricity dispatch centre

Electrical Drawings and Systems of a Power Plant

OBJECTIVE

Reminders on the running of the various electric systems comprising the installations of the power plant in order to realize operating acts.

People concerned: operators and technicians

PEDAGOGY

Theoretical and practical training based on:

- Installations of the power plant itself
- Drawings of the electric systems
- Files of the installations

Length of the course: 5 days.

PROGRAM

At the end of the course, the trainees must be able to:

Electric systems in direct current 125 V and 48 V:

- Understand the global functioning of the system
- Recognise the various components of this system, their features and place them within the installations of the power plant
- Describe the various configurations and functions of each element from the electrical drawings
- Refresher module on the prerequisites concerning every operations on elements during the electrical lockouts

Emergency LV power sources:

- Understand the permutation automatism of the electric sources

Mechanical and electrical protections of the generator, the alternator and the energy grid:

- Quote the mechanical protections of generating sets, explain their principles of action and quote the limit values of alarm and engine stop, as well as the behaviour in case of defect

The electric parameters of the alternator:

- Refresher module on the main electric parameters which determine the functioning of the alternator
- Reminder on the normal conditions necessary for the manual coupling of a synchronous machine
- Explain the notion of statism and its effects on the production/consumption balance

Electrical Drawings and Systems of a Power Plant

OBJECTIVE

Reminders on the running of the various electric systems comprising the installations of the power plant in order to realize operating acts.

People concerned: operators and technicians

PEDAGOGY

Theoretical and practical training based on:

- Installations of the power plant itself
- Drawings of the electric systems
- Files of the installations

Length of the course: 5 days.

PROGRAM

At the end of the course, the trainees must be able to:

Electric systems in direct current 125 V and 48 V:

- Understand the global functioning of the system
- Recognise the various components of this system, their features and place them within the installations of the power plant
- Describe the various configurations and functions of each element from the electrical drawings
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Emergency LV power sources:

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- Refresher module on the main electric parameters which determine the functioning of the alternator.
- Reminder on the normal conditions necessary for the manual coupling of a synchronous machine
- Explain the notion of statism and its effects on the production/consumption balance

Electrical Engineering: Background Knowledge

OBJECTIVE

At the end of the course, the trainees will know the basics of electricity in order to operate electrical installations.

Length of the course: 5 days

PEDAGOGY

- Individual testing of knowledge at the beginning in order to adapt the training program
- Alternate exercises and presentations
- Individual testing of knowledge at the end of the course, with relevant comments by the trainer

PROGRAM

- Elements in an electrical circuit
- Electrical parameters (voltage, current, resistance, power, alternating current, direct current, Ohm law, Joule effect, etc.)
- Single-phase alternating current circuits (principles, schematic representation, sinusoidal signal, phase shift, power factor, etc.)
- Balanced three-phase circuits (voltage drop, cable diameter and protections)
- Powers (active, reactive and apparent)
- Unbalanced three-phase circuits and role of the neutral
- Fault currents (overload, short circuit and earth fault)
- Principles of electromagnetism
- Transformer
- Electrical measuring devices
- Circuit breaker, fuses and meter
- Rotating machines (direct and alternating current)
- Protection equipment, breaking capacity, insulation, etc.
- The risks of working with electricity
- Electrical safety rules

Electrical Engineering: Advanced Course

OBJECTIVE

At the end of the course, the trainees will have an in-depth understanding of electricity laws and techniques in order to optimize the maintenance of electrical installations.

People Concerned: electricians or people who have already followed the "background" course

PEDAGOGY

- Individual testing of knowledge at the beginning in order to adapt the training program
- Alternate exercises and presentations
- Individual testing of knowledge at the end of the course, with relevant comments by the trainer

Length of the training: 5 days

PROGRAM

- Reminders on electrical circuits and parameters, as well as their schematic representations
- Unbalanced three-phase circuits and symmetrical components
- Three-phase transformer (coupling, phase shifting)
- Rotating electrical machines (technology and parameters, direct and alternating current)
- Synchronous machine as a generator (isolated and infinite network, active and reactive power adjustment, stability)
- Asynchronous machine as a motor
- Protection of the rotating machines
- Batteries and associated protections
- Neutrals (rules, advantages and disadvantages)
- Protection of electricity networks (faults and values of the electrical parameters, means of protection, processing of harmonic disturbances)
- Requirements made by the EHV and HV grids operators
- Maintenance policy in order to adapt to the interests of the power plant
- Maintenance optimization related to electricity safety

Electricity Transmission

Substations and Lines

Network Management

Protections and Local Control Command in HV Substations

OBJECTIVE

Knowledge about protection against short-circuits and LV material in a substation

Ability to intervene safely on settings and automations of a substation

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training
- Individual testing of knowledge at the beginning and end of the course
- Possibility to accompany onsite interventions
- Enhance customer experience feedback
- Summary of the course animated by a manager

PROGRAM

- Refresher course on electrical engineering
- LV components of substations (cells, transmissions, state recording etc.)
- Substation functioning
- The principles of different relays and their functioning
- The choice of protections (minimum of impedance, differentials,max currentetc.)
- The protection plan and the definition of settings (calculation, and orientation etc.)
- Interactivity between HV and MV
- Different types of instrumentation and control (electromechanical engineering, 1975 plan , numerical etc.)
- The transmission of orders and information
- Recording of events, incidents and disturbances (analogue recording)
- The rules of access to HV substations (workers security)
- Maintenance and interventions on protections
- Going digital (optional)

HV Substation Technology

OBJECTIVE

Knowledge about protections against short-circuits and LV material in a substation

Ability to intervene safely on settings and automations of a substation

Length of the course: 5 days

PEDAGOGY

- Theoretical and practical training
- Individual testing of knowledge at the beginning and end of the course
- Possibility to accompany onsite interventions
- Enhancement of customer experience feedback
- Summary of the course animated by a manager

PROGRAM

- Refresher course on electrical engineering
- NF C 18-510 standard and safety principals
- Accesses to networks and use of various working documents
- Identify the components of a substation (transmissions, recorder...)
- Substation functioning
- Protection plan and definition of settings
- Interactivity between HV and MV
- Technology of different HV equipment
- Circuit breakers
- Disconnecting switches
- Current transformers
- Voltage transformers
- Power transformers
- LV equipment
- Recording events, incidents and disturbances
- Usual activities (Opening and closing of HV apparatus, choice the network topology)
- Maintenance of sensitive organs
- On site coaching

Management of Alstom c264 RTU Configuration in an Electrical Substation

OBJECTIVE

- Understand the role of RTU in a substation
- Ability to do hardware and software configuration of the C264
- Ability to use C264 sustaining tools and databases configurator

PEDAGOGY

- Expert engineer for theoretical training
- Practicals (dismantling, boards exchange, database configuration, etc.)
- Possibility to partake in customer site visits

Length of the course: 5 days

PROGRAM

- Main features for remote access to substations
- RTU architecture (mono rack, multi rack, sub-equipment etc.)
- RTU HIM
- Hardware configuration (types of boards, racks, dismantling etc.)
- Overview of IEC 870-5-101 protocol for data exchanges
- Utilisation of Computer Maintenance Tools –CMT- (RTU software and databases downloading, access to events recorder, statements etc.)
- Expert mode for recovery after a major fault
- Utilisation of the System Configurator Editor –SCE- (generalities, limitations for RTU configuration, HMI etc.)
- Generation of a RTU database (analysis, I/O acquisition, transmission lines configuration, database generation etc.)
- Implementation of a database in RTU and validation thereof

Management of an Electrical System in an HV Dispatch Centre

OBJECTIVE

Ability to manage a power system with a control center in the phases of development, operation planning and real time operation:

- know the targets of power system operation
- know the risks related to power system safety
- ability to master the peer system parameters at any time

PEDAGOGY

- Theoretical training
- Real case studies
- Use of network simulator (when available)

Length of the course:

- 2 to 3 days for managers
- 3 to 5 days for the staff not working in real time
- 10 to 20 days for real time operators

PROGRAM

Power system operation

- The different components of the power system and their specificities
- Operation targets
- The different states of the power system
- Power system safety
- Margin and reserve concepts
- Real time operating rules
- Power system operation planning
- Help from EMS (Electronic Management Systems) software
- Power system development
- Feed-back from experience on a power system

Control center working

- Responsibilities shared between the different actors of the power system
- Data acquisition
- Control center organisation
- Power system safety in normal state
- Load-generation balancing
- Voltage control
- The balance of electricity flows
- Stability

Power system safety in a deteriorated state

- Emergency scheme
- Defense scheme
- Load shedding scheme
- Restoration procedure

Design, Operation and Maintenance of Interconnected Electrical Systems

OBJECTIVE

Understanding of the main rules & know how of interconnected electrical sytems O&M

Length of the course: 5 days

PEDAGOGY

- Theoretical training
- Practical training with « school » case studies
- Use of network softwares

PROGRAM

- Interconnected Electrical Systems (IES) principles and description
- IES origins and missions
- IES's problems
- Impact on the stability and power plant behaviour
- IES operation and the necessary information exchanges
- Dynamic behaviour of an IES and the supervision of key parameters
- Protection system of an IES
- Communication system of an IES
- Remote control of an IES
- General incidents
- electrical network blackouts / interconnected system blackouts
- The problem of maintenance of an IES
- The different steps of Interconnection studies of two electrical systems
- Decision process for IES studies
- Softwares for Network studies

(being formalized)