TECHNICAL REPORT

ON

STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

BY

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1. CHAPTER ONE: SIWES

Introduction

The Student Industrial Work Experience Scheme (SIWES) was established in 1973 by the Industrial Training Fund (ITF) in Nigeria. The program was introduced in response to the growing concern that graduates from higher institutions in engineering and technology fields lacked adequate practical experience and skills required by industries. At that time, many Nigerian students completed their education without exposure to real-world industrial practices, which contributed to a skills gap between academic training and industry requirements.

To address this challenge, SIWES was initiated as a collaborative effort between the Federal Government, higher institutions, and industries. The program aimed to enhance the training of students by providing hands-on experience in industrial settings, allowing them to apply theoretical knowledge in real-world applications. It was initially designed for students in engineering and technology programs but later expanded to include students in science, environmental studies, and other professional courses.

Since its inception, SIWES has become a mandatory requirement for students in various accredited programs in Nigerian universities, polytechnics, and technical colleges. The program is supervised by the ITF, which ensures that students are properly placed in industries where they can gain relevant experience.

Objectives of SIWES

The primary objectives of SIWES are:

1. **Bridge the gap between theory and practice**: SIWES aims to provide students with practical exposure to complement the theoretical knowledge they acquire in classrooms. By working in real-life industrial environments, students can see how concepts learned in school are applied in practice.

2. **Enhance employability**: The program helps students develop essential skills, including technical and soft skills, which are highly valued by employers. Through industrial training, students gain firsthand experience in the workplace making them better prepared for employment after graduation.

3. **Familiarize students with modern technologies and equipment**: SIWES gives students the opportunity to work with advanced tools, machines, and technologies that they may not have access to in school. This exposure ensures that students are up to date with industry standards.

4. **Promote industry-academia collaboration**: The scheme fosters a close relationship between academic institutions and industries, ensuring that students receive relevant training and that academic curricula are aligned with industry needs.

5. **Improve students' problem-solving abilities**: By working in a real industrial environment, students are exposed to challenges and practical problems that require innovative solutions. This helps sharpen their problem-solving and critical-thinking skills.

6. **Prepare students for leadership and teamwork roles**: SIWES promotes collaboration and teamwork, as students often work in teams to achieve project goals. This experience helps build leadership and teamwork skills, essential for career growth.

7. **Provide insights into workplace culture**: The program helps students gain an understanding of professional ethics, workplace culture, and communication, which are vital in any professional setting.

2. CHAPTER TWO: IBEDC BABOKO OJA TUNTUN

IBEDC and its Significance in Nigeria

The Ibadan Electricity Distribution Company (IBEDC) plays a critical role in Nigeria's power sector, providing electricity to several states including Oyo, Ogun, Osun, Kwara, and parts of Niger, Ekiti, and Kogi. As one of the largest of Nigeria’s 11 distribution companies (DISCOs), IBEDC operates within a vital segment of the country's energy value chain, responsible for the final stage of delivering electricity to residential, commercial, and industrial users.

Established in 2013 after the privatization of Nigeria's power sector, IBEDC’s significance lies in its vast coverage area and its impact on the economic and social development of the regions it serves. The company is tasked with the distribution and sale of electricity, as well as maintaining the infrastructure required for power delivery, such as transformers, substations, and distribution lines. By providing power to both urban and rural areas, IBEDC contributes to the growth of small and large businesses, industries, and essential services like health care and education.

In addition to its core distribution services, IBEDC is involved in various initiatives to improve power supply reliability, reduce energy theft, and modernize infrastructure. One of its notable efforts includes the introduction of smart metering to promote accurate billing and enhance energy efficiency. The company also engages in customer service improvement initiatives, such as opening service centers in strategic locations, like Baboko near the Oja Tuntun market in Ilorin, to ensure convenient access for its customers

IBEDC’s success is integral to Nigeria's broader goals of economic growth and sustainable development, as reliable electricity is a key driver of productivity and social well-being.

However, like many distribution companies in the country, IBEDC faces challenges related to power

Generation limitations, infrastructure decay, and customer service issues, all of which it is actively working to address.

IBEDC BABOKO OJA TUNTUN

Ibadan Electricity Distribution Company (IBEDC) is one of the largest electricity distribution companies in Nigeria. It covers a wide geographical area, serving several states, including Oyo, Ogun,Osun,Kwara, and parts of Ekiti, Kogi, and Niger. The company was established following the privatization of the Nigerian power sectorin2013, where the old Power Holding Company of Nigeria (PHCN) was unbundled.

IBEDC's core mandate is to distribute electricity to end-users within its franchise area. It maintains the electrical infrastructure, such as substations and distribution lines, and ensures reliable power supply to both urban and rural areas. The company is also responsible for metering, billing, and customer service, addressing issues related to electricity consumption and complaints. With various service centers and offices, like the Baboko office near Oja Tuntun Market in Ilorin, IBEDC provides customers with easy access to its services

One of the company's major challenges includes the need to modernize aging infrastructure and improve electricity supply reliability. Despite these challenges, IBEDC has been working on customer-centric initiatives such as smart metering and improving response times to outages, aiming to enhance service delivery.

Major departments at IBEDC and their functions

Ibadan Electricity Distribution Company (IBEDC) has several key departments that work together to ensure smooth operations, electricity distribution, and customer satisfaction. Here is a list of major departments and their functions:

1. **Customer Service Department:** This department handles customer inquiries, complaints, and service requests. It is responsible for resolving issues such as billing errors, connection requests, meter installations, and general customer satisfaction. They operate service centers, including the one at Baboko, near Oja Tuntun market
2. **Technical/Operations Department:** The technical team oversees maintaining and upgrading the electrical infrastructure, including transformers, substations, and power lines. They ensure consistent power distribution and handle emergency repairs and maintenance to minimize outages. This department also oversees system upgrades and manages grid expansion projects.
3. **Metering Department:** The metering team focuses on the installation, calibration, and maintenance of electricity meters. This department plays a critical role in the company's effort store duce energy theft by promoting smart meter usage, ensuring that customers are billed accurately for their consumption.
4. **Billing and Revenue Collection Department:** This department is responsible for processing and distributing electricity bills to customers. They also ensure revenue collection from customers and monitor payments to reduce losses from unpaid bills. Collaborating with the metering department, they verify consumption data to generate accurate bills.
5. **Legal and Compliance Department:** The legal team ensures that IBEDC operates in accordance with regulatory standards. They handle legal issues, regulatory compliance, and contracts. This departmental provides guidance on navigating government policies and consumer protection laws.

6. **Human Resources (HR) Department:** HR manages recruitment, employee training, welfare, performance appraisals, and development. They ensure that the workforce is well-trained and motivated to deliver services effectively.
7. **Finance and Accounts Department:** The finance department manages IBEDC's budget, financial planning, and financial records. They handle transactions, auditing, and investments while ensuring that the company's financial goals align with its overall strategy.
8. **Corporate Communications and Marketing Department:** This department manages the company's public image and customer outreach efforts. It handles median relations, public announcements, and promotional campaigns aimed at enhancing the company's reputation. They also manage communication during emergencies or outages to keep the public informed.
9. **Procurement and Supply Chain Department:** The procurement team handles the purchase of equipment, tools, and materials needed for the company's operations. They are responsible for sourcing reliable suppliers and ensuring that all purchases meet the technical and financial requirements of IBEDC.
10. **Audit and Risk Management Department:** This department oversees internal audits to ensure that all financial transactions and operational processes comply with internal and external standards. They also assess risks and work to mitigate any potential threat sto the company's operations or reputation.

ORGANIZATIONAL STRUCTURE

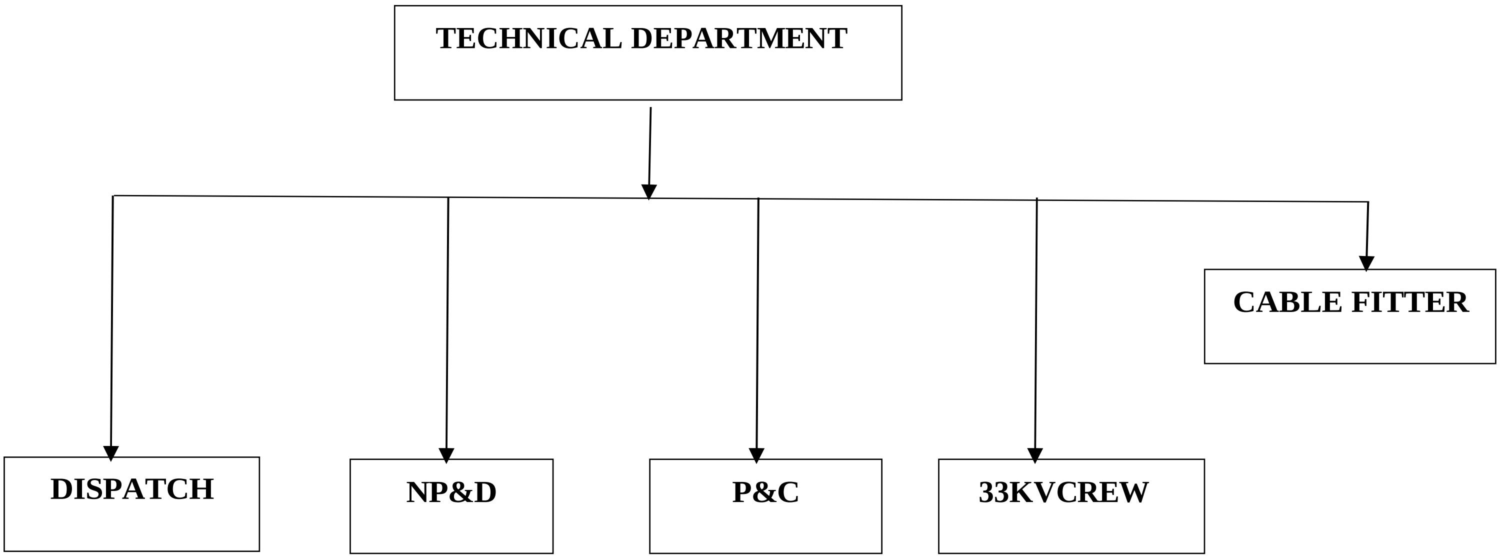

Figure2.1: Company's Organogram

3. CHAPTER THREE :ACTUAL WORKDONE

During my SIWES program, I was privileged to work in five different units in operation departments which are listed below:

Departments worked in

During my SIWES placement at IBEDC, I was assigned to various sections within the Operations Department, where I gained practical experience in several key areas:

1. Despatch Department

I assisted in the timely delivery of essential materials, documents, and equipment across different departments. My duties included tracking and organizing deliveries, ensuring that the correct items reached their destinations promptly, and updating records of dispatched items. This experience gave me insights into the logistical coordination needed for operational efficiency within IBEDC.

2. Filter & Cable Jointer Department

In the Filter& Cable Jointer section, I participated in maintaining and repairing underground cables. The tasks I took part in included observing and assisting in cable splicing, insulation testing, and high-tension cable jointing. I learned techniques for preparing and sealing cables and followed stringent safety protocols while working around live cables. I also assisted in filtering operations that helped keep electrical equipment free from contaminants, which is vital for maintaining system reliability.

3. Protection, Control & Maintenance Department

In this department, I was involved in routine inspections and preventive maintenance on control systems, protection relays, transformers and circuit breakers. I assisted in testing and calibrating control equipment, observing the configuration of protection devices to ensure they responded accurately to faults. This experience deepened my understanding of electrical network protection and highlighted the importance of these systems in preventing equipment damage and ensuring safety.

4. Network Planning & Drawing Department

My time in the Network Planning& Drawing section involved supporting the creation and updating of network blueprints for new installations. I took part in preparation of electrical network maps and forecasts of future demand, which were essential for network expansion planning. I also reviewed designs for proposed substations and distribution lines, gaining valuable insights into the electrical grid's layout.

5. Line Fault Clearing Section (33KVCREW)

Working with the 33KV crew, I participated in diagnosing and clearing faults in high-voltage power lines. I assisted in identifying fault locations, replacing faulty insulators, and resetting tripped breakers. Through this, I learned the critical importance of safety protocols, including using personal protective equipment (PPE) when working on high-voltage lines, and saw first hand how swift fault resolution helps maintain uninterrupted power supply.

This experience across various sections of the Operations Department provided me with practical knowledge of electrical distribution systems and their maintenance, equipping me with skills essential for a future career in the power sector.

IBEDC
Baboko Business Hub,
P.M.B 1426
Ilorin,
Kwara State.
Date:- 26/4/2024

Ref No.: IBEDC/BHTE/BBK/510/2024
ABDULAZEEZ AYOMIDE ONIKOKO

TRAINING SCHEDULE FOR SIX MONTHS

S/NO	SECTION	PERIOD	SUPERVISOR	STATION
1	DISPATCH	25 MARCH – 25 APRIL	DISPATCH SUPERVISOR	BABOKO BUSINESS HUB
2	FILTER & CABLE JOINTER	26 APRIL – 25 MAY	HOD	BABOKO BUSINESS HUB
3	PROTECTION & CONTROL (P & C)	26 MAY – 25 JUNE	HOD	BABOKO BUSINESS HUB
4	NETWORK PLANNING AND DRAWING	26 JUNE – 25 JULY	HOD	BABOKO BUSINESS HUB
5	33KV CREW (Line fault clearing section)	26 JULY – 12 AUGUST	LINE SUPERVISOR	BABOKO BUSINESS HUB
6	CONTROL ROOMS SAWMILL ISS ADETA ISS OKOLOWO ISS SOBI ISS HARMONY ISS POLY ISS	13 AUGUST – 02 SEPTEMBER		

Above is for your Training Programme, please report to the Sectional Head of each section as you resume duty for further instructions.

ENGR. MUSA ISIAKA
Technical Engineer
Baboko Business Hub, Ilorin

Figure3.1: Department posted at

Despatch Department

In this department, I learnt the process of distribution of electricity to various injection substation the process will be explained below:

The process of electricity distribution to various injection substations begins at the generation stations and follows through transmission and finally distribution. Here’s a detailed breakdown of the process:

Electricity Generation

Electricity is produced at power plants (generation stations) using various energy sources, such as hydro, gas, coal, solar, and wind. These plants generate power at relatively low voltages, usually between 11kV and 25kV.

Step-Up Transformation

To minimize energy loss over long distances, the voltage generated at the power plant is "stepped up" to a much higher voltage, typically ranging from 132kV to 330kV, by transformers located at the generation station’s switchyard. High-voltage transmission reduces resistive losses as the electricity travels across long distances.

Transmission to Grid Substations

The high-voltage electricity is then transmitted through transmission lines to grid substations or "grid injection substations," which are located closer to the demand centers. These transmission substations act as nodes within the power network and play a crucial role in directing and managing power flow across the network. The primary purpose of these substations is to step down the voltage to levels suitable for distribution.

Step-Down Transformation at Injection Substations

Upon reaching grid substations, the electricity voltage is reduced or" stepped down" to a medium voltage, typically between 33kV and 11kV. Injection substations are part of the distribution network and receive power from the main grid at medium voltage. They serve as a critical link between high-voltage transmission and lower-voltage distribution suitable for direct use by consumers.

Distribution to Injection Substations

From the grid substations, the 33kV or 11kVelectricity is sent to different injection substations located in various regions or neighbor hoods. Each injection substation caters to a particular geographical area and further steps down the voltage if necessary (usually from 33kV to 11kV or from 11kVto 415V). These substations are responsible for distributing power efficiently to various locations in their service areas.

Step-Down for Local Distribution

Injection substations then distribute the medium-voltage electricity to feeder lines, which supply power to distribution transformers mounted on poles or placed in local substations within neighbor hoods. These transformers step down the voltage from 11kV (or sometimes from 33kV) to the standard consumer level of 415V for three-phase connections or 230V for single-phase connections.

Delivery to End Users

After final voltage reduction, the electricity is ready for local distribution. Feeder lines from distribution transformers carry the electricity directly to homes, businesses, and industries at a safe and usable voltage level.

Additional Control Measures

Throughout this process, control centres monitor the flow and distribution of electricity using real-time data from sensors and communication networks. This helps operators manage load, prevent over loads, and respond to any faults or outages promptly to ensure reliable supply.

This multi-step process ensures that electricity is transmitted over long distances efficiently and distributed to meet the specific voltage needs of different users, from residential homes to large industries.

Filter & Cable Jointer Department

In the Filter & Cable Jointer Department of a power distribution company like IBEDC, various specialized activities are carried out to maintain the underground cable network and ensure the consistent, safe delivery of electricity. Here's a detailed overview of the tasks and procedures typically undertaken:

Cable Jointing and Termination

i. **Cable Jointing:** This involves connecting two cable ends, which may be necessary due to cable repairs, extensions, or network expansion. As part of this, the damage do rold cable sections are cut, prepared, and joined using heat-shrink sleeves or re sink its, depending on the type and voltage of the cables. These joints are thoroughly insulated to prevent moisture ingress and ensure safety.

ii. **Cable Termination:** The process also includes terminating cables, which involves securely attaching cable ends to equipment such as transformers, switchgear, or distribution boards. Proper terminations are essential to prevent cable movement and ensure a reliable electrical connection.

Cable Splicing and Insulation Testing

i. **Splicing:** Splicing is a critical part of the department’s work, where the conductors of two cables are connected in away that minimizes resistance and ensures conductivity. Different techniques are used depending on the voltage and cable type, such as mechanical, heat-shrink, or resin-based splicing.

ii. **Insulation Testing:** Testing insulation resistance ensures that cables are properly insulated, reducing the likelihood of faults. High-voltage insulation tests measure resistance and identify any weak points in the cable insulation, which could lead to breakdowns or electrical shorts.

Preventive and Corrective Maintenance

The department conducts both preventive and corrective maintenance on underground cables. Preventive maintenance includes scheduled inspections to check for signs of wear or environmental damage, like moisture penetration, that could degrade cables over time. Corrective maintenance involves repairs to cables that have been damaged due to environmental factors, construction work, or other incidents.

Cable Filtering and Moisture Control

One unique task is cable filtering, which involves using devices to remove impurities from systems, particularly in substations, where dust and contaminants can affect the performance of transformers, switchgear, and other equipment. Additionally, desiccants and other moisture control methods are used around cable joints and terminations to prevent water ingress, which can corrode connections and compromise insulation.

Testing and Quality Control

After repairs or new installations, the department performs voltage withstand tests to verify that the cable joints and terminations can handle operational voltages without breakdown. Testing procedures ensure that joints, splices, and terminations are secure, withstanding the load they'll carry during regular operation. This quality control is essential for reducing power interruptions and extending the lifespan of the cable infrastructure.

Safety and Compliance

Given the high voltages involved, strict safety procedures are followed. Proper grounding, PPE use, and isolation protocols are enforced. The team adheres to regulatory standards for installation, repair, and testing to prevent accidents and maintain network reliability.

The Protection, Control & Maintenance Department

The Protection, Control& Maintenance Department plays a crucial role in the safe, efficient operation of an electrical distribution network. This department is responsible for protecting equipment, controlling electrical flow, and ensuring the reliability of the power system through rigorous maintenance. Here’s a detailed look at each of their main activities:

Protection System Design and Implementation

This department designs and implements protection systems to detect and isolate faults, preventing damage to equipment and minimizing power outages. Protection systems include relays, circuit breakers, and fuses that respond to electrical faults like short circuits or overloading.

Protection Relays: These devices monitor electrical parameters (e.g., current, voltage) and signal circuit breakers to trip if they detect anomalies. Different types of relays such as over current, differential, and distance relays are set up based on the needs of the system and the type of equipment they protect.

Control Systems and Automation

The control systems manage the operation of electrical equipment, allowing operators to monitor and control network performance. Automation is integrated to enhance system reliability and provide remote control and real-time monitoring of the grid. SCADA (Supervisory Control and Data Acquisition) systems are commonly used for remote operation, allowing the control centre to manage substations and monitor the distribution network.

Automated Switching: Through automated control, this department can remotely operate circuit breakers and switches to restore power after a fault, reducing the need for on-site intervention and speeding up recovery.

Routine Testing and Calibration

The department conducts routine testing and calibration of protection and control equipment to ensure proper functionality. This includes testing relays, circuit breakers, and transformers to verify they respond accurately and within set limits. Secondary injection testing of relays, for example, involves injecting simulated fault signals to check that the relay trips as expected.

Calibration of Equipment: Calibrating devices ensures they perform accurately under operational conditions, which is crucial for maintaining precise control over current and voltage levels. Testing can involve functional tests, insulation resistance testing, and timing checks for circuit breakers to ensure reliability during actual faults.

Preventive and Corrective Maintenance

This department carries out both preventive and corrective maintenance on all protective and control devices to extend their operation all if e and prevent unexpected failures. Preventive

Maintenance involves scheduled inspections and minor repairs, like cleaning contacts, tightening connections, and replacing worn components before they fail.

Corrective Maintenance: In the case of faults or equipment failures, the department conducts corrective maintenance to identify the cause of the issue, repair or replace faulty components, and restore normal operation. This process often includes troubleshooting, parts replacement, and retesting of equipment to verify repairs.

Performing preventive maintenance on a 100kV A transformer

Performing preventive maintenance on a 100kVA transformer is essential for extending its operational life, maintaining efficiency, and ensuring safety. Here is a detailed breakdown of the preventive maintenance process for a 100kVA transformer, covering inspection, testing, and servicing tasks:

1. Visual Inspection

i. **Oil Levels:** Check the oil level in the transformer's conservator tank, which helps with cooling and insulation. Low oil levels can indicate leaks, so inspecting for any visible oil leaks is crucial. If oil levels are low, topping up with compatible insulating oil may be required.

ii. **Physical Condition:** Inspect the transformer housing, bushings, and surrounding area for signs of corrosion, wear, or damage. Bushings should be clean and free from cracks, which could lead to flashovers. Rust or corrosion on the metal parts should be treated and painted to prevent further degradation.

iii. **Cooling System:** Check the radiator fins, cooling fans, and pumps for any obstructions or damage. Ensure that all fans and pumps are operational, as they prevent the transformer from overheating.

2. Oil Testing

Dielectric Strength Test: This test measures the insulating capability of the transformer oil. Using a dielectric test kit, oil samples are tested to ensure they can withstand high voltage without breaking down. Decreased dielectric strength indicates contamination or aging, and oil replacement or filtration may be necessary.

i. **Dissolved Gas Analysis (DGA):** DGA is performed on the transformer oil to detect gases dissolved within it. Gases like hydrogen, methane, and ethylene may indicate internal faults, such as overheating or arcing. Regular DGA monitoring helps identify potential issues before they lead to failure.

ii. **Moisture Content:** High moisture level scan reduce insulation strength, so a moisture test is performed. If moisture is found to be above recommended levels, oil dehydration or replacement may be required to maintain insulation quality.

3. Electrical Testing

i. **Insulation Resistance Test:** Using a Meg ohmmeter, an insulation resistance test checks the condition of the transformer winding insulation. High insulation resistance indicates good insulation, while low resistance can signal insulation breakdown.

ii. **Turns Ratio Test:** This test checks the turn’s ratio of primary to secondary windings to verify the transformer's winding ratio. Any deviation from the specified ratio could indicate internal winding issues.

iii. **Winding Resistance Test:** The winding resistance of primary and secondary windings is measured. Consistency in resistance values helps confirm the integrity of the windings. Changes in resistance can indicate issues like loose connections or winding deformation.

4. Thermal Scanning

Infrared (IR) Scanning: Thermal imaging is used to detect hotspots on the transformer's surface, bushings, and connections. Any unusual temperature readings can indicate poor connections, overloading, or insulation issues. Thermal scanning is crucial for identifying potential points of failure.

5. Bushing Inspection and Cleaning

i. **Physical Inspection of Bushings:** Check the bushings for any cracks, chips, or signs of tracking. These defects can lead to electrical discharge and should be repaired or replaced.

ii. **Cleaning:** Bushings accumulate dirt and dust, which can lead to reduced insulation effectiveness. Cleaning the bushings with a lint-free cloth or a recommended cleaning solution ensures they maintain their insulating properties.

6. Tap Changer Maintenance

i. **Inspecting and Servicing Tap Changer:** Tap changers allow voltage adjustments based on load requirements and are prone to wear due to frequent operation. Inspect the tap changer mechanism for wear, clean contacts, and replace any worn parts if necessary.

ii. **Contact Resistance Measurement:** Measuring contact resistance helps assess the condition of the tap changer. Increased resistance may indicate dirty or worn contacts, which can lead to arcing or overheating.

7. Grounding System Check

i. **Ground Connection Inspection:** Verify that the grounding connections are intact and secure. The ground system protects against faults, and a poor ground connection can compromise the transformer's safety and protection.

ii. **Earth Resistance Test:** Conduct an earth resistance test to ensure that the grounding resistance is within acceptable limits. Poor grounding can increase the risk of lightning damage and faults.

8. Cooling System Maintenance

i. **Inspection of Cooling Fans and Radiators:** Cooling fans and radiators should be inspected for debris and obstructions. Clean any dust or dirt accumulation that could restrict airflow.

ii. **Fan Operation Check:** Confirm that all cooling fans operate correctly by testing their on/off controls and thermometers. Cooling is essential to prevent the transformer from overheating during peak loads.

9. Load Analysis and Monitoring

Load Recording and Analysis: Review the transformer's historical load data and compare it with the transformer's rating. Overloading can shorten the transformer's lifespan, so monitoring load patterns is essential for preventive maintenance.

Thermal Performance Review: Evaluate the transformer's temperature performance under load. Unusual temperatures during typical load conditions can indicate inefficiencies or issues with cooling mechanisms.

10. Documentation and Record Keeping

After completing the preventive maintenance tasks, all test results, measurements, and observations are documented. This record is essential for tracking the transformer's performance over time and for identifying trends that could indicate future issues.

Report Generation: A maintenance report is created, which includes details of all tests, repairs, and replacements performed. This report serves as a reference for future maintenance and helps in planning any necessary corrective actions.

These preventive maintenance steps are vital for ensuring that a 100kVA transformer operates reliably, safely, and efficiently. Regular maintenance reduces downtime and the likelihood of unexpected transformer failures, enhancing the overall stability of the power distribution network.

Fault Analysis and Reporting

Following an electrical fault, the department conducts a fault analysis to identify the cause, location, and extent of the issue. This involves reviewing relay records, analyzing breaker operations, and using fault indicators to pinpoint the affected sections. They document their findings and generate a report outlining the cause, effects, and corrective actions taken.

Post-fault Reporting: The department creates detailed reports on each fault event to improve future responses and refine protection settings. This data is used to adjust relay settings, improve maintenance schedules, and enhance system protection schemes.

System Upgrades and Modernization

With technological advances, the department also oversees system upgrades to enhance the network's efficiency and reliability. This includes upgrading traditional relays with digital protective relays, incorporating smart sensors, and enhancing SCADA systems. Such upgrades improve real-time monitoring, diagnostics, and automation, supporting faster response to faults.

Safety and Compliance

In every task, this department follows strict safety and regulatory compliance standards to ensure safe working conditions and meet government and industry standards. Compliance checks, safety drills, and training programs are regularly conducted for team members to mitigate risks.

Network Planning and Drawing Department

During my time with the Network Planning and Drawing Department for the placement of a new transformer, the site visit process involved several key steps to gather geographical details and evaluate the site's suitability. Here's a breakdown of the general process involved in planning for a new transformer placement:

Site Survey and Initial Assessment

The team began by assessing the designated area for the transformer, checking for adequate space to accommodate the transformer and its related infrastructure. This included measuring distances from other structures, roads, and vegetation to meet safety regulations.

The site survey also involved inspecting the terrain and environmental conditions, which could affect the transformer's installation and long-term performance.

Geographical Data Collection

Mapping and Topography: Geographical coordinates and elevations were recorded using GPS tools or mapping software. Understanding the topography helps in planning for drainage, foundation stability, and determining if additional grading is required.

Accessibility Analysis: Ensuring proper access for maintenance vehicles and personnel was essential. The team likely mapped out pathways or existing roads to verify that transport of equipment and maintenance access would be feasible in the long term.

Load Analysis and Demand Forecasting

The department team considered the power demand for the area to ensure that the transformer would be appropriately sized for current and anticipated future needs. They may have checked nearby facilities or residential areas to gauge load requirements, working closely with the design team to determine if additional capacity would be needed in the future.

Environmental and Safety Considerations

Assessing the environmental factors, such as distance from water sources or vegetation, helped ensure compliance with safety standards to mitigate risks of electrical hazards, fire, and potential environmental impact.

Clearances were checked to ensure compliance with regulatory standards, and if required, protective measures (e.g., fencing, grounding, and lightning arresters) were planned to secure the site against potential hazards.

Drafting Site Plans and Network Mapping

The team would document findings, create a preliminary layout for the transformer location, and map it within the existing distribution network. Using CAD (Computer-Aided Design) tools, they developed drawings that integrated the transformer placement into the current electrical infrastructure, including connections to nearby substations and feeder lines.

Documentation and Reporting

Finally, a detailed report summarizing all geographical and technical data was prepared, including site maps, demand analysis, environmental assessments, and recommendations. This report provided the basis for finalizing the transformer placement and ensuring all necessary approvals and regulatory compliance.

In the Line Fault Clearing Section (33KVCrew)

In the Line Fault Clearing Section (33KVCrew), the primary focus is on identifying, diagnosing, and clearing faults in Sobi 33kV distribution lines, which are crucial for maintaining a stable power supply. Working in this section involves highly skilled tasks aimed at restoring power swiftly and ensuring the safety and reliability of the electrical distribution network. Here's a detailed breakdown of the tasks typically performed:

Fault Detection and Isolation

i. **Initial Fault Location:** When a fault occurs, it's often identified through automated systems or SCADA (Supervisory Control and Data Acquisition), which alerts the crew to a specific line section affected. The 33KV crew uses specialized fault-detection devices, such as fault locators, to pinpoint the exact location of the issue.

ii. **Isolation of Faulty Sections:** Once the fault is located, the team isolates the affected section by opening circuit breakers and disconnect switches. This step ensures the safety of the crew members working on repairs and prevents potential damage to other parts of the network.

Visual Inspection and Physical Assessment

i. **Ground Patrol:** A visual inspection, often known as a line patrol, is carried out along the faulted section to look for visible damage like broken conductors, fallen trees, or equipment damage caused by weather or external factors.

ii. **Equipment Inspection:** The crew inspects components such as insulators, cross-arms, conductors, and surge arresters to identify wear, cracks, or damage. They may use binoculars, thermal imaging cameras, or even drones to inspect hard-to-reach areas.

Repair and Replacement of Damaged Components

i. **Replacing Damaged Conductors and Insulators**: If conductors or insulators are damaged, the crew replaces them to restore functionality. This process may involve restringing lines, replacing insulators, or repairing cross-arms.

ii. **Clearing Vegetation:** Often, faults on 33kV lines occur due to trees or branches encountering the lines, especially during storms. The crew trims or removes trees and vegetation within the line corridor to prevent future faults.

Testing and Re-Energizing the Line

i. **Insulation and Ground Testing:** Before re-energizing the line, the crew conducts insulation resistance tests to ensure the integrity of repaired components and uses ground testers to verify grounding effectiveness.

ii. **Gradual Energizing and Monitoring:** Once the repairs are complete, the line is re-energized in stages, allowing the crew to monitor the current flow and voltage levels. Any irregularities observed at this stage may require additional checks or adjustments.

Preventive Measures and Documentation

i. **Installation of Fault Indicators:** To improve future response times, fault indicators or sensors are sometimes installed along the line to help with faster fault detection and isolation.

ii. **Reporting and Documentation:** A detailed report is prepared on each fault, including the cause, the repairs conducted, and recommendations for preventing similar faults in the future. This documentation helps with future troubles hooting and maintenance scheduling.

Safety Measures

Working in the 33KV section involves high-voltage risk, so strict adherence to safety protocols is essential. The team uses personal protective equipment (PPE) like insulated gloves, helmets, and safety harnesses, and they follow lockout-tag out (LOTO) procedures to ensure safety during the repair process.

4. CHAPTERFOUR:EQUIPMENTUSED

Here is a list of common instruments and tools used across various departments in electrical utility operations like the Despatch Department, Filter & Cable Jointer Department, Protection, Control &Maintenance Department, Network Planning & Drawing Department, and Line Fault Clearing Section (33KVCrew). Each tool has its specific role to ensure the safe, efficient operation and maintenance of the power distribution network.

Despatch Department

SCADA (Supervisory Control and Data Acquisition): Used to monitor and control substations and power lines remotely .It allows dispatchers to oversee the network status, open/close breakers, and detect faults.

Distribution Management System (DMS): Helps manage load dispatching, analyse network performance, and respond to distribution network events.

Filter & Cable Jointer Department

1. **Cable Crimping Tools:** Used for connecting cables securely by compressing cable connectors onto wires, providing a durable, stable connection.
2. **Insulation Resistance Tester:** Measures the insulation resistance of cables, checking for insulation breakdown which could lead to faults.
3. **Cable Jointing Kits:** These kits contain materials such as insulating tape, heat shrink tubing, and connectors required to splice cables safely and ensure high-quality joints.
4. **Cable Sheath Testers:** Used to test for damage or faults in the outer sheath of cables, helping ensure the cable's integrity and insulation quality.

Figure4.2:Cable crimping tool

Figure4.3:Insulation Resistance tester

Figure4.1:Cablesheattester

Protection, Control & Maintenance Department

1. **Dielectric Test Kit:** Used to measure the dielectric strength of transformer oil, assessing its ability to insulate and prevent internal arcing.
2. **Relay Test Set:** Used for testing protection relays by simulating fault conditions, verifying their response to anomalies in the network.
3. **Meg ohmmeter (Insulation Tester):** Checks insulation resistance in transformers and cables, preventing faults caused by insulation failure.
4. **Thermal Imaging Camera:** Detects hotspots in equipment like transformers, breakers, and bus bars, revealing areas that might be overheating or damaged.
5. **Digital Multi meter:** Measures electrical parameters such as voltage, current, and resistance, crucial for troubleshooting and testing equipment.
6. **Earth Resistance Tester:** Verifies grounding effectiveness in equipment, ensuring safe discharge of fault currents to ground.

Figure4.6:Dielectric Test Kit

Figure4.5:Relay Test Set

Figure 4.4: Thermal Imaging Camera

Network Planning & Drawing Department

1. **Global Positioning System (GPS):** Used to accurately mark geographical coordinates during site surveys for new installations.
2. **Total Station or Theodolite:** Instruments used to measure distances, angles, and elevations during land surveying, aiding in accurate mapping of the installation site.
3. **Mapping Software (GIS - Geographic Information System):** Aids in creating detailed maps for planning transformer locations and plotting network infrastructure.
4. **Laser Range Finder:** Measures distances and elevations, helpful in designing line routes and placing equipment like transformers.
5. **Computer-Aided Design (CAD) Software**: Software like AutoCAD is used to design and model layouts of the electrical network, ensuring precise measurements and planning.

Figure4.8:Total Station or Theodolite

Figure4.7: Laser Range Finder

Line Fault Clearing Section (33KVCrew)

1. **Fault Locator:** Locates faults in transmission lines by measuring the distance to the fault, helping the crew quickly pinpoint issues.
2. **Line Tester:** Detects live currents in cables and lines, ensuring the line is de-energized before maintenance.
3. **Infrared Thermometer:** Measures temperatures on cables and connectors from a distance, detecting overheating that could indicate faults.
4. **Line Insulator Tester:** Checks the integrity of line insulators to detect cracks or deterioration, ensuring the line remains safely insulated.
5. **Voltage Detector:** Checks for the presence of voltage in lines and equipment, confirming de-energization for safe maintenance.
6. **Hot Sticks (Insulating Poles):** Allows crew members to work on high-voltage lines safely, maintaining a safe distance while performing tasks such as disconnecting or grounding.

Figure4.10: Fault Locator

Figure4.11: Line Tester

Figure4.9: Infrared Thermometer

Figure4.12: Hot Sticks (Insulating Poles)

5. CHAPTER FIVE: CONCLUSION

Conclusion

In conclusion, my Industrial Training at the Ibadan Electricity Distribution Company (IBEDC) has been an invaluable experience, enriching my understanding of the operations and complexities involved in electrical distribution and maintenance. Working in various departments, including the Network Planning and Drawing Department, Line Fault Clearing Section, and Filter& Cable Jointer Department, I gained practical insights into critical processes such as fault detection, cable jointing, and transformer maintenance.

Through hands-on involvement with specialized instruments and tools, I learned the importance of meticulous planning, safety protocols, and teamwork in ensuring a reliable power supply to consumers. The emphasis on preventive maintenance practices has highlighted the significance of proactive measures in minimizing downtime and enhancing system efficiency.

This training not only solidified my technical skills but also fostered my problem-solving abilities in real-world situations, preparing me for future challenges in the electrical engineering field. I am grateful for the guidance and mentorship received from experienced professionals at IBEDC, which has greatly contributed to my professional growth and understanding of the energy sector in Nigeria.

Moving forward, I am excited to apply the knowledge and skills acquired during this experience to my academic pursuits and future career, with a renewed commitment to contributing to the advancement of sustainable energy solutions.

Problem Faced During SIWES Program

Some of the problems experienced during the SIWES program. These areas stated below.

1. A brief orientation before the program begins.

2. Becauseaplacementletterwasdelayed,itisalsodifficulttosecureaplacement.

3. Because of the excessively large workload, engineers were unable to emphasize the significance of work completed on the equipment and how it connects to theoretical understanding, collected.

Recommendations

Based on the experience and knowledge acquired at the course of the SIWES training, I hereby give the following recommendation based on my observations.

1. Proper orientation should be given to the students by the university before they go on SIWES at least before mid-semester break of first semester.
2. The placement letter should be given to students early enough to avoid attachment in an irrelevant organization.
3. Students should avoid prioritizing money over work and experience and should develop a good attitude, good work ethics and be a good ambassador of the university they are representing.
4. Institutions and ITF should ensure that students are attached to relevant establishments for effective training, experience and exposure related to their course of study in the university.