STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME(SIWES)

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SUBMITTED TO

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IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

NATIONAl DIPLOMA

CERTIFICATION

I, ADEMUYIWA, LOLADE KOREDE with Matric No 0050, of the department of Mechanical Engineering, KWARA STATE POLYTHECNIC ILORIN(KWARA POLY) confirm that this Student Industrial Work Experience Scheme (SIWES) report was independently put together by me from the successful conclusion of

my Industrial Training carried out at Avon Crowncaps and Containers Nigeria Limited during the academic year 2024/2025 in accordance to the statutory requirements of the Students? Industrial Work Experience Scheme (SIWES) as a summary of my experience and knowledge gained during the period of my training (5th August, 2024 ? 29th Novembwr, 2024).

Signature: Date: .

ADEMUYIWA.Lolade korede(Student)

Signature: Date:

DEDICATION

All glory goes first to The Almighty God, the Beneficent, the Merciful, the giver of joy, strength, good health, and wisdom, who gave me the grace, strength and wisdom to successfully find a place, start and successfully complete my SIWES.

In addition, I dedicate this report to my beloved parents, Mr and Mrs. ADEMUYIWA and siblings for their emotional, financial and spiritual support.

ACKNOWLEDGEMENT

I appreciate God Almighty for the conclusion of my industrial training without hitches.

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enough, God bless you and I love you.

I appreciate and acknowledge the entire staff of Avon Crowncaps and Containers Nigera Limited, Sango Ota, Ogun State and my industrial based supervisor, Engr. A Adeshina

Finally, I appreciate my lecturers in Mechanical engineering, KWARA STATE POLYTHECNIC ILORIN who taught me the theoretical background I needed before I embarked on my industrial training.

ABSTRACT

The introduction of the Student Industrial Work Experience Scheme into the syllabus of Higher Institutional students studying science, technology and engineering related courses by the Federal Government was done to enable them gain necessary practical knowledge that will prepare them for work in the industry.

This technical report summarizes the experience I acquired during my Industrial Training (IT) as part of my participation in the Student Industrial Work Experience Scheme (SIWES) at Avon Crowncaps and Containers Nigera Limited, Sango Ota, Ogun State.

I worked with Avon Crowncaps and Containers Nigera Limited, Sango Ota, Ogun state during the 16 weeks spent working in the company.

Finally, I would like to declare that my SIWES training was a huge success as it amplified my understanding of basic Mechanical Engineering principles and the experience made me not just a better engineering student but broaden my knowledge in other career paths.

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CHAPTER ONE

INTRODUCTION TO SIWES

The Students Industrial Work Experience Scheme (SIWES) started in 1973/1974 by the Industrial Training Fund (ITF) with about 748 students from 11 institutions of higher learning. This became very necessary when it was discovered that theoretical knowledge alone would not usually prepare an educated person for the world of work. Therefore, the need to set up a scheme to train students (particularly for those pursuing careers in sciences, engineering and technology discipline SET) not only to be knowledgeable in their fields but to be able to apply the acquired knowledge and skills to perform defined jobs on work. There is a demand for a new cadre of workers having a range of skills across related disciplines and not theoretical experts in a single discipline. Such a wide range of skills, as being demanded by the world of work today, cannot be readily acquired through theoretical training alone but in combination with training. By 1978, the scope participation in the scheme had increased to about 5,000 students from 32 institutions.

The Students Industrial Work Experience Scheme (SIWES) is a skill training program designed to prepare and expose students of the university to the industrial work situation they are likely to meet after graduation. The need for the establishment of the scheme arose when there was a growing concern among industrialists that graduates of institutions of higher learning lacked adequate practical background required for employment in the industries.

The student industrial work experience scheme has contributed immensely to the building of the common pool of technical and allied skills available to the Nigeria economy which are needed for the nation?s

industrial development. These contributions and achievements have been possible because of regular innovations and improvement in the modalities employed for the management of the scheme. SIWES forms part of the approved minimum academic standard in the various degree programs for all the Nigerian Universities. It serves as an effort to bridge the gap existing between theoretical knowledge obtained during lectures with the actual industrial conditions.

The Scope of SIWES (Industrial Training)

As a student, we all are facing one common problem which is a lack of practical knowledge. This is one of the major issues of unemployment in the country after graduation or post-graduation. As a result of this, students face depression and family pressure which leads to mental stress. However, industrial training equips students to overcome this difficulty.

Recently, many companies and institutes provide Industrial Training to help students to acquire practical knowledge of industries current scenario. After undergoing industrial training students are enhanced for job opportunities and career options.

It is essential for students to choose the right industrial training module which is in accordance with their career options.

Industrial work experience nowadays is considered as a prerequisite by numerous organizations for their hiring process.

Industrial work experience is nowadays considered as a prerequisite by numerous organizations for their hiring process. The industrial training period is used by the employers as an opportunity to assess the new

trainees for future recruitment in the company.

Industrial training is vital for the aspirant as it provides him an opportunity to evaluate the organization and its work atmosphere.

1.1.1 Outcomes of Industrial Training

Capability to acquire and apply fundamental principles

Become updated with all the latest changes in the technological world.

Ability to communicate efficiently

Ability to recognize frame and model problems and find engineering solutions based on a system approach.

Capability and Enthusiasm for elf-improvement through the continuous professional development and life-long learning.

1.2 Aims and Objective of SIWES/I. T

Main aims and objectives of industrial training;

To provide students with industrial skills and needed experience with the course of study.

To create conditions and circumstances which can be as close as possible to the actual workflow.

To prepare specialists who will be ready for any working situations immediately after graduation.

To teach students the techniques and methods of working with facilities and equipment that may not be available within the walls of educational institutions.

To give students the ability to try and apply the given knowledge.

The objective of SIWES/IT. The program is about strengthening the future employees.

1.3 Place of Training

I was privileged to have my industrial training at Avon Crown caps and Containers Nigeria Limited Sango Ota, Ogun State. I trained in the Mechanical/Maintenance department. I started by learning various Automobile tools and their usefulness. The report is based on what I have learnt so far in the organization.

During my internship at Avon, I had the privilege of immersing myself in a focused and enriching learning experience centered on Mechanical Engineering (Forklifts, Compressor and Generator Maintenance). The company's commitment to my excellence and innovation was evident as I delved into a curriculum designed to equip individuals with the skills and knowledge crucial in the realm of Automobile Repairing. Under the guidance of industry-experienced instructors and supervisors, the internship provided a unique opportunity to learn and put into practices what we?ve learnt in school. The hands-on approach allowed me to not only grasp theoretical concepts but also actively apply them to real-world projects. The curriculum, tailored to reflect the dynamic nature of the industry, ensured that I acquired proficiency in the latest and best tools. Beyond the technical aspects, Avon fostered a collaborative and supportive community among interns. Networking events and interactions with professionals in the field enriched my understanding and allowed me

to build valuable connections.

The internship at Avon Crown caps and Containers was more than just a learning experience; it was a transformative journey that prepared me to diagnose the common problems and fault in forklifts, generators and compressors and to repair the faults with confidence and competence. Avon stands as a testament to its dedication to shaping future mechanical engineer professionals.

1.4 Brief History and Background of Avon Crown caps and Containers Nigeria Limited

Avon Crown caps and Containers (Nigeria) Limited is Nigeria?s leading manufacturer of metal packaging products ? a one stop shop for all your metal packaging requirements.

Avon manufactures crown caps, screw caps, metal containers which are used for packaging of baby foods, milk powder, beverages, insecticides, chemicals and agro based products. Avon is also a leading supplier of tinlets for packing ointments, balms etc, pilfer proof caps used in the pharmaceutical industry and metal drums used by the oil and lubricants industry.

Avon commenced commercial operations in 1981 at its state-of-the-art manufacturing facility at Sango-Otta near Lagos. Since then it has grown from strength to strength and today, with over 70% market share it is the market leader in the Nigerian metal packaging industry.

Avon is part of the Enpee Group ? a diversified transnational conglomerate with interests across the packaging, construction, energy, FMCG & chemicals sectors and with over 50 years of business experience across Africa & Asia.

1.5 General introduction to Mechanical/Forklift Engineering

Mechanical and forklift engineering is a field that combines principles of mechanical engineering with specialized knowledge of industrial equipment, particularly forklifts. Mechanical engineering is a broad discipline focused on the design, analysis, manufacturing, and maintenance of mechanical systems. It covers a wide range of machines and equipment, from small devices to large industrial machinery, and applies principles of physics, thermodynamics, material science, and mechanics to create and maintain efficient and reliable systems.

Forklift engineering, a subset of mechanical engineering, focuses specifically on forklifts, which are essential vehicles in warehouses, construction sites, and manufacturing plants. Forklifts are designed for lifting, moving, and stacking heavy loads, often in confined spaces. Engineers working in this area must understand not only the mechanics and maintenance of forklifts but also the safety requirements, hydraulic systems, and electronics that ensure their reliable and efficient operation.

In addition to the fundamentals of mechanical engineering, forklift engineers need knowledge of hydraulic and pneumatic systems, load dynamics, and electrical systems to troubleshoot, repair, and maintain forklifts effectively. They ensure these machines are safe, efficient, and capable of handling rigorous operational demands. They also play a vital role in maximizing productivity and minimizing downtime in various industries by maintaining equipment in peak condition and implementing preventive maintenance measures.

Purpose of Forklift Maintenance

The purpose of forklift maintenance is to ensure the safe, efficient, and reliable operation of forklifts in industrial and warehouse settings. Regular maintenance extends the lifespan of forklifts, minimizes costly

repairs, and prevents unexpected breakdowns that can disrupt productivity. Key benefits of forklift maintenance include:

1. Safety: A well-maintained forklift reduces the risk of accidents caused by mechanical failures, such as malfunctioning brakes, hydraulic leaks, or worn-out tires. Ensuring that safety features are in top condition protects operators and other employees in the workplace.

2. Reliability: Consistent maintenance minimizes the likelihood of sudden breakdowns, ensuring that forklifts are ready for use when needed. This reliability is critical in environments where forklifts are essential for daily operations.

3. Cost Savings: Preventive maintenance helps identify and fix minor issues before they develop into major problems. Addressing issues early reduces the need for expensive repairs and the costs associated with unplanned downtime.

4. Equipment Longevity: Regular maintenance extends the life of the forklift, protecting the company?s investment. By replacing or repairing worn parts as needed, forklifts can remain in service for a longer period.

5. Efficiency and Performance: A well-maintained forklift operates smoothly and at optimal performance, allowing operators to complete tasks more quickly and effectively. This contributes to overall productivity and reduces operator fatigue.

6. Regulatory Compliance: Many workplaces are subject to safety regulations that require routine inspections and maintenance of industrial equipment. Proper forklift maintenance ensures compliance with safety standards and avoids legal or financial penalties.

In summary, forklift maintenance is essential for creating a safe, productive, and cost-effective work environment. Regular inspection and servicing protect the workforce, ensure seamless operations, and maximize the equipment?s value over its lifespan.

Key Component of a Forklift

Forklifts have several key components essential for their function, safety, and efficiency. These components work together to lift, move, and maneuver heavy loads. Here?s a breakdown of the major parts:

1. Mast: The vertical structure that raises and lowers the load. It?s powered by hydraulic cylinders and often consists of several stages to allow varying heights.

2. Forks (Tines): The horizontal arms attached to the carriage used to pick up, support, and transport loads. Forks come in various lengths and shapes depending on the type of load.

3. Carriage: The part that moves up and down along the mast and to which the forks or attachments are attached. It acts as the support for lifting and securing the load.

4. Hydraulic System: Powers the lifting, tilting, and lowering functions of the mast and forks. The system includes pumps, cylinders, and lines that allow for the controlled movement of loads.

5. Counterweight: Located at the rear of the forklift, this heavy mass counterbalances the weight of the load being lifted, preventing the forklift from tipping forward.

6. Power Source: Forklifts can be powered by internal combustion engines (using diesel, gasoline, or

propane) or by electric batteries. The power source drives the movement and operation of the forklift.

7. Tires: Forklift tires come in different types depending on the operating environment (e.g., solid, pneumatic, cushion). They provide stability and traction for various terrains.

8. Operator?s Cab: The area where the operator controls the forklift, usually equipped with a seat, steering wheel, levers, and various controls for lifting, tilting, and driving.

9. Overhead Guard: A safety structure above the operator?s cab that protects against falling objects, ensuring the safety of the operator during lifting operations.

10. Steering System: Typically involves rear-wheel steering, allowing for tight turning radii and maneuverability in confined spaces, a key feature for warehouse environments.

11. Braking System: Essential for safe operation, the brakes provide control when stopping and maneuvering, especially under load. Some forklifts also have parking brakes for stability.

12. Tilt Cylinders: These hydraulic cylinders allow the mast to tilt forward and backward, helping stabilize loads and ease loading/unloading.

13. Control Levers: Located in the operator?s cab, these levers control lifting, tilting, and often other functions, allowing the operator to adjust the position of the load with precision.

14. Lights and Indicators: Forklifts often have front and rear lights, horns, and sometimes alarms to ensure visibility and alert others, enhancing safety in busy work areas.

1.5.1 Tools and Equipment?s in the IT Environment

Technical Tools and Equipment?s in the IT Environment: Enhancing Efficiency and Collaboration In my place of Internship (IT), a diverse array of tools and equipment?s form the backbone of operations, fostering efficiency, collaboration, and innovation. These tools and equipment?s help?s to make works easy and faster.

Tools:

1. Tool box containing all the necessary tools needed for mechanical maintenance and repair.

Equipment:

Scan tools (e.g., OBD 11, CAN): It is used to identify issues in vehicles by reading error codes from sensors and providing access to vehicle data

Code readers: It is used to identify and fix car issue with car system by providing a short description of a potential problem and direct you to specific car part that is affected.

Multimeters: It is used for diagnosing and troubleshooting issues in a car, including problems with the battery, alternator and relays.

Fuel injection testers: It helps a vehicle fuel injection system is working properly by checking the condition of the injectors.

Engine compression testers: It helps to measure the pressure in each cylinder of an engine to help determine the health of the engine.

Leak down testers: It helps to determine the condition of an engine by measuring compression pressure and leak rate.

Brake testers: It is a critical tools for assessing a vehicle brake system and performance.

Hydraulic lifts (2-post, 4-post): It enables mechanics to elevate vehicles to a comfortable working height.

Jacks (hydraulic, mechanical): It is used to lift a car off the ground.

Jack stand: It is used for supporting a vehicle while performing maintenance or repair.

Trolley jack: It is used for suspending or raising up the wheel of a vehicle, while the jack stand helps to keep the vehicle away from falling.

Crane: This is used for removing a complete engine from a vehicle after the necessary component has been removed from the engine.

Hand tools box/crate: it is used to keep all hand tools like spanners, pliers, hammers, wrenches etc.

Compressing machine or compressor: This is the machine used for pumping air (source of air) into a tire.

Battery charger: This equipment is used for charging vehicle battery up to 12volts.

Welding machine: This machine controls the arc welding process during welding

Grinding machine: This is used to smooth the surface of work piece, most it is used in finishing. It used mainly to sharp tools, to smooth rough surface of brake disc etc.

Transmission jack: used for easy removal of transmission (gearbox) from the engine cabin. It has two pedals. One pedal for increasing the height of the jack and second pedal for reducing the height of the jack.

2.0 Learning Mechanical Engineering Maintenance at Avon Crowncaps and Containers Nigeria Limited

2.1 Introduction to different Departments/Sections in the Workshop

Overview:

My First day at Avon Crowncaps and Containers Nigeria Limited, Engineer A. Adeshina took and introduced me to various department/sections and those working in each department also in the workshop, I was introduced to everyone in each section in the workshop as an IT student who have come to gain knowledge in my learning field. And also they were told to put me through and help me with some basic knowledge and the safety precautions in each sections.

Various sections in the workshop include the following:

Mechanical Section: In the mechanical section, forklifts are being repaired and different faults were rectified. Often times it starts with diagnosing the issue with the forklift using different diagnosing equipment when we don?t know the origin of the fault or did not know where the fault is. After diagnosing the forklift, the fault is

detected and necessary solution is proffer to it.

Also, works such as removal of gear box in order to replace the oil seal or clutch plate and overhauling of engines after their removal for their respective engines were done in this section. Then, in this section, forklifts are being serviced in which component parts such brake pads, brake shoes, oil filter, oil filter and so on were being serviced or changed as the case may be.

Moreover, fuel tanks and pumps were being repaired or replaced as the case may be. The experience helps in knowing how to properly handle hand tools such as spanners, pliers, wrench, and sockets with their handle and so on, also help in knowing how to properly service a vehicle and the inlet manifold of an engine such as servicing of fuel injectors and removing of dusts from the air filter. Also, identifying of sensors and their function was part of experience gained. For example, Manifold Absolute Pressure (MAP) is a sensor controlling the amount of pressure through which air enter the inlet manifold, then Mass Air Flow (MAF)is a sensor which controls the amount of air that enter in to the cylinder from the inlet manifold. Then, each component part of an engine was able to be identified and their functions. For example, connecting rod which transmits motion from the crank shaft to the piston then camshaft which is responsible for opening and closing of inlet and exhaust valves and so on. Also, proper knowledge of how to remove gear box and fix the damages such as clutch plate, disc, Gear box, and oil seal and so on was acquired.

Electrical section: is the place where every fault related to electrical system of a vehicle is being repaired. In this section, the knowledge of electrical system of vehicles was acquired.

Welding section: is another section presents, in this section, damages from the mechanical section which needed to be fixed were brought and fixed in welding section. And some repairs were made in some part of vehicles using welding. Knowledge of how to fix minor damages in vehicle component part was acquired in

this section.

Tool Room: this is the department that deals with operating and maintenance of different machines such as milling machine, drilling machine and other various workshop machines

2.1.1 Safety Precautions in the Workshop

Mechanical workshop safety practices are important to follow because workshop rules and regulations only ensure workers safety but also bring efficiency to the work process. Safety guidelines, fire precautions and general work rules ensure that a symmetrical work process is observed in workshops.

Safe practices are advised in order to prevent accident which is caused by either personal element of the victim or threat which is beyond his control. Likely causes of accident in the workshop include;

Ignorance

Over-confidence

Carelessness

Poor maintenance of equipment and engineering facilities

Poor working condition/environment

Tiredness

Lack of protective devices

Unsuitable clothing

2.3.1 Industrial Forklifts ? Systems, Servicing, and Maintenance

Forklifts are essential material handling equipment used in industrial and warehouse environments to move, lift, and stack heavy loads. Understanding the various systems in a forklift, as well as their servicing and maintenance requirements, is crucial for ensuring operational efficiency and safety. This chapter provides an in-depth look at the systems in industrial forklifts, the types of systems commonly found in forklifts, and the key elements of forklift servicing and maintenance.

2.3.1.2 Introduction to Industrial Forklifts

Industrial forklifts are powered industrial trucks used primarily for lifting and transporting heavy loads. They are commonly employed in warehouses, factories, construction sites, and distribution centers. Forklifts come in different sizes and designs, ranging from small electric forklifts to large internal combustion engine-powered models. These machines are equipped with various systems that control their operation, such as the powertrain, hydraulic system, steering mechanism, and electrical component.

2.3.2.5 Electrical System

The electrical system in a forklift includes the battery (for electric forklifts) or alternator (for internal combustion forklifts), wiring, and electronic control systems.

Battery: In electric forklifts, the battery powers the entire system, including the motor, lights, and other electrical components.

Alternator: In combustion engine forklifts, the alternator charges the battery and powers the forklift?s electrical system.

Control Systems: Modern forklifts use sophisticated electronic systems to control the engine, brakes, and hydraulic systems, ensuring precise operation.

2.3.2.5 Fuel System (for Diesel and Gas Forklifts)

Forklifts powered by internal combustion engines use a fuel system to store and deliver the necessary fuel to the engine.

Fuel Tank: Holds the fuel, which may be gasoline, diesel, or propane.

Fuel Filters: Help keep the fuel clean by filtering out dirt and debris.

Fuel Injector: Delivers fuel into the combustion chamber of the engine for ignition.

2.4 Forklift Servicing and Maintenance

Proper servicing and maintenance of industrial forklifts are critical for maintaining their operational efficiency and extending their lifespan. Regular maintenance ensures that forklifts remain safe to operate and function at optimal performance.

2.4.1 Routine Servicing

Routine servicing tasks should be performed daily, weekly, and monthly. These tasks are designed to ensure that the forklift is in proper working condition and can perform its tasks without any disruptions.

Daily Checks:

Check Fluid Levels: Ensure that engine oil, hydraulic fluid, and coolant are at the correct levels.

Inspect the Tires: Look for signs of wear or damage. Low tire pressure or worn-out tires can affect the forklift?s stability and safety.

Check Battery or Fuel Levels: For electric forklifts, verify that the battery is fully charged. For internal combustion forklifts, ensure the fuel tank is adequately filled.

Inspect the Forks and Mast: Check for cracks or damage on the forks and mast. Ensure that the lifting mechanism operates smoothly.

Weekly Checks:

Hydraulic System: Check hydraulic hoses for leaks, cracks, or damage. Ensure the hydraulic fluid is clean and at the right level.

Brakes: Inspect the brake system for wear and ensure that it is functioning properly.

Lights and Horn: Verify that all lights (e.g., headlights, warning lights) and the horn are operational for safety.

Monthly Checks:

Oil and Filters: Change engine oil and replace fuel, air, and hydraulic filters as needed.

Transmission Fluid: Check and top off transmission fluid to ensure smooth shifting.

2.4.2 Preventive Maintenance

Preventive maintenance involves regularly scheduled tasks aimed at preventing breakdowns before they occur. This can extend the lifespan of the forklift and improve its reliability.

Oil Changes: Regular oil changes (typically every 250 to 500 hours of operation) are essential to keep the engine running smoothly and prevent wear.

Battery Maintenance (Electric Forklifts): For electric forklifts, ensure that the battery is regularly charged, cleaned, and maintained. Check for signs of corrosion or damage on battery terminals.

Filter Replacements: Change air filters, fuel filters, and hydraulic filters at scheduled intervals.

Tire Rotation and Replacement: Tires should be rotated to ensure even wear, and worn-out tires should be replaced promptly to maintain load stability.

2.4.3 Major Maintenance and Overhaul

In addition to routine servicing, forklifts require major maintenance or overhauls at periodic intervals. This can involve more in-depth tasks and should be performed by trained technicians.

Engine Overhaul: Over time, engines may require a complete overhaul, including the replacement of worn-out components such as pistons, valves, and bearings.

Transmission and Hydraulic System Overhaul: Overhauling the transmission or hydraulic systems may be necessary if performance degrades or if parts fail.

2.4.4 Forklift Inspections and Safety

Regular inspections should be conducted to ensure the forklift is operating safely and complies with regulations. Forklift inspections are often required by law, and failure to comply can lead to safety hazards and legal issues.

Pre-Operation Inspection: Operators should perform a daily safety inspection before using the forklift. This includes checking for leaks, inspecting the lift mechanism, and ensuring that all safety features (e.g., seat belts, lights) are functioning.

Annual Inspections: Forklifts should undergo annual safety checks by certified technicians to ensure compliance with industry standards, such as OSHA (Occupational Safety and Health Administration) or local safety regulations.

2.5 Common Forklift Problems and Troubleshooting

Industrial forklifts, like any mechanical equipment, may experience occasional issues. Common problems include:

Engine Failures: Engine issues can arise from poor fuel quality, clogged air filters, or a lack of proper lubrication.

Hydraulic System Leaks: Hydraulic fluid leaks can result from damaged hoses, worn-out seals, or corrosion.

Battery Issues (Electric Forklifts): Battery problems may arise due to improper charging, dead cells, or corroded terminals.

Brake Problems: Brake failure can occur due to worn brake pads or low brake fluid levels.

When troubleshooting forklift problems, it is essential to follow the manufacturer's service manual and consult a trained technician if the issue is beyond basic maintenance.

2.6 Conclusion

Industrial forklifts are complex machines with various systems that must work together to provide reliable and efficient material handling. Understanding the key systems in a forklift, including the powertrain, hydraulic system, steering, and electrical components, is crucial for safe operation. Proper servicing and maintenance practices, from routine inspections to major overhauls, are essential for extending the forklift?s lifespan and ensuring the safety of operators and other personnel. Regular maintenance, preventive care, and timely troubleshooting are necessary for keeping forklifts in optimal

CHAPTER FOUR

4.0 INDUSTRIAL GENERATORS

In large companies, power generation systems primarily gas and diesel generators are vital for maintaining operational continuity, especially in regions with unreliable electricity supply or during power outages. Generators provide essential backup power, supporting critical operations and avoiding productivity losses. This chapter explores the types of generators commonly used in industrial settings, their components, maintenance strategies, operational precautions, and other crucial aspects necessary for effective use and upkeep.

4.1 Overview of Industrial Generators

Industrial generators are designed to handle heavy loads and provide consistent power over extended periods. Companies may use either gas or diesel generators based on factors such as fuel availability, cost, environmental considerations, and power requirements.

Diesel Generators: Diesel engines are widely used in industrial applications due to their durability, high power output, and fuel efficiency. They are often chosen for high-load applications and are known for their reliability and long service life.

Gas Generators: Gas generators, typically fueled by natural gas or propane, are increasingly popular due to their lower emissions and potentially lower fuel costs. They are a preferred choice in regions with easy access to natural gas and for companies prioritizing a reduced environmental footprint.

4.2 Components of Industrial Generators

Both gas and diesel generators share a set of core components critical to their function:

Engine: Converts fuel (gas or diesel) into mechanical energy. Diesel engines are generally more robust and efficient, while gas engines are cleaner and quieter.

Alternator: Converts mechanical energy from the engine into electrical energy.

Fuel System: Stores and supplies fuel to the engine. This includes tanks, pumps, and filters. Diesel systems often require additional filtration to prevent contamination, while gas systems require pressurized supply lines.

Cooling System: Prevents the engine from overheating. Industrial generators typically use a closed-loop liquid cooling system with radiators and cooling fans to maintain optimal temperatures.

Lubrication System: Circulates oil to reduce friction and wear on engine parts. Proper lubrication is essential for long-term durability and efficiency.

Control Panel: Interface for starting, stopping, and monitoring the generator?s operations. It often includes digital displays for voltage, frequency, fuel levels, and engine temperature.

Battery: Powers the starter motor, which initiates the engine. Batteries must be charged or regularly maintained to ensure reliable startup.

Exhaust System: Discharges exhaust gases generated by combustion. Diesel generators generally have more complex exhaust systems due to higher emissions, often including after-treatment systems to reduce pollutants.

4.3 Maintenance Practices for Industrial Generators

Regular maintenance is essential for maximizing the lifespan, efficiency, and reliability of industrial generators. Maintenance protocols are generally divided into daily, weekly, monthly, and annual tasks.

4.3.1 Daily Maintenance

Check Fuel Levels: Inspect fuel levels and ensure the generator has enough fuel to run in an emergency.

Visual Inspection: Look for leaks, corrosion, or visible wear on components such as hoses, belts, and fuel lines.

Battery Check: Ensure the battery terminals are clean, tight, and free of corrosion.

4.3.2 Weekly Maintenance

Test Run: Perform a short test run (under no load) to ensure the engine starts correctly and to check for unusual noises or vibrations.

Coolant Level: Check and refill the coolant level as needed, ensuring the system is free of leaks.

4.3.3 Monthly Maintenance

Full Test Run: Perform a test run under load to ensure the generator can handle the intended load capacity.

Inspect Exhaust System: Check for any blockages or leaks and ensure all clamps and fittings are secure.

Oil Level Check: Check and top off engine oil if needed. Also, inspect oil filters and clean or replace as necessary.

4.3.4 Quarterly Maintenance

Replace Filters: Change fuel, oil, and air filters to ensure the generator operates efficiently without contaminants.

Battery Testing: Conduct a full test on the battery and, if necessary, replace any degraded units.

Cooling System Flush: For liquid-cooled systems, flush and refill the cooling system to prevent sediment buildup.

4.3.5 Annual Maintenance

Complete System Inspection: Conduct a comprehensive inspection of all generator components, including electrical connections, alternator, control panel, and fuel system.

Load Bank Testing: Perform load bank testing to ensure the generator can handle maximum load for a

prolonged period.

Exhaust System Servicing: Clean the exhaust system and replace parts as needed to ensure emissions remain within regulated limits.

4.4 Precautions for Safe Generator Operation

Operating and maintaining industrial generators requires strict adherence to safety protocols to prevent accidents, injuries, and equipment damage.

4.4.1 Fuel Safety

Proper Fuel Storage: Store fuel in approved, ventilated areas away from heat sources. Diesel fuel degrades over time, so it must be regularly rotated or stabilized.

Avoid Spills: Diesel and gas spills are fire hazards. Use spill containment systems and promptly clean up any spills.

4.4.2 Electrical Safety

Disconnect Power Sources: Before performing any maintenance, disconnect the generator from power sources to avoid electric shock.

Use Insulated Tools: When working with electrical components, use insulated tools to reduce the risk of electric shock.

4.4.3 Exhaust and Ventilation Safety

Ventilate Properly: Ensure the generator is in a well-ventilated area to prevent carbon monoxide buildup.

Check Exhaust System: Inspect exhaust systems for leaks and cracks to prevent hazardous gas leaks.

4.4.4 Noise Safety

Hearing Protection: Industrial generators can be noisy. Use ear protection to prevent hearing damage.

Limit Exposure: Restrict personnel access to generator rooms when the generator is running, if possible, to minimize noise exposure.

4.4.5 Mechanical Safety

Avoid Hot Surfaces: Engines, exhausts, and other components can become extremely hot. Allow the generator to cool before handling.

Use Caution with Moving Parts: Keep hands, tools, and clothing clear of belts, fans, and other moving parts to prevent injury.

4.5 Differences between Gas and Diesel Generators

Here are some differences between gas and diesel generators:

Fuel: Gas generators use natural gas, propane, or gasoline, while diesel generators use diesel fuel.

Efficiency: Diesel generators are more efficient than gas generators, producing more power with less fuel.

Lifespan: Diesel generators can last up to twice as long as gas generators.

Maintenance: Diesel generators require less maintenance than gas generators.

Emissions: Both gas and diesel generators emit pollutants, but natural gas emits lower levels than diesel.

Cost: Diesel generators typically cost more upfront than gas generators, but have lower operating costs.

Size: Diesel generators are typically smaller than gas generators with similar capabilities.

Safety: Diesel generators are considered safer to operate because their fuel is less flammable and they have no spark plugs.

Availability: Natural gas is readily available in large cities through pipelines, but diesel fuel is not as readily available.

Use: Natural gas generators are usually used in urban settings, while diesel generators are more commonly used in industrial settings.

4.6 Environmental and Regulatory Considerations

Both gas and diesel generators are subject to environmental regulations, particularly regarding emissions. In some regions, companies may need permits to operate diesel generators due to their NOx and particulate emissions.

Emission Control Systems: Modern diesel generators are equipped with catalytic converters, particulate filters, or selective catalytic reduction (SCR) systems to reduce emissions.

Noise Regulations: In areas with strict noise limits, companies may be required to install noise-reduction enclosures around generators.

Fuel Storage Regulations: Fuel storage is subject to environmental regulations to prevent contamination. Diesel storage tanks must be equipped with secondary containment to prevent leaks.

4.7 Conclusion

Gas and diesel generators are indispensable for large companies where continuous power is essential. Diesel generators are often preferred for their durability and efficiency in handling high loads, while gas generators provide an environmentally friendly option with quieter operation and lower emissions. Regardless of the generator type, regular maintenance and adherence to operational precautions are critical for ensuring safe, reliable, and efficient power generation.

In summary, understanding the key components, regular maintenance routines, operational safety protocols, and regulatory considerations of industrial generators is crucial for any large-scale operation. By following these guidelines, companies can maximize uptime, reduce operational costs, and maintain a safe working environment for all personnel involved.

CHAPTER FIVE

5.0 Summary, Conclusion and Recommendations

5.1 Summary:

The internship commenced with a comprehensive learning path, starting from foundational concepts like knowing various sections and tools in the workshop. The hands-on experience with assisting the technicians in the workshop and gaining more knowledge.

The integration of ethical considerations, workshop best practices, and the collaborative aspect of working on real-world projects enriched my learning experience.

Avon Crowncaps and Containers Nigeria Limited emerged as an influential guide, providing not only theoretical knowledge but also a platform for practical application. The supervisor?s, with their workshop expertise, facilitated a seamless transition from theoretical concepts to real-world scenarios, fostering a holistic understanding of Repairing and basic maintenance of forklifts, generators and air compressors.

The internship nurtured an environment of collaboration and community-building among interns. Networking events and discussions with professionals helps to understand and work accurately and neatly.

5.2 Conclusion:

Over-viewing of the aims of the students Industrial Work Experience Scheme (SIWES) reveals that it has lot of help to offer undergraduate engineering students in order to utilize their God given talents. This SIWES

really helped in enhancing the level of relationship with other students in general and technicians in particular and also teaches how to face the challenges that may arise in any industrial set up as there are many challenges that came up during the course of the program.

Through my training I was able to appreciate my chosen course of study even more, because I had the opportunity to blend the theoretical knowledge acquired from school with the practical hands-on application of knowledge gained here to perform very important tasks that contributed in a way to my productivity in the company. My training here has given me a broader view to the importance and relevance of Automobile Technology in the immediate society and the world as a whole, and making me to know that automobile is not only about the mechanical aspect but also include the electrical/electronic aspect too, I now look forward to impacting the knowledge positively after graduation. I have also been able to improve my communication and presentation skills and thereby developed good relationship with my fellow colleagues at work. I have also been able to appreciate the connection between my course of study and other disciplines in producing a successful result.

I suggest the continuation of orientating of students before starting the program to prepare their minds towards the task ahead.

5.3 Recommendations:

Through the work experience program, I achieve a lot, nevertheless the following recommendations are suggested to improve the qualitative context of the program:

Orientation of students before going out from the school to prepare their minds towards the task ahead

It should be taken with utmost seriousness because it really exposes students to technical, practical and physical work experience

Participation of various professional, regulatory and statutory bodies such as NSE in the supervision of student

Payment of befitting student allowance to assist in student?s finances during the period of training.

I also plead with SIWES to help students in securing places for training because most companies grant students placement based on influence and favoritism making it very difficult for the non-influential students to secure a place for training.

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