

Electrical Equipment and Safety: Operation, Control, Maintenance and Troubleshooting

21st to 23rd Oct 2019 | Suva Fiji

John D. Sams

Program Overview

Electrical energy is all around and many of us rely on electrical energy to simply perform our day to day tasks. There are unique terms associated with electricity, voltage, current, and resistance the most common. There are two forms of electricity, Alternating Current (AC) and Direct Current (DC), AC production is different than DC. Electricity reacts differently when applied to certain components such as capacitors and inductors. Semi-conductive devices such as transistors, rectifiers, voltage regulators, and voltage multipliers provide many capabilities of our electronic world, while limit switches, load cells, and photo eyes are used extensively in manufacturing process.

Electrical transmission and distribution uses several types of transformers, power and distribution, which due to the large amounts of heat generated require special cooling methods. Potential and current transformers provide the ability to monitor the electrical power a facility is receiving from the power company, normally installed in switchgear, an electrical apparatus to connect to the power company. Protective devices, such as circuit breakers and protective relays are installed in switchgear to protect both the power company and the utility. Operation of circuit breakers under a load condition may result in a tremendous release of energy and there are several methods used to dissipate this energy. Motor Control Centers (MCC) are much like switchgear and contain much of the same equipment, but are typically used to centralize the control circuits for many motors. All electrical equipment requires maintenance, determining the required maintenance and how often it should be accomplished requires planning.

Working with electrical energy presents two distinct hazards, and the methods to protect the individual and the equipment are different for each of the hazards. Construction of the electrical distribution system will reduce the hazard, but may not completely remove it, Personnel Protective Equipment may be required to perform electrical work. The rules for electrical safety change based on the voltage level and a clear understanding of the voltage levels is important to providing safety from electrical hazards.

Training Methodology

Training using a lecture, Power Point discussion with group discussion on practical experience, movies, group exercise in application of material.



Who Should Attend

- Maintenance managers
- Electrical supervisors
- Maintenance electricians
- Maintenance planners
- Maintenance technicians
- Electrical troubleshooting
- Repair technicians.

Target industries

- Manufacturing
- Power generation and distribution
- Logistics and distribution
- facilities maintenance and repair

Benefits of attending the training

Trained individuals reduce labor cost by using less time to correctly diagnose equipment and system breakdowns, reduce parts costs caused by incorrectly identifying the wrong faulty part, better understanding of equipment operation and maintenance requirements.

For an in-house training option, alternative dates & locations kindly contact **IBEFoRuM**

We are happy to add extra content to the programme to meet additional requirements from your company.

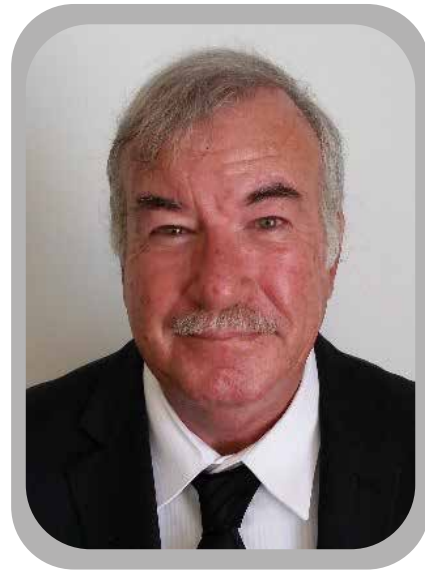
Muzzamil Shaik | +91 966 316 6006
muzzamil.shaik@ibeforum.com



Expert Profile

Mr. Sams has been involved in the electrical equipment maintenance field for over 30 years, with equipment experience ranging from user level voltage levels to the maintenance of circuit breakers with a voltage rating of 69,000 volts. He has served as a technician and a supervisor for electrical technicians with extensive knowledge of the maintenance practices and equipment operation. Mr. Sams has been actively involved in the application of work methods and safety precautions needed to ensure the safety of personnel in his charge.

Mr. Sams has conducted over 50 technical training course on a variety of electrical equipment in addition to his work in the electrical safety field.



John D. Sams

Course Objectives

- Demonstrate an understanding of current, voltage and resistance relationships in electrical systems
- Explain the theory of a generator and how a sine wave is produced
- State the difference between a power transformer and a distribution transformer.
- Explain the cooling methods used for transformers.
- State the safety precautions necessary for current transformers and potential transformers.
- Define switchgear.
- Explain the operation of a low and medium voltage circuit breaker.
- List the different arc suppression methods.
- State the purpose of protective relaying.
- Explain the purpose of a Motor Control Center (MCC).
- Develop a maintenance schedule for electrical equipment.
- Minimize risks by identifying the hazards associated with electrical energy and by complying with safety guidelines.
- Enhance safety by understanding the difference between low, medium, and high voltage and by adopting the relevant safety rules accordingly.
- Follow inspection requirements for Personal Protective Equipment (PPE) and reduce injuries by identifying defective PPE.
- Describe and apply the requirements in EN 500110, the most widely used standard for the protection of individuals from the effects of electrical hazard.

Breakdown of topics

Attendees should come prepared with a sample list of the electrical equipment they are currently using. As a minimum, the list must include manufacture and model number.

Day 1

Module - 1

Electrical concepts

- Basic atomic structure
- Voltage
- Current
- Resistance
- Inductance
- Magnetism
- Capacitance
- Direct Current (DC)
- Alternating Current (AC)

Electrical terminology

- Volts / Amperes / Ohms
- Henry
- Farads
- Ohm's Law
- Kirchhoff's Law

Module - 2

Motor fundamentals

- Direct current motors
- Alternating current motors
- Types of controllers
- Control devices and symbols
- Magnetic contactors
- Overloads
- Control circuits
- Troubleshooting Motor Control Circuits

Exercise 1: Troubleshooting Motor Control Circuits

Module - 3

Transformers

- Turns ratios
- Conservation of Power

- Construction
- Cooling
- Operation
- Maintenance
- Troubleshooting

Exercise 2: Transformer Calculations

Module - 4

Switchgear

- Purpose
- Construction
- Contents
- Maintenance
- Troubleshooting

Module - 5

Circuit Breakers

- Low voltage circuit breakers
- Low voltage circuit breaker operation
- Medium voltage circuit breakers
- Medium voltage circuit breaker operation
- Circuit breaker maintenance
- Circuit breaker troubleshooting

Day 2

Module - 6

Protective Relaying

- Purpose of protective relaying
- Circuit parameters monitored by protective relaying
- Interaction of protective relaying and circuit breakers
- Troubleshooting

Module - 7

Motor Control Center

- Purpose
- Construction
- Maintenance
- Troubleshooting

Exercise 4: Troubleshooting a Motor Control Center

Electrical Maintenance Planning

- Definition of Planned Maintenance
- Recommended Maintenance Periodicities
- Factor that Effect Periodicities
- Scheduling Tips

Exercise 5: Develop an electrical maintenance schedule

Day 3

Module - 8

Electrical hazards

- Electrical terminology
 - o Conductor
 - o Insulator
 - o Grounding
 - o Protective earthing
 - o Bonding
- Electric shock
 - o Electric shock defined
 - o How it occurs
 - o Effect on the human
 - o Rescue methods
- Arc flash
 - o Arc flash defined
 - o How it occurs
 - o Effect on the human
 - o Rescue methods

Module 9

Equipment hazards associated with electric shock

- Equipment hazards
- Inadequate wiring hazards
- Overload hazards
- Flexible cords
- Inadequate protective earthing
- Protective devices
 - o Fuses
 - o Circuit breakers
 - o Ground fault circuit interrupters

Electric shock protective measures

- Equipment engineering for shock protection
- Boundaries for shock protection
- Personal Protective Equipment for shock protection

Exercise 6 Selection of PPE

Maintainability

- Maintenance strategies
- Preventive maintenance analysis
- Corrective maintenance analysis

Module 10

Arc flash protective measures

- Equipment engineering for arc flash protection
- Arc flash boundaries
- Personal Protective Equipment (PPE) for arc flash protection

Exercise 7 Selection of PPE

Module - 11

Hazard assessment concerns for live electrical work

- Determining what hazards are involved
- Identifying the risks involved
- Developing measures to reduce the risks
- Implementing the measures
- Documenting the process
- Reviewing process

Exercise 8 Application of the Hazard Assessment Process

Course Examination Course Critique

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Delegate Registration Form

Delegate Details

Title	Name	Job Title	Phone	Email

Organisation Details

Contact Person for Finance/Payment	Phone	Email

Payment Method

Bank Wire Transfer

Visa Master Card Amex Diners Club

Name on Card: _____

Card Billing Address: _____

City: _____ State: _____

Country: _____ Zip: _____

Card#: _____

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Visa CVC Number or Euro card/Master CVV Number

(Last 3 Digit No's on the back of the card)

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Valid From: ____/____/____ Expiry Date: ____/____/____

Authorization & Acceptance of Sales Contract

I hereby declare I am authorised to sign this contract, Term & Conditions in the name of the Company/ Organisation.

Name: _____

Date: _____ Signature: _____

Agreed Price for this Contract

Per Delegate Price (A)	USD 1,999.00
No. of Delegates (B)	
Total Price (A x B)	

20 USD administration charge and any applicable withholding or any other tax or fee will be applied

Kindly Complete this form and Send it back to:

IBEForum Contact Name	Phone	Email ID
Ajay Joseph	+91 80 5006 0064	ajay.joseph@ibeforum.com

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2. Cancellation, Postponement and Substitution Policy. All cancellations, postponement and substitution shall be communicated via email to the official EMAIL ID as provided in the registration form.

You may substitute delegates at any time by providing reasonable advance notice no less than 8 (eight) days prior to the event to IBEFORUM. For any cancellations received via email to our official EMAIL ID not less than ten (10) days (inclusive of business & holidays) prior to the event, you will receive a 90% credit to be used at another IBEFORUM event which must occur within one year from the date of issuance of such credit. An administration fee of 10% of the contract fee will be retained by IBEFORUM for all permitted cancellations. 100% cancellation fee will be levied if the cancellation takes place within nine (9) days (inclusive of business & holidays) of the event. No credit will be issued for any cancellations occurring within nine (9) days (inclusive of business & holidays) of the event date. No refund would be given for delegates that do not show up at the event.

In the event that IBEFORUM cancels an event for any reason, you will receive a credit for 100% of the contract fee paid. You may use this credit for another IBEFORUM event to be mutually agreed with IBEFORUM, which must occur within one year from the date of cancellation.

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 - Standard Public terms & conditions apply

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- Enquiries and complaints shall be made in written form/Email and have to contain sufficient detail to allow IBEFORUM to compile an official written/online response
 - All official enquiries and complaints shall be submitted electronically to complaints@ibeforum.com
 - IBEFORUM shall officially respond to the complaint no later than 7 days (Business days or Business + Holidays) from the date of its reception

7. Force Majeure Event
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IBEFORUM shall not be liable to the clients or be deemed to be in breach of any agreement it has concluded with them for any delay in performing or failure to perform any of the IBEFORUM's obligations in respect of the services if the delay or failure was due to any cause such as act of God, war, warlike activities, fire, storm, explosion, national emergency, labor dispute, strike, lock-out, civil disturbance, actual or threatened violence by any terrorist group, newly enacted law or regulation or any other cause not within the control of IBEFORUM. For the purpose of this "Force Majeure Event" means any event arising that is beyond the reasonable control of IBEFORUM including (without limitation) to speaker or participant cancellation or withdrawal, supplier or contractor failure, venue damage or cancellation, health scares, industrial dispute, governmental regulations or action, military action, fire, flood, disaster, civil riot, acts of terrorism or war. These terms and conditions shall apply in respect of any rearranged or rescheduled Conference organised by IBEFORUM pursuant to this Condition.