صيانة المحولات الكهربية

MAINTENANCE OF POWER TRANSFORMER

INTRODUCTION:
Installation of high voltage distribution and transmission equipment has increased significantly over the years due to ongoing global demand for power. As a result, the need to ensure the reliability of operation of power systems is paramount.

Power transformers are among the most important and most expensive components of power systems, their failure can impose extraordinarily high costs on plants, factories and utilities of all descriptions.

It is critical that all personnel operating and working with such equipment have a sound knowledge of their operational requirements and maintenance.

This practical workshop provides knowledge on both the theory and operation of Power Transformers. The course will develop and enhance an understanding of what is involved in the maintenance of these essential components of the power systems, through the tips and tricks learnt and developed by some of the World's pre-eminent electrical engineers.

OBJECTIVES:
At the end of this workshop delegates will have gained;
- An understanding of the fundamental theory and principles of the operation of power transformers
- An insight into the identification and application of transformers' types
- An understanding of the power transformers components and their construction
- Knowledge of power transformer protection
- An understanding of power transformers oil and oil tests and interpretation of results
- Knowledge of the most effective power transformer electrical tests
- Skills in how to manage power transformer breakdowns to ensure minimum disruption

WHO SHOULD ATTEND?
- Power System Engineers
- Electrical Engineers
- Consulting Engineers
- Project Engineers
- Power System Technicians
- Electrical Contractors
- Electrical Technicians
- Tradesman Electricians
- Electrical Inspectors
- Utility Engineers

PRE-REQUISITES:
Some basic knowledge of electrical engineering and general knowledge of nature and operation of transformers is required. However participants do not need specific knowledge on transformers and the course will start from the basic theory of transformers.

TIMING:

Course timing is generally 8.00am registration and 8.30am start with 12.30 lunch and finish between 4:30 and 5.00pm. There are also morning and afternoon breaks. These can be varied for on-site presentations.

Duration: 3 days

Registration:
This work shop will be organized in cooperation with our partner in Egypt (El-Sewedy
Automation SAE). So please fill the registration form (in the last page) and send it to:

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CONTENT SUMMARY

REGISTRATION

INTRODUCTION

TRANSFORMERS' MAIN FUNCTIONS AND CLASSIFICATION

- Construction (Shell Type- Core Type…)
- Classification and Type in relation to Insulation, Windings, Core, Cooling Systems, Voltage level, Sizing, Tank, Breathing action,…
- Transformer parts

POWER TRANSFORMERS AND SAFETY

- How to install, operate and work with High Voltage Power Transformers safely.
- Earthing of HV Transformers

TRANSFORMER THEORY

- Electrical values and their definition in a power transformer - Voltage, Current, Number of turns, Impedance and their interrelation)

OPERATION OF POWER TRANSFORMERS IN A POWER SYSTEM

- Thermal performance, loading, paralleling, tap-changing, Connections and Vector groups

POWER TRANSFORMER PROTECTION

- Surge protection
- Protective relaying (Differential, Over-current, Earth fault)
- Buchholz relay, Pressure relief relay…
- Thermal devices and instruments (Oil temperature Alarm and Trip, Winding temperature Alarm and Trip.)

AUTO-TRANSFORMERS

- Design criteria
- Specifications

GENERATOR TRANSFORMERS

- Design criteria
- Specifications

UNIT TRANSFORMERS

- Design criteria
- Specifications

STATION TRANSFORMERS

- Design criteria
- Specifications

POWER TRANSFORMER OIL AND OIL QUALITY

- Oil contents: Water, Acidity, Dissolved gas…
- Oil tests: Dielectric breakdown, Moisture, Resistivity, Interfacial tension, Specific gravity, Power factor, Furan analysis.
- Recovery Voltage Measurement test

POWER TRANSFORMER ELECTRICAL TESTS:

- ac Tests:
- Power factor tests (Insulation, Oil, and Bushings)
- Single Phase Excitation Current Test
- Transformer Turns Ratio Test
- dc Tests:
- dc Tests:
- Insulation Resistance Test
- Dielectric Absorption Test
- Polarisation Index Test
- Step Voltage Test
- Hi-Pot Test

TAPPINGS AND TAP CHANGERS

- Uses of tap changers
- Impedance Variation
- Tap changer mechanisms
- On-load Tap Changing by reactor transition
- Divertor Resistor Tapchangers
    - In Tank Type tap changers
    - Externally mounted tap changers
- Off-circuit Tapchangers
- Construction of tap changers
- Control of on-load tap changers
    - Master/follower control
    - Circulating current control
    - Runaway prevention
- Moving coil regulator
- The Brentford linear regulating transformer
- Preventative maintenance guidelines
- Standards applicable to tap changers C57.131-1995
- Comparison between IEEE and IEC approaches

PRACTICAL SESSION – DESIGN EXERCISE

PREVENTATIVE MAINTENANCE ON POWER TRANSFORMERS

- Techniques to improve life expectancy

SUMMARY & OPEN FORUM

COMPLETE FEEDBACK SHEETS

CLOSING