HV/MV SWITCHGEAR INSPECTION, MAINTENANCE & TECHNOLOGY WORKSHOP

17 - 18 August 2017
Kuala Lumpur Malaysia

This Workshop explains typical switchgear maintenance, configurations and arrangements, typical problems encountered in the field and means of extending the life of HV/MV switchgear. The course also highlights training, safety considerations and provides practical guidance for operation, condition monitoring, maintenance and testing of HV/MV switchgear.

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Switchgear, like many other types of industrial equipment, is often unnoticed and neglected until it fails to function normally. The level to which switchgear is maintained in industry varies significantly.

- Maintenance levels at one extreme might involve ‘Condition Monitoring’ (Continuous Monitoring) of equipment with linear or rotating transducers.
- At the other end of the spectrum, maintenance might only involve doing Periodic Maintenance Tasks (PMT), Inspections or even Major Maintenance Task (MOT).
- One can also run equipment until it breaks down or even self-destructs.
- The vast majority of appropriate switchgear maintenance programs will fall somewhere in between these extremes.

Hevilex cc has identified these issues, not just as white coat specialist trainers, but during hands-on circuit breaker breakdowns & repairs, mechanism/pole malfunction problem solving, different maintenance tasks, writing of maintenance manuals and the writing of ‘specific specifications/requirements’ for purchasing of new circuit breakers.

This workshop will highlight all the challenges and issues encountered when it comes to the maintenance of HV and MV Switchgear.

This course will provide you with the opportunity to walk away with the skills to most importantly understand the theory of how a circuit breaker mechanism & interrupter chamber works, ensure that the correct maintenance activities are carried out effectively, implement failure investigations, identify ways in which to do the maintenance cost effectively and not end up ‘over or under’ maintaining the equipment.

Walk Away With the Knowledge and Skills to...

- Understand the mechanical theory of switchgear
- Carry out correct application methods and ensure a longer life span on your MV and HV switchgear
- Able to source spares
- Able to choose the correct CB by implementing a ‘specification & requirement’ list.
- Implement effective testing methods that work!
John Greyling is a High Voltage Switchgear Specialist & Director at Hevilex with over 38 years in the Electrical Industry. His experience stems from being in Eskom’s employ for 34 years. During the latter 19 years, John was involved in switchgear maintenance and achieved Circuit Breaker Specialist status for Transmission nationally and Distribution in Western and Southern Cape. He specialized on the development of skills related to maintaining and monitoring system.

Facilitator | John Greyling

- HV/MV Circuit Breaker Specialist
- Switchgear Consultant
- Accredited technical trainer
- Accredited module writer
- Accredited coach (training)
- Accredited technical auditor
- Accredited mentor
- CB Training (First line, Major Overhaul & Specialist)
- Equipment training module writing
- CB Maintenance & Testing
- CB Spares Sourcing
- Breakdown Repairs
- CB Procurement Specifications
- Equipment training module writing
- Maintenance Standards
- Failure Investigation
- Facilitate & Present Switchgear Seminars
- Substation Equipment Technical Audits

Attend this event and....
- Take part in interactive discussions on application, installation, maintenance and testing issues relating switchgear
- Gain a solid foundation in switchgear mechanism & interrupter theory
- Learn from a recognised expert with international & cross industry experience
- Build a thorough understanding of issues associated with switchgear equipment and an emphasis on safety
- At the end of the program the delegates will be aware of diagnostic tools that aid the planning of maintenance, understand the changing requirements placed on the system with increasing load and fault levels.

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COURSE OUTLINE

DAY 1

Introduction to trainer

# Substation layout overview
- Current Transformers(CT)
- Voltage Transformers(VT)
- Transformer
- Circuit Breaker(CB)
- Isolator
- Surge Arrestors

# Different types of switching equipment
- Isolator
- Circuit Breaker
- Switching Resistors
- Grading Capacitor

# Introduction to Circuit Breakers
- What is a circuit breaker?
- Circuit breaker construction & operation

# Circuit breaker limb / pole / Interrupter chamber
- Function of the SF6 nozzle
- ‘Moving, fixed & Transfer’ contact operating theory

# Types of switchgear
- Oil as insulation
- SF6 as insulation
- Vacuum as insulation
- ‘Air blast’ compressed air as insulation
- GIS (Gas insulated Switchgear)

# Characteristics & expected functions of the Circuit Breaker

# Circuit interruption
- Short time current carrying capacity
- Short circuit current rating
- Recovery voltage versus Dielectric strength

# Auxiliary contacts and electrical interlocks

# Overstressing the switchgear
- Substation & equipment KA ratings

# Oil Circuit Breakers
- Advantages / disadvantages
- Insulating liquids
- The effect of impurities on mineral oil
- Circuit interruption [oil]
- Small oil volume circuit breaker
Self test

# Arc control devices
- Function
- Different types

# SF6 Circuit breakers
- Development
- Advantages / disadvantages
- 1st, 2nd, 3rd generation SF6 CB
- Blast nozzles
- SF6 gas testing
- Absolute versus atmospheric pressure
- SF6 handling

# SF6 Gas medium
- SF6 handling
- Standardize gas fittings
- Filling equipment
- Testing equipment
- SF6 gas leak detection / 2 x usa videos
- Measure main contact penetration in arcing chamber [external measurement]
- Measure arcing contact burn off in arcing chamber [external measurement]
- Nozzle function versus turbulator for arc extinguishing
- Topping up SF6 gas! Can we do this with CB alive?
Self test

# Vacuum Circuit Breakers
- Development
- Advantages / Disadvantages
- Theory & Function
- Different types
Self test
Continuation of DAY 1

# Air blast Circuit Breaker
- Theory
- Advantages / disadvantages
- Function
- Different types

# GIS / Gas Insulated Switchgear
- Description of GIS main components
- Switching components functions and applications
- Technical evolution of GIS
- Gas circuit breakers arc extinction
- Disconnectors and earth switches construction and operation
- Structural Components, busbars and support insulators

# Substation Relay Protection philosophy
- Basic System Protection Concepts

# Earthing
- Substation earthing
- Lightening protection

DAY 2

# Types of Maintenance
- Breakdown
- Inspections
- Periodic
- Major
- Testing

# General Circuit Breaker maintenance: Philosophy & Requirements
- Scope of works
- Competency certified
- Trained staff or certified contractor ensuring maintenance activities are carried out effectively
- Manufacturers manual
- Special tools available on site
- Maintenance spares available on site
- NB Inspection task
- NB Periodic maintenance task
- NB Major overhaul task / nozzle inspection / nozzle replacement
- Slow closing’ philosophy
- Oem (Original Equipment Manufacturer) retrofits?
- CB inherent problems, mechanical adjustments and troubleshooting discussion
- Minimum closing energy philosophy
- Pretension philosophy
- Correct lubrication
- Bushing flange cementation inspection and repair
- Defect management
- Failure analysis

# Circuit Breaker mechanism
- Check list
- Different types: hydraulic/pneumatic/spring/torsion bar etc
- Function / design
- Safety aspect: All energy springs discharged, CB open, CB isolated & earthed
- Mechanical operating theory
- Check CB operation by operating CB at minimum closing energy
- How to determine if closing spring has stretched / deviation
- Self test
Continuation of DAY 2

# Mechanical Operation
- Spring
- Hydraulic
- Pneumatic

# Choosing the correct Circuit Breaker for your application
- Draw up CB specifications before purchase
- Determine which CBs are reliable and maintenance friendly. What to buy

# Maintenance philosophy & planned maintenance program
- Setting maintenance standards
- Maintenance and service schedules
- Data capturing
- System studies

# Circuit Breaker testing
- Contact resistance testing
- Velocity testing
- Timing testing
- Dynamic resistance testing
- Density monitor for correct operation and settings [low gas / inhibit alarms]
- SF6 dew point
- SF6 acidity / impurities
- SF6 content [%]
- Minimum close tension
- Clutch slip if required
- Coil resistances
- Insulation testing
- Mechanical close & trip latch resistance checks
- Oil sampling.

# Training available including evaluation:
- What are the necessary tools, training / skills needed to improve reliability of your HV/MV switchgear.
- Technical training to provide skills required to improving reliability of switchgear. This includes inspection, pmt, mot, breakdowns and specialist level.
- General worker training
- Nozzle replacement

# Condition monitoring
- What is to be monitored???
- How is it to be monitored???

# Thermography / Infrared Scanning

# Corona Phenomena

# Single line diagram interpretation

# HV Aluminum clamp maintenance

End of Workshop

Upcoming Workshop

Electrical Power, Instruments & Control Systems

2 CPD | 14th - 15th September 2017, Johannesburg. RSA

This workshop is designed to update participants with the latest development of Circuit Breakers and to present some of the more common and updated aspects of low, medium and high voltage switchgear maintenance. It must be understood that there is an incredible variety of equipment used on low, medium and high voltage switchgear today. Switchgears play an important role in the distribution and control of electrical power in manufacturing or power plant and in a utility distribution system. Negligent maintenance practices can lead to power system inefficiency and loss of system reliability.
Delegate Attendance information:

Note: Please provide information as you wish it to appear on your name badge and on the official participant database.

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Early Bird Discount
USD1, 500.00*
Register before 25 July 2017

Course Fees
USD2, 000.00*

2-Day Course

Payment Policy

Payment - In order to secure your registration, payment is due in full upon receipt of invoice.

Confirmation - Your registration will not be confirmed until such time as payment is received and may be subject to cancellation.

Right of Admission - Peganix reserves the right to refuse admission to the training course where evidence of full payment cannot be shown.

In-House - Full payment is to be made to Peganix before running an In-House Training

Cancellations & Replacements

A replacement is welcome if you are unable to attend. A full refund less 10% administrative charge will be made for cancellation received 2 weeks before the event. Regrettably, no refund can be made for cancellation received less than 2 weeks before or for “no show” participant. You will however be credited to a future Peganix event. This credit will be available for up to one year from the date of issuance. In the event that Peganix postpones an event, delegate payments at the stipulated date, after which Regular Fee will apply.

Payments are due in full upon receipt of invoice. Any substitutions or alterations will be updated on our web site as soon as possible.

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TERMS & CONDITIONS

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Delegate Cancellations – All delegate cancellations must be received in writing and are subject to the following conditions:

▪ for any cancellations received less than 2 weeks before the start of the training course, the full fee will be payable and no refunds or credit vouchers will be given
▪ if a registered delegate does not cancel and fails to attend the training course, this will be treated as a cancellation and no refund or voucher will be issued

Transfers; Transfer requests must be made in writing 7 days before the start of the event

Pegasa
▪ Please note that speakers and topics were confirmed at the time of publishing, however, circumstances beyond the control of the organizers may necessitate substitutions, alterations or cancellations of the speakers and/or topics.

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