Study on Power Distribution System and Substation Operation of DESCO

(Dhaka Electric Supply Company Limited)

An internship submitted in partial fulfillment of the requirements for the award Degree of Bachelor of Science in Electrical and Electronics Engineering

Submitted by

Tanmoy Ray

ID : 191-33-4966

Supervised by

Ms. Kanij Ahmad

Assistant Professor

Department of EEE

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

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DECLARATION

Hereby confirm that the thesis titled **"Analysis of Electricity Distribution, Substation Operation and Maintenance Activity of DESCO"** has been completed by the students listed below under my direct guidance. The research was conducted in the laboratories of the Department of Electrical and Electronic Engineering as part of their Bachelor of Science degree in Electrical and Electronic Engineering. The presentation of their findings took place on 30 January 2024.

Signature of the candidates

Tanmoy Ray

Tanmoy Ray

ID :191-33-4966

APPROVAL

The project and thesis entitled **"Study on Power Distribution System and Substation Operation of DESCO (Dhaka Electric Supply Company Limited)"** submitted by Name: Tanmoy Ray, ID: 191-33-4966, Session: The requirement for the degree of Bachelor of Science in Electrical and Electronic Engineering by Spring 2022 has been recognized as partially satisfied by Spring 2019 as of this writing. Session: Spring 2019 has been accepted as satisfactory in partial fulfillment of the requirement of the degree of Bachelor of Science in Electrical and Electronic Engineering on Spring 2022.

Signed

....

Ms. Kanij Ahmad
Assistant Professor
Department of Electrical and Electronic Engineering
Faculty of Engineering
Daffodil International University

Our Parents &

Teacher

With love & Respect

CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

HFO	Heavy Fuel Oil
LFO	Low Fuel Oil
HRSG	Heat Recovery Steam Generator
CB	Circuit Breaker
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
VCB	Vacuum Circuit Breaker
ELCB	Earth Leakage Circuit Breaker
BDT	Bangladeshi Taka
KW	Kilowatt
KWh	Kilowatt Hours
MW	Megawatt
RPM	Rate per minute
MM	Millimeter
HT	High Temperature
LT	Low Temperature
AFR	Air–Fuel Ratio

LIST OF SYMBOL

%	Percentage
º	Degree
C	Celsius
F	Frequency
P	Number of pole pairs
N	Number of pole

ACKNOWLEDGEMENT

First and foremost, I express my appreciation and praise to Almighty, the Highest, from whom seek guidance and understanding. Nobody but Almighty could have provided us with the knowledge, motivation, strength, patience, and everything else we needed to finish this task. Then there is my sincerest gratitude to Mr. Mamunor Rashid Sir, Deputy General Manager, DESCO'S HRM Division, for his unfailing counsel, support, and, most all, supervision throughout my internship It is been a pleasure to work with him because his guidance, support, and general instructions helped me complete my internship successfully.

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ABSTRACT

Bangladesh is developing, and power demands are increasing. We can't picture a world without power today. Every day appliances are energized by electricity. Around 50 percent of people had access to electricity a few years ago, but now it is available to nearly 98 percent of the population. Our per capita energy consumption was around 220 kWh ten years ago, and it is nowat 512 kWh. It demonstrates the rising need for electricity. With 149 generating units, we now have a capacity of 23,000 MW. The distribution units, however, are the power system's essential backbone. This is where electricity is sold and where the money is made. We have six distribution firms who are working hard to service the country.

CHAPTER-1

INTRODUCTION

1.1 Background

Power plants are one of Bangladesh's more promising businesses, offering a substantial amount of foreign direct investment in addition to a large number of job possibilities. DESCO is an officially recognized distribution company. Half of the capital is made up of its knowledgeable, enthusiastic, and committed employees. Being a part of such a prestigious organization is an amazing opportunity for us. Both the Bashundhara Grid and the Badda S&D were visited. Among other topics covered are single line schematics, protection relays, metering, distribution transformer manufacturing, network operation, commercial operation, protection and maintenance, and more. Each year, DESCO fulfills its objective on schedule and is awarded the incentives. A new Purbachal City area is being added to DESCO as it grows. By using the tagline "Power is Yours," DESCO is growing. They are committed to provide excellent customer service. Students can test their passion in a specific subject through internships, which also provide them a high level of practical knowledge.

Graduate students may get their feet wet in the real world with this internship program.

The actions I completed during my internship at DESCO (Dhaka Electric Supply Company Limited) are the basis for my report. The operations, vision, financial status, supply capacity, distribution of power, and future planning of DESCO are the main topics of this research. Under the Companies Act of 1994, the Dhaka Electric Supply Business was founded in 1996 as a distribution business with TK. 5 million in permitted capital. At the moment, DESCO is among the biggest companies in Bangladesh that distributes power. I was able to learn a little bit about power factor optimization, transformer maintenance, grid substations, and other topics that were directly linked to my study materials during my internship. I've also observed their administrative activities, which would surely help me visualize their effectiveness in my daily life. These activities include control room operations, complaint room operations, IT (Information & Technology), and one point operations.

1.2 Problem Statement

To get knowledge about substation operation and maintenance Inside DESCO related to the DESCO power distribution system's components and exercises. to look into errors and how to research and get ready for them. They build their substation in several locations throughout Dhaka city as part of this power distribution system. Congested areas are not ideal for constructing substations. Since they located their substation in a separate location, they don't care about it.

1.3 Objectives

To carry out a comprehensive analysis of the power distribution system's functioning and the ways in which cutting-edge technology might help us satisfy our electrical demands.

Specific objective:

- In order to ascertain the present and future market positions of Dhaka Electric Supply Company Limited (DESCO).
- To find out more about the special supplies and services offered by Dhaka Electric Supply Company Limited (DESCO).
- Explore the advantages and disadvantages of the distribution networks for electricity.

1.4 Scopes

Energy distribution in Dhaka City is handled by the public limited firm DESCO, also known as Dhaka Electric Supply Firm Limited.

In November 1996, the company was established as a Public Limited company under the Companies Act of 1994. Since the company presently serves 880505 clients as part of the Power Division of the Bangladesh Ministry of Power, Energy, and Mineral Resources.

CHAPTER-2

LITERATURE REVIEW

2.1 Company Profile

Company Name: Dhaka Electric Supply Company Limited Year of Establishment: 1996

2.1.1 History of DESCO

In 1972, the first government of Bangladesh passed an act creating the Bangladesh Power Development Board (BPDB) in an attempt to increase investment in the industry. Between 1972 and 1995, BPDB increased the nation's generating capacity from 475 MW to 2818 MW and extended its 230 kV and 132 kV transmission networks to 419 km and 2469 km, respectively. The first East-West Inter-connector opened in December 1982, bringing the country's eastern and western regions together electrically. Between Ishwardi and Tongi, there was a 230 kV twin circuit transmission line that was electrified at 132 kV and spanned the Jamuna River. As a consequence, all major towns' distribution networks were connected via 230 kV and 132 kV interties. But starting in 1986, the BPDB's commercial performance declined. By 1991, the average gross system loss was over 42%, and the amount of accounts receivable exceeded 6.5 months' worth of bills. The World Bank and Asian Development Bank agreements that the Government and BPDB had with them were judged to be unmet by this performance. Because of this, in 1990 an additional ordinance was published and later passed as an Act, giving the Dhaka Electric Supply Authority—a recently established government organization—ownership of the 33 kV and 132 kV transmission and distribution systems in the Greater Dhaka Area, which includes the Metropolitan City. This was carried out in order to free up the administration of BPDB from the administrative burden of overseeing almost half of the nation's energy distribution. Even though the economy was doing well, there was a notable increase in the demand for energy between 1992 and 1995.With severe energy shortages predicted for the next years, the cabinet accepted in principle the interministerial committee report "Power Industry Reforms in Bangladesh (PSRB)" to enable the industry become financially self-sustaining and attract private capital.

2.1.2 Formation of DESCO

Development partners have agreed to re-fund the sector in light of this progress and the government's restructuring efforts, on the condition that any project they sponsor address the changes implemented by the government. Redefining DESA's franchise region, giving PBSs under REB control over distribution networks outside of metropolitan Dhaka City, and establishing a corporatized Dhaka Electric Supply Company (DESCO) are all related to Part (C) of the Project. It will gradually take over the entirety of DESA's distribution network as part of the "Reforms- Funding" relationship that the government and development partners agreed upon. In order to reduce excessive inefficiencies in the capital's distribution network and to facilitate the "corporatization and commercialization" of the sector, this firm's development is deemed required.

2.2 Company Structure and service

The corporation is structured in a hierarchical manner. The Board of Directors and the Chairman are in charge of this organization. The executive team of the company is headed by the Managing Director and consists of five Executive Directors, two General Managers, two Chief Engineers, twelve Superintending Engineers, two Deputy General Managers, and one Company Secretary.

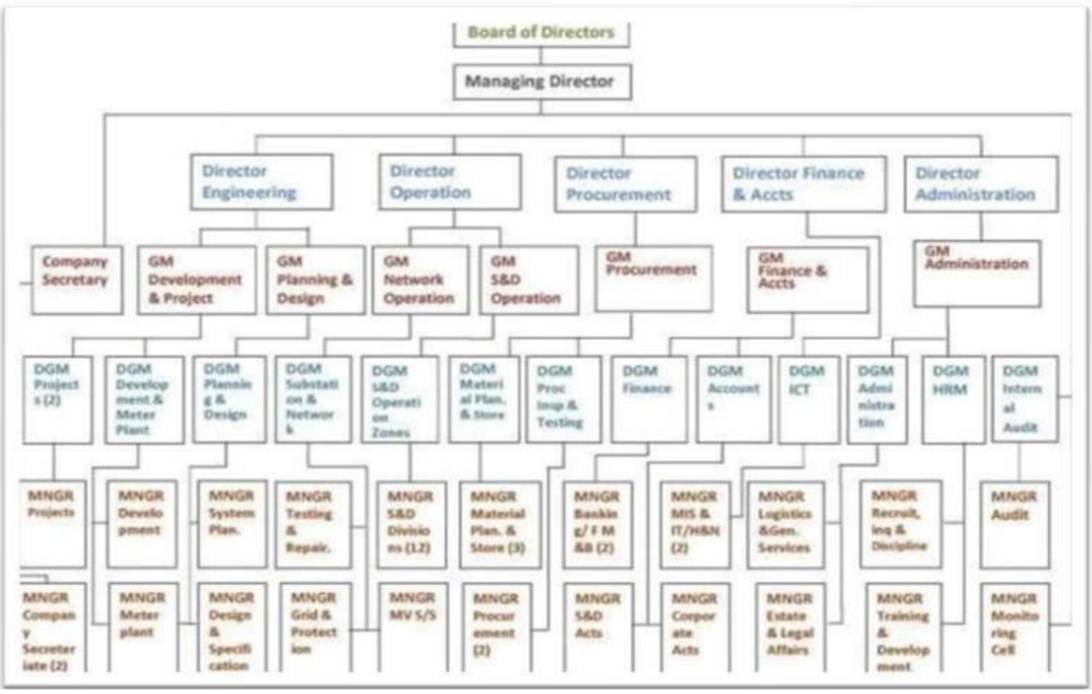

Figure 2.1: organizational structure of the corporation is hierarchical

Service

The following is a list of DESCO's earliest activities:

2 Operation and Maintenance of Substations and Lines

3 Commercial tasks, including customer accounting, billing, disconnecting and reconnecting customers, testing and installing customer meters, and so on.

4 For instance, lines and substations are planned, developed, and erected.

2.3 Mission and Vision

Vision: To be a catalyst for economic growth and social improvement by delivering safe, dependable, and long-lasting power.

Mission: Strong communities are created, businesses and trade are encouraged, and customers are reassured. attaining and upholding the greatest levels of efficiency, dependability, and responsiveness for a diverse range of clients.

Corporate philosophy: Our core values as a company will enable us to accomplish our objectives.

Safety: The safety of our workers, clients, and communities comes fir

Customer Focus: Providing great service to assist clients in better controlling their electricity use;

Operational Excellence: utilizing ongoing development to deliver affordable, dependable, and safe power;

Performance Driven Culture: Strong communities are developed, customers are reassured, and business and trade are encouraged. Attaining and maintaining optimal levels of effectiveness, reliability, and responsiveness for a wide spectrum of clients.

2.3 Some Other Utility Service Provider in Bangladesh

The Board is a part of the Power Division of Bangladesh's Ministry of Power, Energy, and Mineral Resources. Several Generation and Distribution firms have been formed as part of the reform and restructuring process. Dhaka Power Distribution Company Limited is one of BPDB's subsidiaries. The Board oversees most of the country's energy generation and distribution in metropolitan areas, with the exception of Dhaka and the West Zone.

The second business in the West Zone Power Distribution Company Limited group is called West Zone Power Distribution Company Limited (WZPDC).

3. REB

The structure of Bangladesh's power sector is shown below

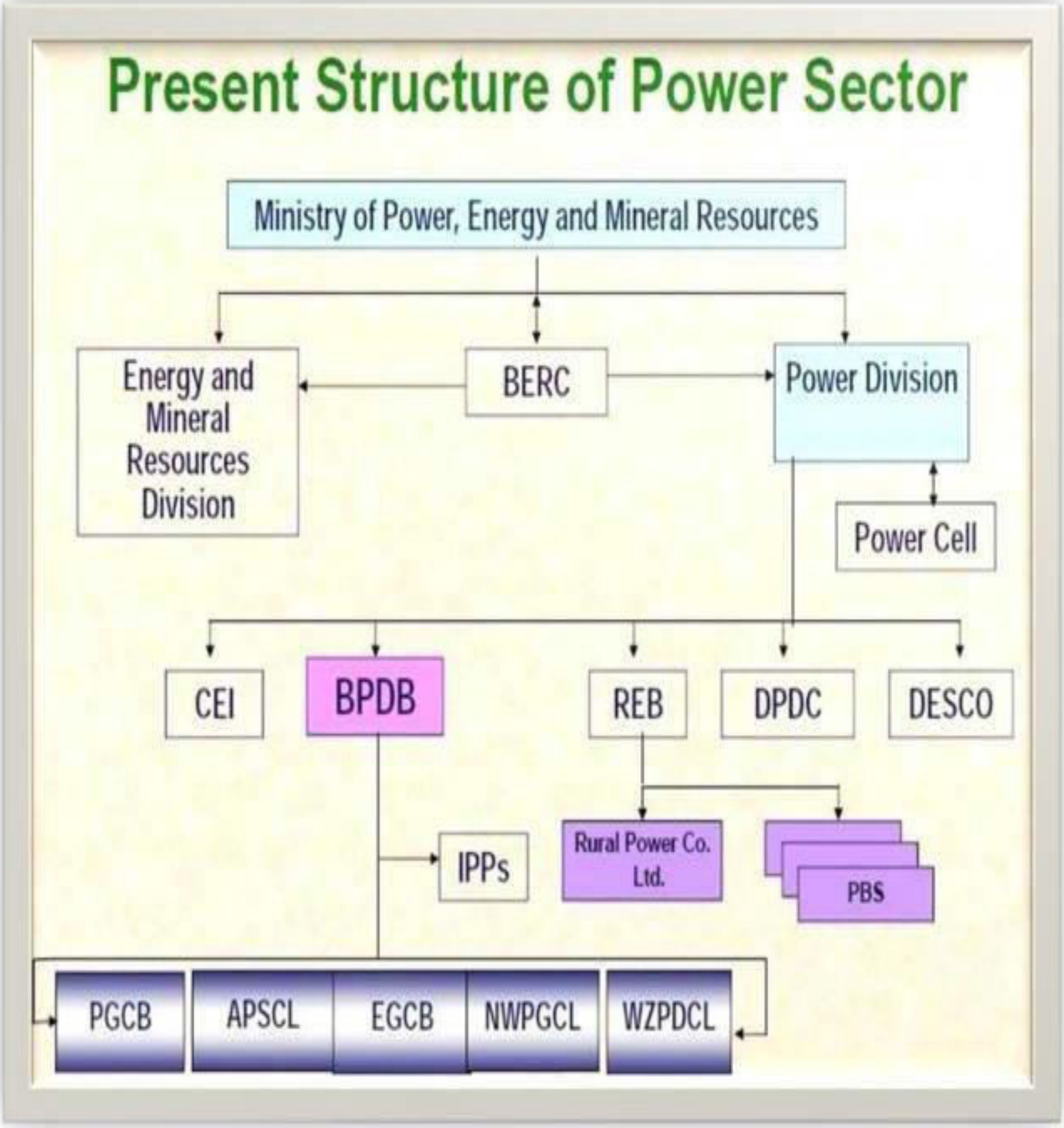

Figure 2.2: Present Structure of Power Sector

CHAPTER 3

Operation, Maintenance & Protection of Grid Substation

3.1 Grid-substation

A grid-substation is a system of linked substations used to provide power from generators to end users. There is no power plant owned by DESCO. Consequently, they buy electricity from the Power Development Board (PDB) at several points around Dhaka through the Power Grid Company of Bangladesh (PGCB). A grid-substation, often called a substation, uses electrical transformers to change voltages from high to low. Step-down arrangement For usage in homes and businesses, substation transformers increase current while lowering voltage. During my internship, I went to this one grid substation, known as Badda Grid Substation.

3.1.1 Basundhara Grid Substation

The Purbachal and Tongi grids provide four incoming sources at the Banani grid substation. The Tongi grid has two lines, and Purbachal grid has two. Purbachal 132/33KV.The single-line diagram for the grid substation (SLD).

First, an O/H line was used to link the 132KV incoming sources from the Purbachal and Tongi grids to the Bashundhara grid. The 132KV bus bar is connected to the incoming lines via the isolator, earth switch, LA, PT, wave trap, and CB. For attaching bus1 (132KV), where a 132KV bus coupler is used for bus 2. The grid transformers are then linked to the 33KV bus by CTs, PTs, CBs, and earth switches, and to the 132KV bus through isolators, CBs, CTs, and LAs. This substation is equipped with three 132/33KV power transformers. A 50/75 MVA capacity is available for every transformer. Two 33KV buses can also be connected using a 33KV bus coupler. Lastly, a 33KV bus bar is connected to eleven outbound lines via an earth switch, CB, and CT.

3.1.2 Badda Substation

A 33/11 KV substation near Badda caught my attention. Badda was my primary web address. I have gained knowledge about the operational, general, and protective systems from this specific substation.

3.2 General Equipment

- Power transformer
- Switchgear
- Circuit breaker (Air blast, Vacuum CB, SF6 CB)
- Instrument transformer (CT & PT)
- Isolator
- Earth switch
- Wave trap
- Lightening arrester
- Bus bar (main bus bar and reserve bus bar)
- Battery and battery charger
- Control relay panel
- Ac & dc distribution panels, Voltage regulator
- Auxiliary transformer

3.3 Operational Equipment

- **Transformer at DESCO**
- **Transformer Specification**
- **Transformer Component**

3.3.1 Transformer at DESCO

At the Basundhara substation (33/11KV), where I interned, I worked with transformers. Essentially, a transformer is an apparatus that moves electrical power from one circuit to another without changing frequency. Transistor electromagnetic induction generates electricity between windings or circuits. A constant frequency of voltage and current shifts from the primary (source) to the secondary (load) depending on the size of the windings. Power transformers that utilized PGCB's 132 KV to convert 33 KV to 11 KV and 33 KV to 33 KV were visible to me at DESCO. The majority of Energy Pack's power transformers are produced and maintained by them.

Figure 3.1: Transformer at Bashundhara Grid Substation

3.3.2 Transformer Specification

Transformers are available in an array of sizes and forms. DESCO, on the other hand, favors Chinese oil-based transformers. In China, transformers are less expensive than in Bangladesh. China has therefore entirely controlled this industry. Because they are more affordable and widely accessible than other types of transformers, oil-based transformers are widely used.

3.3.3 Transformer Component

There are so many transformer pasts like:

- Transformer Winding
- Tank
- Conservator
- Breathing System
- Cooling System
- Transformer Liquid Oil
- Oil Level Indicator
- Silica Gel
- Tape Changer
- Insulator

Winding:

There are two windings: an 11-kilovolt secondary winding and a 33-kilovolt primary winding. Since this is

In a step-down transformer, the primary winding is connected as (delta), while the secondary winding is linked as Y (w ye). The AC source is the main winding. In secondary winding, we mean the burden that originates at the source. Either silicon steel or soft iron makes up the transformer's core. It is connected to two windings: the primary and secondary windings. Insulation keeps the windings apart from one another. The conducting substance of the windings is determined by the application (a conductor is a material that contains moveable electric charges). Every turn must, under all conditions, be electrically isolated from the others to guarantee that the current passes through every turn.

Main Tank:

In addition to the primary windings, the secondary windings are shielded by the main tank. The primary winding's terminal edge is attached to one side of the main tank. The primary tank's opposite location is linked to the starting edge of the secondary winding. The main tank's oil supply has been restored. Additionally, between the windings and the main tank, oil serves as insulation.

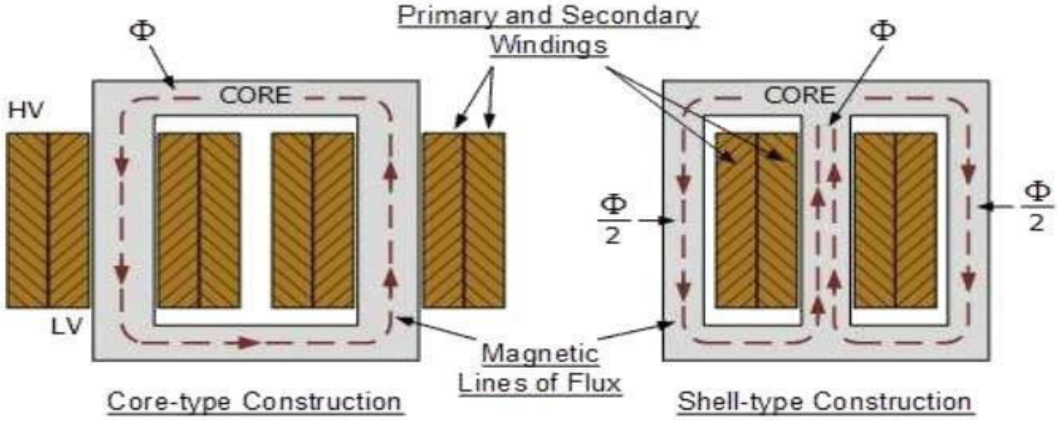

Figure 3.2: Primary & Secondary Winding

Conservator Tank:

When oil expands due to an inherent transformer flaw or when the load increases, the primary and secondary windings of the transformer generate more heat. The amount of oil may thus rise. By using the Buchholz relay, oil volume can also be raised from the main tank to the conservator tank. Oil can expand in the tank while it's in operation because it's meant to be an expansion reservoir.

Buchholz Relay:

Protective component of a transformer is the Buchholz relay. It is located between the conservator tanks and the transformer. The oil volume swells and can go through the Buchholz relay to the conservator tank when a minor malfunction generates gas in the main tank. The control room receives a signal initially if the oil travels extremely swiftly. If the fault is somewhat big, the transformer trips.

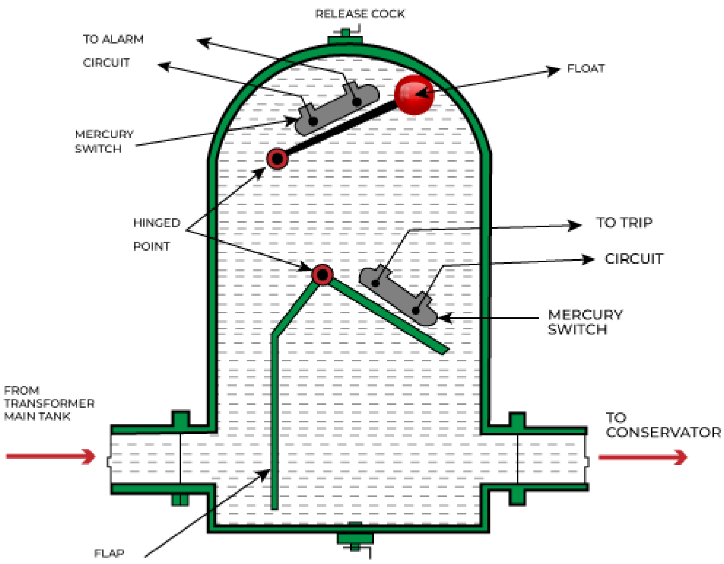

Figure 3.3: Construction of Buchholz Relay Cooling Equipment

Additional cooling devices, such as radiators When the hot oil has cooled, retrieve it from the top of the main tank and put it back in.

Temperature and Oil Temperature Indicators:

Winding temperature indicator (meter) displays the proper winding temperature, which is 75°F, or degrees Celsius. The ideal oil temperature is indicated by a meter or oil temperature indication. The standard oil temperature is 65 degrees Celsius.

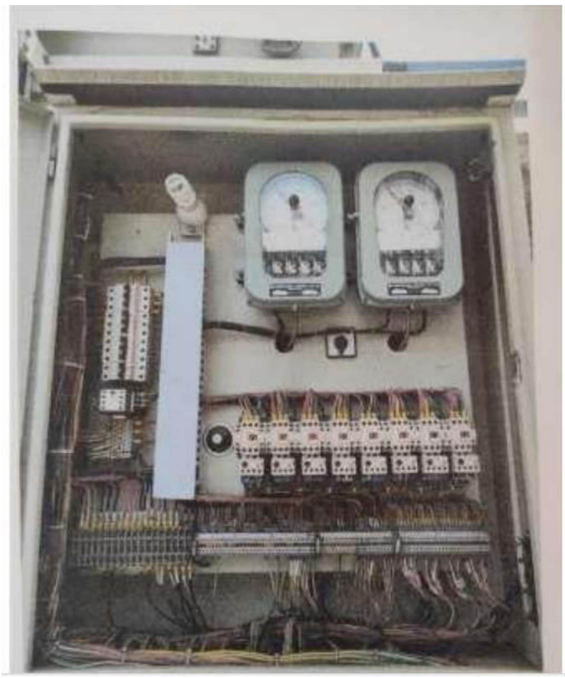

Figure 3.4: Winding temperature and Oil temperature indicator

On load tap Charger:

When there is a disruption in the primary winding or when the input voltages to the primary winding are flawed, the on-load tap change method is usually employed. In figure (2.10), the secondary winding is 11 kV and the primary winding is 33 kV. If 33KV is decreased to 28KV, a load tap changer is needed to increase from 28K to 33KV.

Transformer Oil:

Transformer oil is used to insulate the main tank from the primary and secondary windings of the transformer and to keep the transformer cool. The high dielectric strength of the transformer oil benefits the submerged coils and core. Consequently, the transformer may be made more affordable and small.

Breathing System:

The Transformer's respiratory system is managed by silica gel. It's an absorbing material for moisture.

Air may enter or depart the conservator tank when oil is put into the transformer tank, depending on how the oil expands and is removed from the main tank. Silica gel is utilized to draw moisture out of this air.

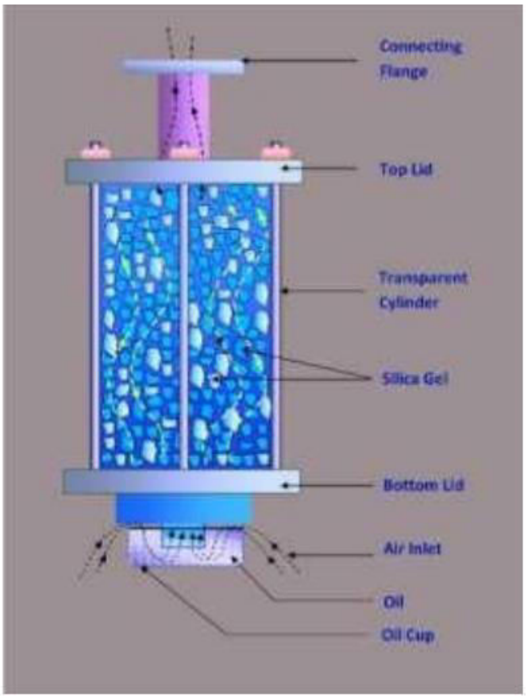

Figure 3.5: Transformer Silica Gel Breather Pressure

The formation of gas during the breakdown and evaporation of oil frequently causes tank pressure to increase in tandem with a flashover or short circuit in a liquid-filled transformer. The likelihood of an uncontrollably large oil spill and tank rupture is reduced by the pressure release device.

A fire may result from it. Quick and wide opening is made possible by the low mass of the valve disc and the low spring rate of the closing springs. As soon as the extra pressure goes down, the valve closes again.

Silica gel:

Silica gel is used in breather transformers to control the amount of moisture and keep it out of the machinery. Their main purpose is to shield transformer oil from harm caused by moisture.

3.3.4 Losses in Transformer

I gained knowledge about transformer losses during my internship at the Badda Grid Substation. Among them are the following:

In real iron cores, eddy currents continue to generate some heat even after lamination.

Copper Losses: In reality, there is some resistance in the transformer's coils. As a result, some energy is lost due to the heat generated by the coils' resistance. Hysteresis Losses: The iron core undergoes a complete magnetization cycle regularly as a result of the alternating current flowing through the coils. Energy is wasted due to hysteresis.

3.4 Protection System for transformer

The following describes the primary transformer protection relays and systems of DESCO's grid substation.

- Buchholz devices protect against all kinds of slow-developing flaws or incipient failures, including: oil level decrease due to leaky joints; core heating; winding insulation failure; and so on. It is only against earth faults that earth-fault relays offer protection.
- Relays designed to handle high currents guard against overloading and phase-to-phase malfunctions.
- The protection against phase and earth faults is provided by a differential system, sometimes referred to as a circulating current system.

3.4.1 Circuit Breaker

One type of switch that may swiftly open and close a circuit in both normal and malfunctioning circumstances is a circuit breaker. In essence, it is controlled by an electrical switch whose primary function is to identify a flawed state. The primary function of the switch is to safeguard an electrical circuit from harm resulting from overloads or short circuits.

SF6 Gas Circuit Breakers

I saw and learnt about four sulfur hexafluoride (SF6) gas circuit breakers while I was an intern at the Badda grid-substation. A circuit breaker for SF6 gas is a high-voltage device. SF6 gas has excellent arc-extinguishing and dielectric qualities. It is heavy and inert. It possesses good arc quenching properties and a high die-electric strength.

The followings are the advantages of SF6 gas circuit breaker:

- The arcing period of such breakers is extremely low because SF6 has an arc quenching ability that is superior to air.
- These breakers may interrupt large currents because SF6 has a dielectric strength that is two to three times greater than that of air.
- SF6 gas circuit breakers offer low maintenance costs, low foundation requirements, and little auxiliary equipment needed since they operate in a closed circuit, which eliminates noise and fire danger.

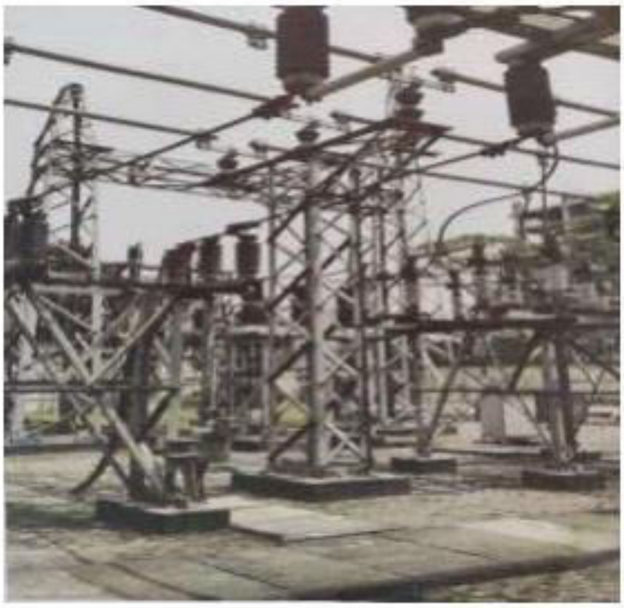

Figure 3.6: Circuit Breaker

Vacuum Circuit Breakers

- The arcing period of such breakers is extremely low because SF6 has an arc-quenching ability that is superior to air.
- These breakers may interrupt large currents because SF6 has a dielectric strength that is two to three times greater than that of air.
- SF6 gas circuit breakers offer low maintenance costs, low foundation requirements, and little auxiliary equipment needed since they operate in a closed circuit, which eliminates noise and fire danger.

3.4.2 Isolators

I have noticed that the Badda grid-substation features a variety of isolators. Line, bus, earth, pin and post isolated sections are among the several kinds of isolators. An isolater breaks the three- phase power circuit in the absence of a load. These are frequently installed at substations and are situated both prior to and following transformer maintenance. Removing an electrical system component from the power supply is its main objective. An isolator switch enables the complete de-energization of an electrical circuit for repair or maintenance. Because it is incapable of extinguishing arcs, it can only operate in "no load" mode.

3.4.3 Current Transformer

At the Badda Substation, nine (9) current transformers (CT) were found. These are fastened to the bus bar. Current transformers (CT) are also used to drop AC from a higher value to a lower one for measurement, protection, and control applications. At the Badda substation, the current transformer ratio is (1600/800/1) Ampere.

Figure 3.7: Current transformer

3.4.4 Potential transformer

Twelve (12) potential transformers (PT) were located at the Badda grid substation. These fasteners are positioned parallel to the bus bar. For measurement, protection, and control purposes, an AC voltage that is higher than the desired value is lowered using a potential transformer, sometimes referred to as a voltage transformer. The potential transformer ratio is 132KV to 110V at the Bashundhara grid substation. In the substation, power transformers, bus structures, CBs, power poles, and towers all have lighting arresters installed.

3.4.5 Battery & Battery Charger

Substation's heart is the battery. A battery is a form of storage. To ensure protection, it is essential for backup dc supply. When the ac or charger fails, the battery provides 110V dc voltage to the control and protection circuit. Dc voltage is necessary in a substation for protection, control, and signaling. The battery charger converts 400 volts ac to 110 volts dc and feeds the dc electricity to control panels for the purposes.

Figure 3.8: DC Battery

CHAPTER-4

Badda S & D Division

Based on data from December 2009, DESCO has 1,50,557 clients. To handle such a big customer base, DESCO has 16 Sales and Distribution (S & D) Divisions and 42 Cost Centers. Because to my internship, I was able to make about at Badda S & D.

4.1 Badda S & D at a glance

This is an organ of DESCO's Sales and Distribution Center.

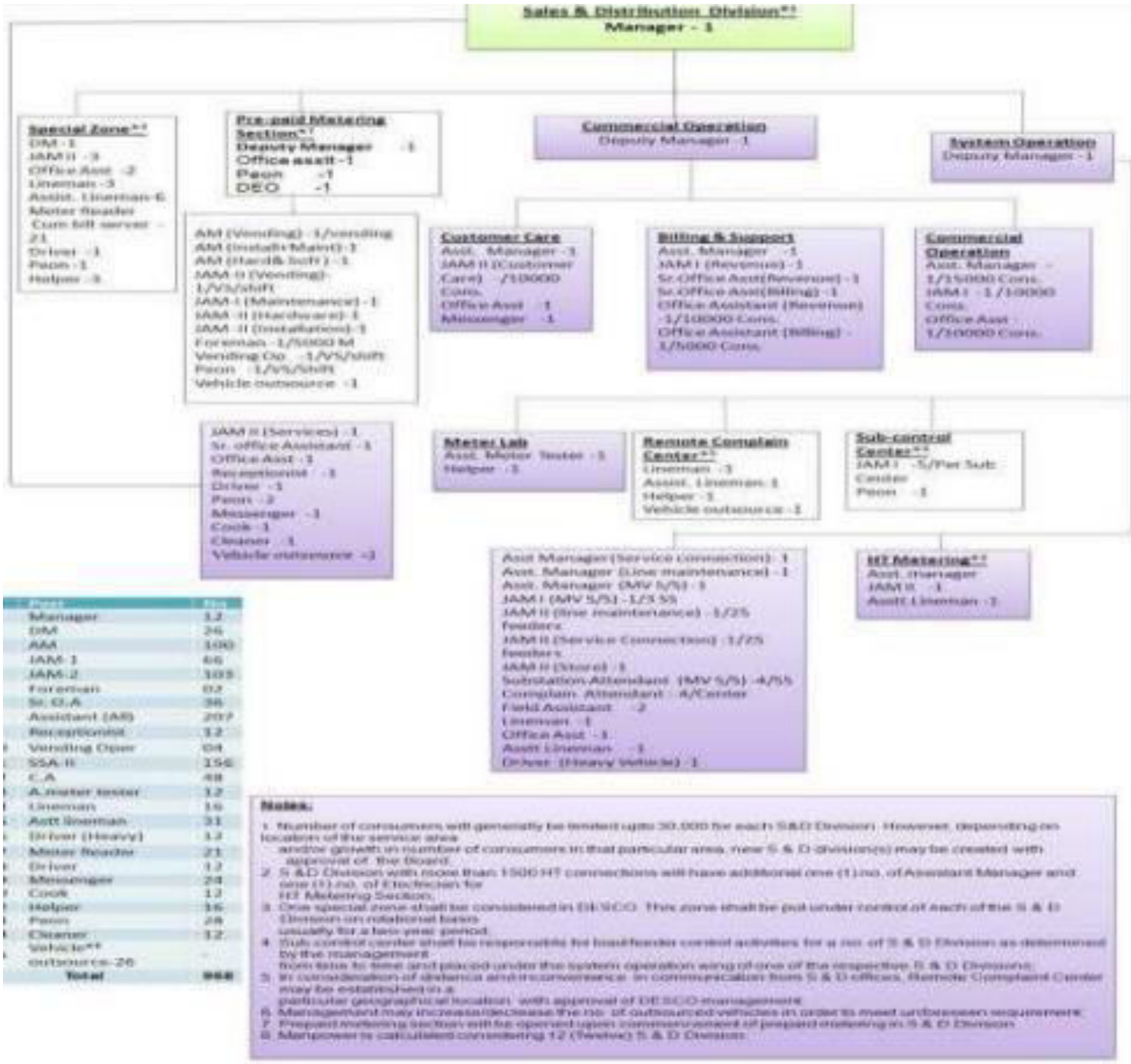

Figure 4.1: Sales & Distribution Center of DESCO

4.2 Badda Operation

Any S & D's operation can be separated into two parts:

- System Operation
- Commercial Operation

4.2.1 Commercial Operation

DESCO's primary function is commercial operations.

- Disconnection/Reconnection
- Metering
- One-Point Service Center
- Billing/Collection
- Outsourcing activities
- Regularization of unlawful connections are the main activities in commercial operations.

Disconnection/Reconnection

Disconnection is the most common method of collecting dues. Disconnection occurs as a result of the following factors:

- Meter tempering • Meter bypass
- Non-payment/past due bill (More than one month)
- Illegal connection, etc.
- Overload use (more than sanctioned load

Metering

Given that the meter is viewed as the organization's "cash box," DESCO has taken considerable measures to guarantee that it is reviewed often. The following are typical operations of the metering section:

- meter refurbishment
- circuit breaker removal prior to meter installation
- meter inspection and sealing

Figure 4.2: Meter Checking

Meter Reading

Meter readings are obtained by Meter Readers in compliance with the schedule; they visit customers' homes on the scheduled date each month and record the readings on a Meter Card that is retained by the customer as well as in a Meter Book that is kept at DESCO's office. The reading from the meter is used to produce an electricity bill.

Meter Reading Schedules are as follows

The following are the meter reading schedules:

- Low-tension consumer: Usually from the fifth to the twenty-fifth of every month.
- Low Tension Industry (LTI) Consumer: Typically, this occurs between the 26th and the 5th of the current month (next month).
- HT (High Tension) Consumer: Typically, this group of people occurs between the 28th and the 3rd of the subsequent month.

One Point Service Center

Any business's ability to succeed depends on its ability to satisfy its clients. From DESCO's perspective, its customers are very important. In order to deliver exceptional customer service, DESCO built "One Point Service Centres" in every S & D division. It accomplishes the following tasks:

- A solitary client interaction point

- Considering fresh requests for connections • Attending to customer grievances

Billing / Collection

Consistent efforts to have a high billing/collection ratio are what enable the business to continue and remain financially viable.

- Decentralized billing and collection procedures. • The month was divided up into bill preparation.
- Adjustments to the bill.

4.2.2 System Operation

Critical issues are handled via system operation. All DESCO O/H and U/G lines are built and maintained by this department.

- Approval and configuration of new connections;
- Load management;
- Control room operations;
- Power factor monitoring and upgrading;
- Load sanction and retention
- Telecommunication & Wireless; Substation operation & maintenance
- Among its duties are line repair and handling, among other things.

4.3 New Connection

A construction meter must be requested in advance by customers. Documents like a copy of the voter ID card, the landowner's copy, and the RAJUK permit copy will all be gathered by DESCO.

The customer may request a permanent meter connection after the building's electrical system is finished. The construction meter bill has a list of all the bills that he needs to pay initially. Generally speaking, a construction meter unit is far more expensive than a flat rate. Therefore, getting the permanent meter as soon as practical is a smart idea.

Following that, a field engineer will visit the site to determine how much energy the customer uses. He will then let you know how

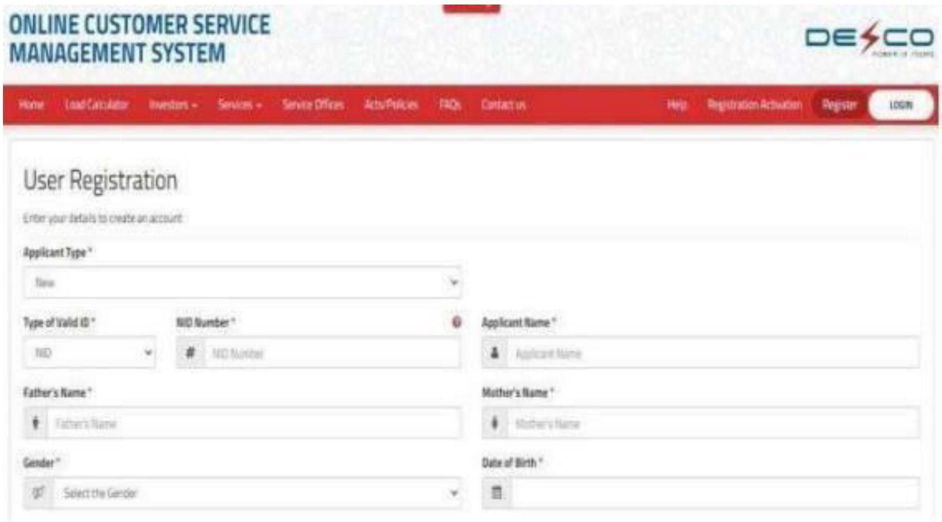

Figure 4.3: Application for New Connection

4.4 Control room Activity

The fundamental duties of a control room include the following:

- Communicates with line maintenance teams;
- Works with other control rooms or grids
- Oversees load shedding
- Keeps track of data (load shedding time, demand load, supply load).

Figure 4.4: Control Room Substation

In power networks, switching stations, and industrial facilities, control relay panels offer centralised control of linked control equipment. To create a board, the panels are screwed together. This method enables substitution, extending, and rearranging as required. The panel has control switches and indication LEDs for remote control of regulated equipment.

4.5 Maintenance and Inspection of Substation:

I learned a little bit about maintaining substation equipment during my internship with DESCO, and I got to see the Tongi (West) substation's maintenance period in action. Although there are many different kinds of substation inspections, DESCO inspects the substation equipment every month and every half year. The Tongi (West) substation has eighteen 11-kV outgoing feeders and three 33-kV entering sources. Certain transformers convert voltages between 33 KV and 415 V instantaneously, whereas other transformers convert voltages between 33 KV and 11 KV.

At the Tongi (West) substation, only eight 11KV outgoing feeders are operational; the remaining seven are spare or in the off position. Three 11KV outgoing feeders are used for switching.

4.6 Power Factor Monitoring and Upgrading

One of the most important aspects of a power system is power factor monitoring. since the production of power is unaffected by low power factor. While the power factor at the Tongi (West) substation was between 0.97 and 0.98, the average power factor is normally around 0.95. Inductive loads cause the factor of power to decrease. The KW to KVA ratio is, as everyone knows, the power factor.

Conversely, it appears that a high KVAR is the source of poor power factor. Furthermore, we know that the magnitude of the KVAR and the inductive load are proportionate. Inductive loads are mostly produced by large factories, industries, and workshops. Energy-efficient lights, transformers, and induction motors are a few examples of inductive loads. A higher quantity of apparent power is produced via reactive power. When perceived power increases, there is a corresponding increase in angle () between KW and KVA; a larger angle equals a lower power factor (Pf=Cos).

CHAPTER-5

Testing & Repairing Division

A workshop for DESCO transformers is located in the Mirpur division. In this instance, a distribution transformer is being fixed. The electricity transformer at this place is beyond repair. Here, they also built a brand-new transformer. The primary and secondary windings are turned first. A 360 kilogram core and 280 liters of oil are needed for a 200 KV transformer. The construction was built, and then dried with either an automated or manual heating process. Here, single-phase and three-phase transformers are made.

5.1 Transformer Structure

Executive Engineer A.T.M. Rasel Ahasan showed me the transformer workshop and meter testing room when I visited this division and gave me a full explanation of everything. I was at the session for three or four hours. I had never before seen a whole transformer being constructed from a primary coil.

Here are some pictures of different transformer sections.

Figure 5.1: Core of Transformer

Figure 5.2: Coil of Transformer

Figure 5.3: Conservative tank of Transformer

Figure 5.4: Radiator of Transformer

Figure 5.5: Bushing of Transformer

Figure 5.6: Transformer Oil

Figure 5.7: Transformer with body

Figure 5.8: Vacuum Chamber

5.2 Meter Plant Division

In this division, each meter is checked for particular lengths of time. Here, digital and analog meters are put to the test. It could be acceptable if the inaccuracy is 2 to 3 for per hundred disk rotations in analog. This digital meter can have the greatest mistake rate. The better the sampling, the more accurate it is. Digital meters in this sample have bit rates ranging from 2600 to 4000 bits per hour. On a PC running certain software, the meter was tested. Note the number of times each meter has opened, any fault events, the date and time, and so on. Find any bugs in the software, fix them, and report them. It is possible to fix a loose connection on the meter by hand.

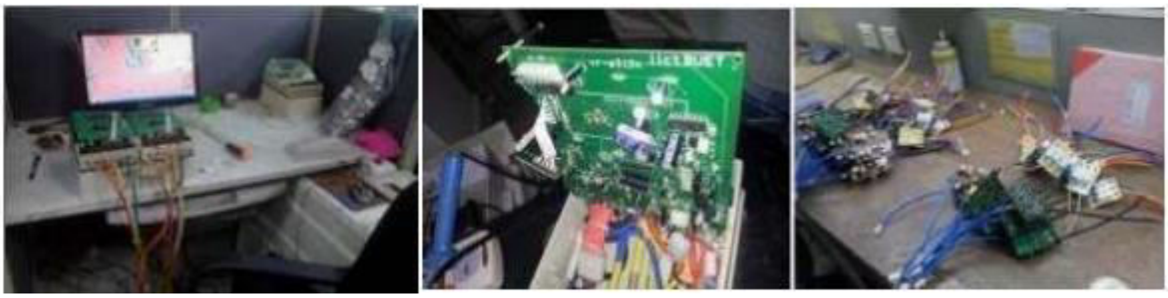

Figure 5.9: Meter testing & repairing unit

Digital meters in this sample have bit rates ranging from 2600 to 4000 bits per hour. On a PC running certain software, the meter was tested. Note the number of times each metre has opened, any fault events, the date and time, and so on. Find any bugs in the software, fix it, and report it. It is possible to fix a loose connection on the meter by hand.

CT (Current Transformer) meters come in two different varieties: Transformer meter with low tension current (LT-CT) Transformer meter with high tension current (HT-CT)

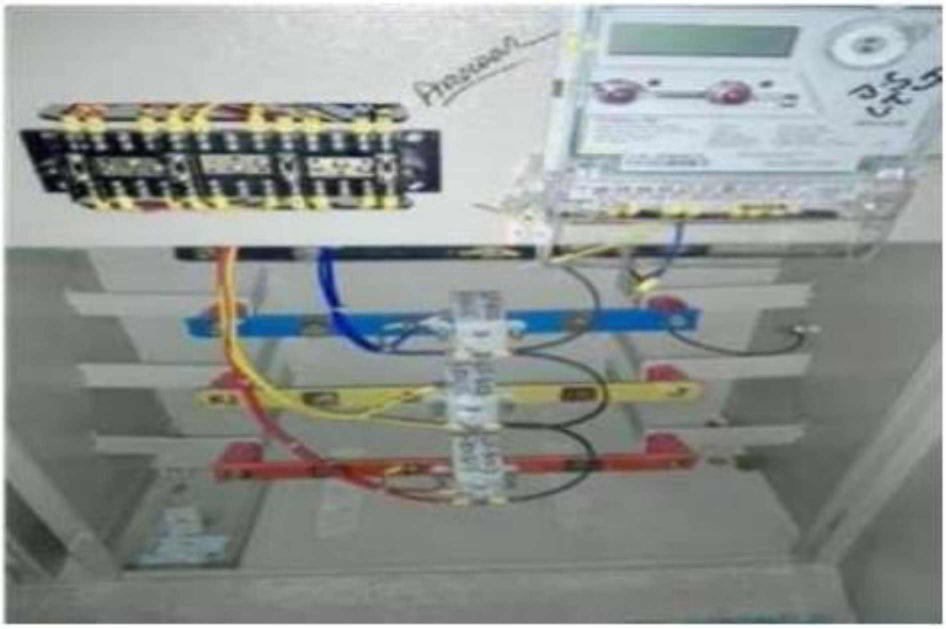

Figure 5.10: Low Tension Current Transformer meter

Figure 5.11: High Tension Current Transformer Meter

Prepaid Meter

This section of DESCO is situated in Mirpur-13. This is where prepaid meters are produced and tested.

They often taste every meter for 72 hours in order to prevent deterioration in the field.

This application uses a number of integrated circuits. At MALE, PLCs and software with an emphasis on microprocessors are also used. The newest meters in our nation are prepaid ones.

Bill collection will be considerably simpler thanks to this technique. This meter is challenging to calibrate since trying to access the meter box will set off an alert and turn the meter off. Because of this, security is great and it includes all of the features that made the previous meter so important. Because this meter has buddy l hour capabilities, customers may easily refill their cards because if its credit runs out after 10 p.m., it won't shut down until the next 10 a.m. It also has a calendar so that people may schedule their holidays.

Figure 5.12: Prepaid Meter

CHAPTER-6

Commercial Line Maintenance & Cable & Wire

6.1 Cable & Wire

Rating of various wire & cable types and pole types used by DESCO is given below:

Figure 6.1: 0.415 KV line over heads wires

Figure 6.2: 11 KV line over heads wires

Figure 6.3: 33 KV line underground cable

Figure6.4: Service Drop (6 mm2 duplex ,10 mm2 Q. duplex,16 mm2 Q. duplex,25 mm2 Q. duplex) wires

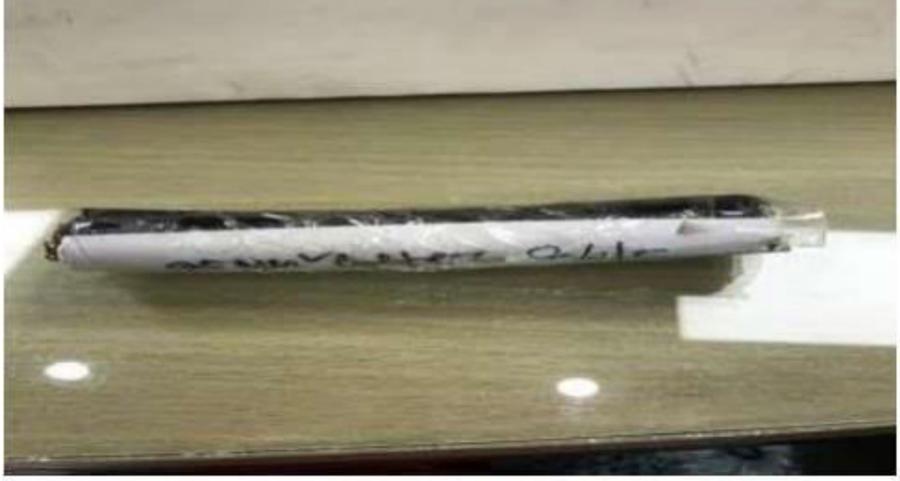

Figure6.5: 95 mm2 Copper Cable (connector of Bushing and Cable)

Meter that is pre-paid

1. A vending machine or system using smart cards

2. A keypad-equipped device

3. Self-Aware SIM

Figure6.6: Smart Card System Prepaid Meter

Figure 6.7: Smart Card and Smart SIM System Prepaid Meter

6.2 System Operation Line Maintenance

Figure 6.8: Line Maintenance

Load management:

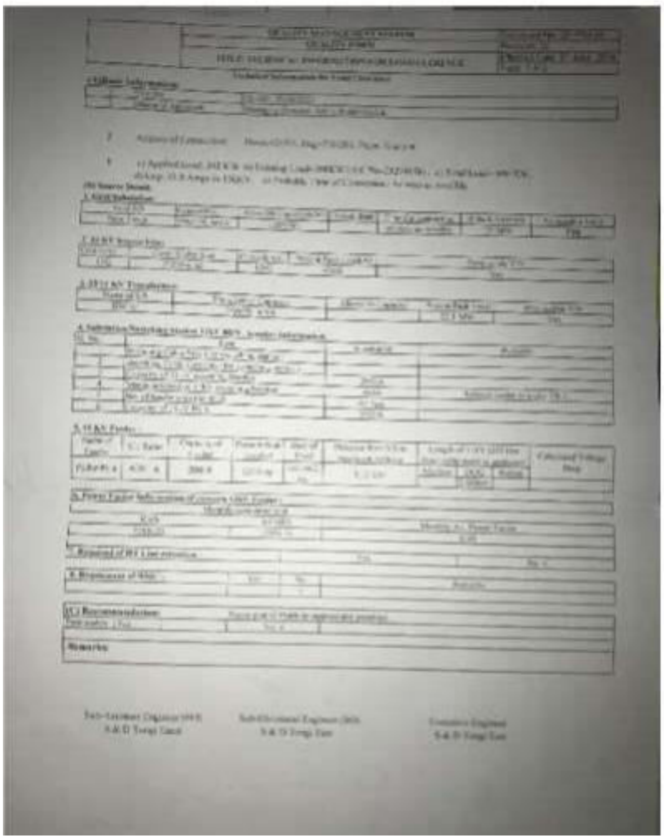

Figure 6.9: Technical Information for Load Clearance

Calculation

The DESCO 500-KVA, 3-phase, 50-Hz transformer is delta/star linked and has a voltage ratio (line voltages) of 132/33-kV. Each phase's resistance is 35 ohm at high voltage.low voltage of 0.876 ohm and 3050 W of iron loss. Find the efficiency values for (a) 500 kW at unity p.f. and (b) 0.8 p.f. at full load and half load, respectively.

Answer: K = 132000 □3×33000 = 2.309 per phase for the transformer ratio 2. 309 + 0.876 = □□2 2 x 35 = 187. 5□h□

Current in the secondary phase = 500000 □3×33,000 = 8.75 A Condition of full load: full load total cu loss = 3 × (500/(132−3)

2 times 187. 5 is 2690 W. 3,050 W is the iron loss.

Total losses at full load = 2490 + 3050 = 5760 w (a) unity p.f = 500 kw

ANS: 98. 86% (FL efficiency = 500000 505704 × 100) (b) output at 0.8 p.f = 400kw -: 400000 405740 × 100 = 98.58%(Ans) is the efficiency.

At half load, the output is equal to 250 kw p.f. Cu loss is 0.5 x 2690 = 672.5 W.

Total Losses = 3050 + 672.5 = 3722.5 W n = 2,50,000 253722.5 × 100 = 98.53 % (Ans)

For, P. f = 0.8: 200kw n = 2,00,000 2037225 × 100 =98. 17 % (Ans)

CHAPTER- 7

Problem Finding & Analysis

The electricity industry is made up of several sectors, each of which has a unique set of challenges. We are currently locating and analyzing the electricity meter issue=

There are some reasons for meter isn't working or stop working:

1. **Sparking:** The wiring of the meter connectors has a few short circuits. Examine your wiring, or hire a qualified electrician to complete the work. In the event that you discover any form of wire, report it to the local authorities.

2. **Smoking:** There is a slight smell of smoke coming from the meter. Check your meter to see if there is any smoke; if so, there may be an internal flaw or some parts that are broken. Report any concerns to your local authorities.

3. **Burning:** It is discovered that the meter is burnt; if this is the case, your meter may have an uneven or heavy load on it. Have you added a new appliance or placed a big load on your home recently? If so, assess the load on your property. If you discover any problems, get in touch with the local authorities as complaints are likely to be coming in.

4. **Meter Tempering:** Any action that causes the meter to run more slowly or not at all is known as "meter tempering." Anything that is utilized to redirect power away from the electric meter is also included.

Theft of electricity from the power provider by meter tampering.

Nowadays, the majority of cases involve persons attempting to moderate their meter. The meter will identify any uncompromising changes, at which point its microprocessor will malfunction and cease to operate.

CHAPTER- 8
Conclusion & Recommendation

8.1 Discussion

Industrial training has become an important and necessary part of education as a result of this training.

We acquired expertise on how to put all of the theoretical techniques we had studied into practice. Its support in assessing our theoretical comprehension using real facts has broadened my knowledge and improved my skills. Thanks to this industrial training, we might also learn more about subjects like power structures. The principles of transformer and operation, variations in the ratio and settings of CT and PT, bus bar system, cables, bushing, ignition system, lightning arrester, control and relay panel, synchronising, synchronic scope, transfer equipment, GIS (gas insulated switchgear), AIS (air insulated switchgear), incoming feeder, electricity item and full manage panel system The desire for strength is growing every day. The rate of growth in power generation is not fast enough to meet Bangladesh's needs. There is a substation at a company like Power Man Bangladesh Ltd. The management of DESCO might be prepared.cooperative but deficient in drive.

In the end, we found that business training offers us confidence in our capacity to handle any issues that happen in our activity zone and enables me to use my knowledge in a practical manner. He had a blast working as a software intern at DESCO. One of the most practical training environments for electrical and electronic engineers in the US is DESCO. The author ought to note that theories that were found at my college were almost found at DESCO. I think it's great that I was able to complete my internship with the respectable power distribution firm DESCO. It enabled me to use my academic skills in a real-world setting. There were a few days during my internship at DESCO that I will never forget. One of the best places in the nation for Electrical and Electronic Engineers to practice is DESCO. I have to admit that DESCO implemented the theories I had learned in college. I count it a great blessing to be a member of an internship program with the esteemed electrical distribution company DESCO. It enabled me to put my academic understanding to use in a real- world situation. My accomplishments with DESCO are listed below: DESCO's commercial. It has improved my capacity to think through the logical workings of the amazing apparatus.

My confidence in handling a destiny activity interview has grown as a result. Through industrial training at DESCO, my practical knowledge has expanded.

It has improved my ability to consider how different pieces of equipment work in real-world scenarios.

My confidence has increased for any upcoming job interviews. I had the once-in-a-lifetime chance to observe substation equipment thanks to DESCO, and the welcoming atmosphere there motivated me to collaborate. I learned a lot and obtained real-world experience during my internship at DESCO, which will help me in the future.

8.2 Limitations

Because they constantly operate a mechanical system, hardware enhancement is typically not possible. The few times a problem has arisen are only when unnecessary effort has been done all of a sudden. The author already knows a little bit about the practical workings of DESCO. But when you're short on time, it becomes difficult to get detailed information on everything. I was unable to gain entry to each place and collect enough photographs because of a few privacy concerns. It became challenging to visit and learn about the Nikunjo, Banani, and Tongi Sub-stations due to a few mechanical/technical concerns. During my internship, I was exposed to a few mechanical devices. But as an electrical engineering student, I had run into a few difficulties when these gadgets were being developed. Because a substation poses a serious risk to both UN staff and the general public, we are only able to thoroughly inspect a small number of items of equipment within the restricted area.

8.3 Recommendation

Community, security, and switchgear Automation is necessary for both the nation's economic system and the present electricity management system. The computer-controlled community.

Automation guarantees the administration of regional and national grids, as well as the regulation of power, voltage, frequency, and waveform in the face of fluctuating and competitive load situations. The Load Control Centre, communication channels, Power Station Control Rooms, and Substation Control Rooms are the means by which automation is accomplished. It is the responsibility of Dhaka Electric Power Supply Corporation Ltd. (DESCO) to oversee the energy transmission and distribution networks. During my studies, I learned about power transmission and distribution devices, controlling and using breakers, isolators, and the history of alarm watching signs. Additionally, I learn about different preservation techniques like conductor insulation testing, transformer dielectric energy of oil testing, and so on. DESCO provides excellent internship options that are advantageous to both in theory and in practice. I think DESCO should keep providing internships. College students who are almost finished with their engineering programs will find it very helpful

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