OVERVIEW OF

BASIC POWER ENGINEERING Ltd.

A project and thesis submitted in partial fulfillment of the requirements

For the award of degree of

Bachelor of since in Electrical and Electronic Engineering

By

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DAFFODIL INTERNATIONAL UNIVERSITY

June 2021

CERTIFICATION

To demonstrate that the report title "Overview of Basic Power Engineering Ltd" was administered by the following understudy under the management and this work was directed by research centers of electrical and electronic designing divisions under the workforce of designing Bachelor of Electrical and electronics designing show of the work was held at Daffodil International University on 31 December 2020.

Signature of the candidate

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The undertaking and theory named "**Overview of Basic Power Engineering Ltd** " Submitted by MD. Nuralam Siddik, ID: 173-33-4294, meeting Fall 2020 has been acknowledged as agreeable in halfway satisfaction of the prerequisites for the level of **Bachelor of Bachelor of since in Electrical and Electronic Engineering** on 31 December 2020

Internship Certificate

SL.NO 20/001

BASIC POWER ENGINEERING LTD

Iso 9001 : 2015 Certified Company

Borodeora,Shingbari,Tongi,Gazipur.

INTERNSHIP CERTIFICATE

This is to certify that MD. Kuralam Siddik, Roll No 16305094, Reg No .....,
Department Electrical & Electronics Engineering, Session 2021 .....,
A Student Of Daffodil International University .....
Has Under Gone Industrial Attachment Training In The Basic Power Engineering Ltd, Tongi, Gazipur. From March 2021 to May 2021 During The Period Of Training He was Found Attentive, Intlligent & Inquisitive.

We Are Confident That This Industrial Attachment Training Will Be Helpful For Future Career.

Chairman

Date: 01-May-2021

MANAGER TRAINING

BOARD OF EXAMNIORS

..... External member

Name:

Designation:

..... Internal member

Name:

Designation

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List of Abbreviation

A= Ampere

V= Voltage

EMF==Electromotive force

P= Primary

S= Secondary

Vs= Secondary Voltage

Vp= Primary Voltage

Ns=Secondary Turn

Np=Primary Turn

AC= Alternating Current

DC=Direct Current

Φ= flux

η= Efficiency

MVA= Mega Volt Ampere

kVA= kilo Volt Ampere

CT= Current Transformer

PT= Potential Transformer

ONAN=Oil Natural Air Natural

DAR= Di-electric Absorption Ratio

HV= High Voltage

LV= Low Voltage

HT=High Tension

LT= Low Tension

W=Watt

SWG= Standard Wire Gauge

CCA=Core Coil Assembly

Δ= Delta

Y=Star

Dedicates to

Our parents

Acknowledgement

First thing I should thank the Almighty Allah for giving us constancy to close my entrance level position program and finally this advanced association. Setting up the brief occupation report reliant upon Maintenance (EEE) a beginning, I have grasped that it is difficult to find the fundamental and a head a spent of Machine Control is generally far away from the theoretical academic data. I offer my impassioned gratitude to Md. Akbar, Basic Power Engineering Ltd, assistant general manager utility & maintenance. I'm so much thank full to Mr. Arif Hossain, production and design engineer, Basic Power Engineering Ltd. I'm appreciative and significantly in talked to my respected teacher MD. Mahbub-Ud-Jaman Department of Electrical and Electronic Engineering, DIU for his constant assistance, support, suggestion, heading and valuable examination to move beyond the mechanical transitory work. I also thank the chief technician MD. Ratan Islam and Co technician MD. Shahjahan of their support, suggestion, heading and valuable examination to move beyond the mechanical transitory work. I thank the organization of— Basic Power Engineering Ltd, for permitting me the opportunity to encounter Industrial Training there. Consequently, everything thought about it might be said that without their help it would not be serviceable for me to set up this impermanent occupation report. So I should give appreciation to documentation to all who directly or by suggestion contributed and breathed life into individual chance to time in setting up the report. My appreciation in like manner goes to all of the delegates of— “Basic Power Engineering Ltd " for their actual co-movement, backing and critical advice which they have given me during the planning of two months.

ABSTRACT

Basic Power Engineering Ltd. is the Electrical Distribution and Switchgear fabricating industry in Bangladesh. It has the condition of the apparatus and follows the current component for creation. Basic Power Engineering Ltd. Produced/Maintenance/Repair Transformer, Distribution board, Sub Distribution board, Power factor improvement device. Basic Power Engineering Ltd. a prospective company is running its business since January 2007 under the prominent successful leadership of the company Directors. the objective of the company is to provide alternate forms of energy and power source to industries based on the government green future. Now the Company is grown as one of the leading organizations in the electrical field and offers a comprehensive range of Supply & Services for the industrial sector. It has three decades of experience in carrying out the full spectrum of electrical contacts for the range of Engineering, Procurement, and installations. the company involved in offering complete electrical solutions that cover designing, supplying, installation, testing, and commissioning of Electrical Projects. They are also one of the leading Suppliers and Service Providers of all range of LV, HV and EHV Distribution Equipment and Accessories that is widely used in electrical plants and substations. The priority of the company is to gain a thorough understanding of the business requirements of clients and efficiently deal with them. They are capable of meeting every related need and provide complete integrated service with the help of a fully committed and equipped team. They capitalize on their innovative technology for all types of internal and external electrification products. Likewise, we have been furthermore prepared to get decline the worth construction with a reserve of significant things and creation of work Openings. Since the association's simply pointed is to serve our customers for their most limit satisfaction, at that point it has given transcendent importance as well:

- Sustainable cost
- Guarantee of value item

Thusly, it's urgent to give Bangladesh a first-class organization. the radiant powerful labor force is in its business who feels a plain environment in the association. We endeavor to give them the opportunity to contribute their best in the progress of significant worth things and presenting first-class organizations to the most limited satisfaction to its purchasers. They work here with perfect energy and obligations in co-usable concordance. Obliging the home market our vision is to cross the edge and let our thing go into the worldwide market.

CHAPTER 1

INTRODUCTION

1.0 introduction:

Assuming the hypothetical information is a glass of water, the reasonable information would be drinking the water. It is in every case simple to cause a man to comprehend about a firebox by appearing and lighting basically as opposed to portraying hypothetically who has not at any point seen a firebox. Thus, for any specialized schooling, commonsense experience is the main well as hypothetical information. As I am concentrating in a specialized line, it is consistently significant for me to accumulate functional information. Through my examination life, the solitary greatest possibility for me to join hypothetical information with pragmatic information is the mechanical connection period—which comes as it were once in the schooling life. So I can undoubtedly understand the significance of modern connection and what's more, the information I assembled from the mechanical preparing reflects in the report of the modern connection note pad.

So modern connection is the interaction where the learner can mix his hypothetical information with reasonable information expanding his capacity of work, expertise, execution, and mentality and soon. It likewise gives adequate information about creation the board, usefulness assessment, work-study and effectiveness, modern administration creation arranging and control, creation cost examination, stock administration, utility, support, etc. Mechanical connection makes us dependable to be acquainted with the modern climate and furthermore improves mental fortitude and motivation to assume self-liability. I made an honest effort to set up this note pad applying my earnest attempts. I attempted to assemble all the essential data to make it significant for me just as for everybody. I figure it will help me a ton in future on my down to earth life.

1.1 Objective

1.1.1 Broad of Objective:

The wide level headed of this report is mostly to comprehend the assembling, collecting, and testing interaction of conveyance transformer and applying this information for improving the capacity and expanding the ability of the force area of our country.

1.1.2 Specific objectives:

The specific goals of the entry level position were as per the following:

- To apply hypothetical information in the viable field. Gathering Knowledge with respect to Distribution Transformer.
- To think about the computation interaction and gain some information about the amassing cycle of a Transformer.
- To notice the assembling cycle and testing interaction of the Transformer.
- To understand the authoritative administration arrangement of Basic Power Engineering Limited.

1.2 Scope of the Study:

The report covers the transformer division of Basic Power Engineering Limited. This report particularly accentuates on assembling of a transformer. I had the chance to have a nearby perspective on the specialist's exercises of Basic Power Engineering Limited.

1.3 Data Collection:

The examination was for the most part the Manufacturing, Assembling, and Testing of Distribution Transformer. Both essential and auxiliary information are being gathered with the end goal of this report.

1.3.1 Primary Data:

Essential Data is gathered from the pragmatic work with a face-to-face discussion with the architects.

1.3.2 Secondary Data:

Optional information was gathered from the online web assets and books of various writers, records and envelopes, every day journal (containing my exercises).

1.4 Limitations of the Study:

There were sure restrictions while leading the examination. These are summed up underneath:

- The primary deterrent while setting up this report was time. As the residency of the entry level position program was exceptionally short, it was impractical to feature everything profoundly.
- A significant segment of the investigation had been led dependent on optional information.
- Confidentiality of data was another boundary that blocked the examination. Each association has its own mystery that isn't uncovered to somebody outside the association. While gathering information at Basic Power Engineering Limited, work force didn't uncover sufficient data for the privacy rule of the association.

CHAPTER 2

COMPANY PROFILE

2.0 Company name:

Basic power engineering Ltd.

2.1 Company profile:

Essential Power Engineering Ltd. is the Electrical Distribution and Switchgear manufacturing industry in Bangladesh. It has the state of the contraption and follows the current part for creation. Fundamental Power Engineering Ltd. Created/Maintenance/Repair Transformer, Distribution board, Sub Distribution board, Power factor improvement gadget. Fundamental Power Engineering Ltd. a forthcoming organization is maintaining its business since January 2007 under the unmistakable fruitful authority of the organization Directors. the target of the organization is to give substitute types of energy and force source to ventures dependent on the public authority green future. Presently the Company is developed as one of the main associations in the electrical field and offers an extensive scope of Supply and Services for the mechanical area. It has thirty years of involvement with doing the full range of electrical contacts for the scope of Engineering, Procurement, and establishments. the organization associated with offering total electrical arrangements that cover planning, providing, establishment, testing, and appointing of Electrical Projects. They are additionally one of the main Suppliers and Service Providers of all scope of LV, HV and EHV Distribution Equipment and Accessories that is broadly utilized in electrical plants and substations. The need of the organization is to acquire an exhaustive comprehension of the business necessities of customers and proficiently manage them. They are fit for meeting each connected need and offer total incorporated assistance with the assistance of a completely dedicated and prepared group. They profit by their inventive innovation for a wide range of interior and outer charge items. In like manner, we have been besides set up to get decrease the value development with a hold of critical things and making of work Openings. Since the affiliation's essentially pointed is to serve our clients for their most cutoff fulfillment. With the mission of offering top-quality types of assistance to its clients, the gathering consistently targets improving the proficiency of creation measures utilizing the most recent

innovation. Today Basic Power Engineering Ltd is one of the prestigious providers in regard to quality, giving, and the most dependable Switchgears producers giving excellent Electrical equipment's like power transformer, distribution transformer, dry type transformer, Feeder Automation, Grid Automation And SCADA Software, Medium Voltage Switchgear, Medium Voltage Switchgear Components, Outdoor Switchgear And Equipment, Power Monitoring And Control, Protection Relays, Energy Management, Fault Passage Indicators.

2.2 Major Works Involved:

- To provide large KVA rating power transformer to customer.
- To acquaint with the installation and commissioning of thousands of transformers, switchgears, and complete substations.
- To involve with the service and maintenance of its own supplied equipment.
- To provide complete solution to the customers including engineering, procurement and construction.
- Working hard and aiming high.
- Serving and devoting to through customers

2.3 Departments of Basic Power Engineering Limited

- Transformer Division
- Switchgear Division
- Instrument Transformer Division
- Breaker & Isolator Division
- Administration Division
- Research & Development Division
- Human Resource Management Division

2.4 Office Address:

2.4.1 CORPORATE OFFICE:

House# 71 (2nd Floor), Block - C, Avenue# 05, Section - 06, Mirpur, Dhaka-1216, Bangladesh.

E-mail:

support@bpelbd.com

info@bpelbd.com

Phone Number:

+88-02-9006204

+88-01713-275958

+88-01713-275959

2.4.2 Factory:

Address: Borodeora, Shingbari, Tongi, Gazipur.

Chapter-03

Transformer

3.0 Introduction:

Transformers contribute enormously to the transmission and dissemination of electric force in the present world. It is one sort of static gadget. This gadget can without much of a stretch exchange electrical energy starting with one circuit then onto the next without changing the recurrence. Note that in this interaction there is no electrical association between the loops. In any case, the two curls are attractively associated to one another. This is the element of the transformer. As there are no pivoting portions of the transformer, there is no deficiency of force because of check of air. The said cycle depends on the standard of electromagnetic enlistment in the entire interaction during the exchange of electrical energy. Researcher Michael Faraday found this rule in 1831.

"A transformer is an electrostatic machine which consistent recurrence increment or decline voltage and move equivalent electric force starting with one circuit then onto the next is called transformer".

3.1 Construction and operation of transformer:

- electrical force equivalent
- steady Frequency
- supply voltage increment or reduction

At the point when transformer working then voltage expands current decline or voltage decline current increment

Step up transformer: At the point when transformer working then voltage expands current decline or voltage decline current increment.

Step down transformer: At the point when transformer working then voltage expands current decline or voltage decline current increment.

3.2 Portray various pieces of the transformer:

a. high voltage winding
b. low voltage winding
c. oil level indicator
d. conservator
e. breather
f. drain cock
g. tube for cooling
h. transformer oil
i. earth point
j. expulsion vent
k. temper gauge
l. Buchholz relay
m. Thermometer
n. Carriage
o. Pressure relief valve
p. Oil pump
q. High voltage bushing
r. Low voltage bushing

3.3 Instrument transformer:

- which transformer utilizing low reach ammeter however estimating high current is called ct.
- which transformer utilizing low reach voltmeter yet estimating high voltage is called pt.

3.4 The materials used in transformer construction discussion below:

A. Alloy steel shit(0.22mm-0.35mm)
B. Laminated core
i. Cold rolled shit
ii. Hot rolled shit
C. Insulation

i. Varnish

ii. phosphate

D. Insulating material: leather wade paper, cotton, silk, wood, paper, fiber, resin, mica, asbestos, ceramic, burnish, Etc.

E. Insulating cupper wire or super enamel wire or cupper flat bar

F. Ampere tube

G. Ampere cloth

H. HT and it terminal house

i. High side low side bushing

ii. Tap changer

iii. Conservator

iv. Breeder

v. Transformer tank

vi. Buchholz relay

vii. Culling fan

viii. Transformer oil

ix. High side low side winding

I. Template, cover, nut bolt.

3.5 Cast resin transformer or Dry Type Transformer:

The air-core transformer is known as a dry-type transformer. It works noticeable all around. Here the air goes about as Protection and cooling. The construction resembles an oil-inundated transformer. This sort of A transformer is utilized as an elective where there is a chance of a mishap because of a fire in an oil-conveying transformer.

Fig 3.5: dry type transformer (cast resin)

At present Basic power engineering Ltd. is restricted assembling huge and medium sort transformer by utilizing aluminum crap So that the curl is given by sap a role as protection. The loop is usually aluminum plain poo and loop ordinarily implies wire curl. This curl is protected cast by tar. This sort of transformer is less expensive to utilized and less inclined to burst into flames. This kind of transformer ordinarily made 1000kva to 5000kva.

3.6 Advantage of dry type transformer:

a. light in Wight

b. upkeep free

c. eco-accommodating

d. precisely open minded

e. over-voltage gives high obstruction

f. high-productivity

g. simple development

h. fire douser

I. gives high resistive in the event of overvoltage

j. creates less commotion

k. liberated from poisonous destructive gases

l. excellent limit finished

m. high voltage loops are liberated from dampness

3.7 Uses of CRT:

a. Elevated structure

b. Condo

c. Emergency clinic

d. Metro

e. Secret market

f. Force plant

g. Substation

h. Material and articles of clothing ventures

I. Synthetic businesses

j. Metro rail.

3.8 Transformer losses:

a. Iron loss or Core loss

i. Eddy current loss

ii. Hysteresis loss

b. I2R loss or Copper loss

Approaches to lessen hysteresis loss: great attractive seats center manganese steel or silicon steel is utilized.

Approaches to lessen Core loss: this misfortune can be diminished by making it slenderer covered center with high silicone.

3.9 No load test or Open circuit test:

An open circuit test is a test performed on one or the other side of a transformer, for the most part with a high voltage side and with the necessary number estimating instruments associated to the transformer and applied to the evaluated typical full recurrence of the transformer. Lowe voltage side is associated ammeter, voltmeter, wattmeter. ayes to decrease hysteresis misfortune: top-notch attractive seat center manganese steel or silicon steel is utilized. Approaches to diminish center misfortune: this misfortune can be decreased by making it slenderer covered center with high silicone.

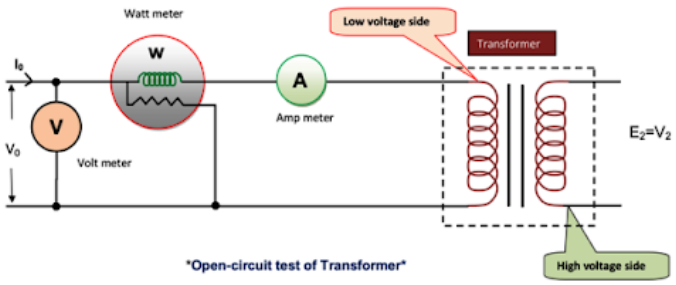

Fig: 3.9 No load test or open circuit test

3.10 The data that is accessible by testing the open circuit:

a. Eddy current loss and Hysteresis loss

b. Current when transformer if no load

c. Magnetizing current

d. Active current

e. Resistance of Core loss

f. Power factor of no load

g. Ratio of Transformation

3.11 The data that is accessible by testing the short circuit:

1.Resistance of Equivalent circuit

2.Reactance of Equivalent circuit

3. Impedance of Equivalents circuit

4. Losses of cupper

5. Resistance and Efficiency

3.12 The technique for cooling the transformer:

1. Constrained air cooling

2. Oil-submerged self-cooled

3. Oil-submerged constrained water-cooled

4. Cooling Naturally

5. Oil-submerged constrained air cooling

6. Oil constrained water constrained

7. Power factor for no load

8. Ratio of Transformation

3.13 Oil inundated self-cool:

In this strategy, the center and loop of the transformer are totally submerged in protecting oil. Various iron lines or cylinders are introduced outwardly of the bolt transformer tank. These are constantly loaded up with transformer oil. At the point when the transformer center or loop is warmed in the full burden the oil warms up and gets lighter and ascends to the top. This hot light oil enters the line and enters the virus oil transformer tank of the line. At that point the hot oil in the line cools in touch with the air and goes down. Normally, oil flows stream center loop pipe. Accordingly, the actual transformer cools with the assistance of its own oil.

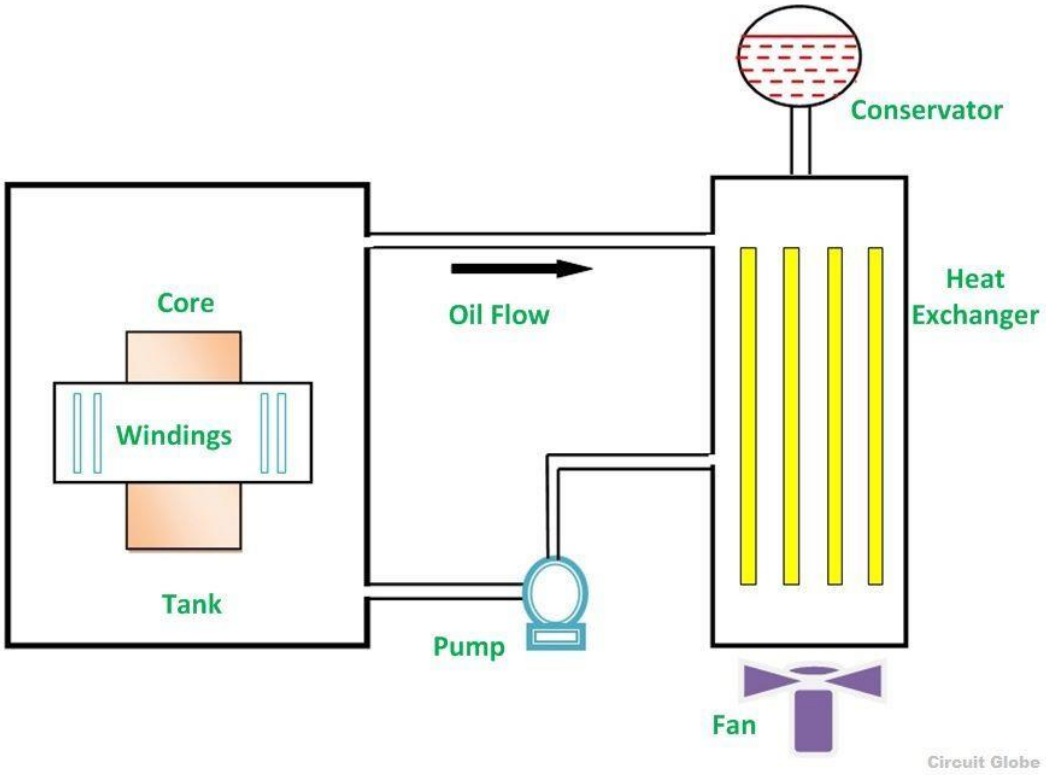

Fig: 3.13 Oil inundated self-cool system

3.14 Purposes behind Parallel Operation

Equal activity of a transformer is important in view of the accompanying reasons are given underneath:

It is unrealistic and uneconomical to have a solitary enormous transformer for hefty and huge burdens. Thus, it will be a shrewd choice to associate various transformers in equal.

In substations, the all-out load required might be provided by a fitting number of the transformer of standard size. Subsequently, this diminishes the extra limit of the substation.

In the event that the transformers are associated in equal, so there will be degree later on, for the development of a substation to supply a heap past the limit of the transformer previously introduced.

In the event that there will be any breakdown of a transformer in an arrangement of transformers associated in equal, there will be no interference of the force supply, for fundamental administrations.

On the off chance that any of the transformer from the framework is removed from administration for its support and investigation, the congruity of the stock won't get upset.

3.15 Equipment classification of 500kVA, three phase Distribution Transformer:

Table 3.1: Specification of Transformer

Brand	Basic Power Engineering Ltd.	
Type of Transformer	Step down	
Serial No	500-013	
Rated power	500 KVA	
Rated voltage	HV side – 11 KV	LV side – 415 V
Rated current	HV side –26.24 A	LV side –695.6A
Phase	3	
Rated Frequency	50 Hz	
Connection type	HT side – Δ	LT side – Y
Cooling type	ONAN	
Insulation Level		
Impulse (Peak)	HV Side- 75KV	
Power Frequency	HV Side -28 KV	LV Side -3 KV
Temperature Rise		

In Oil	60°C
In Windings	65°C
No Load Loss	1000W
Load Loss	5500W
Impedance voltage	4%
Total Weight	1765Kg.
Oil Quantity Ltr.	415
MFG Year	2020

3.16 Transformer core:

Fig: 3.16 Core

A transformer center consistently makes a way into its center channels towards the attractive motion. The right utilization of exceptionally penetrable material assists with accomplishing low hesitance to stay inside the center in the way of attractive transition. Generally, it is made of a few slight electrical steel sheets known as cover sheets. There are numerous kinds of center is accessible, for example, steel covered, strong, and air-center just as varieties of each inside their separate classes.

3.17 Copper

HT side copper wire:

Copper and aluminum are the solitary two winding materials utilized in a transformer there could be no other winding materials that can be utilized as productively and monetarily.

Figure 3.1.1: Copper wire for HT

LT side copper wire:

It isn't viewed as that there is any critical material improvement accessible here. They utilization of bigger winding conductor cross-segment to lessen winding opposition and consequently load misfortune is a potential choice for development. Anyway bigger cross-segment conductor will likewise have the undesired impact of expanding swirl current misfortune when consonant current is available in the twisting with the nonlinear burden. They will likewise add to the weight and cost. Lower temperature activity and the orderly lower winding opposition would lessen load misfortune however would mean lower influence limit with regards to a similar size transformer unit.

Figure 3.2.2: Copper wire for LT

Chapter 4

Transformer Calculation & Processes

4.1 General Calculation of a Transformer

We figure every one of the things of 500kVA Transformer:

Table 4.1: Transformer data table

	HV	LV
Connection type	Delta	Star
Line Voltage	11000V	415V
Line Current	=(kVA × 1000)/ (√3 × line voltage) =(500 * 1000)/ (√3* 11000) =26.24A	=(kVA × 1000)/ (√3 × line voltage) =(500 * 1000)/ (√3* 415) =695.6A
Phase Voltage	Line Voltage=Phase Voltage	415/√3 = 239.6 V ≈ 240V
Phase Current	26.65/√3=15.38 A	Line Current=Phase Current

Power P= 500kVA

Primary /line voltage =11000 Volt

Secondary / line voltage = 415 Volt

At first we need to find out the Diameter of a Transformer

Diameter $=3.94*(kVA)^{1/4}$[it can vary from 3.5-4]

$=3.94*(400)^{1/4}$

=18.63 cm

=18.63*10mm [1cm=10mm]

=186.33=186mm

We can consider 186mm for rounding process

Let, Core width=180mm

The thickness of each stack pertaining to a particular core step is calculated as follows:

We consider step=S

$S_1 = \sqrt{((186)^2 - (180)^2)}$

=46mm

Let, Core width=165mm

$S_2 = \sqrt{((186)^2 - (165)^2)} - S_1$

= (85.85–46) mm

=40mm

Let, Core width=150mm

$S_3 = \sqrt{((186)^2 - (150)^2)} - (S_1+S_2)$

= (109.98–86) mm

=24mm

Let, Core width=135mm

$S_4 = \sqrt{((186)^2 - (135)^2)} - (S_1+S_2+S_3)$

= (127.94–110) mm

=18mm

Let, Core width=120mm

$S_5 = \sqrt{((186)^2 - (120)^2)} - (S_1+S_2+S_3+S_4)$

= (142.12 – 128) mm

=14mm

Let, Core width=105mm

$S_6 = \sqrt{((186)^2 - (105)^2)} - (S_1+S_2+S_3+S_4+S_5)$

= (153.52–142) mm

=12 mm

Let, Core width=90mm

$S_7 = \sqrt{((186)^2 - (90)^2)} - (S_1+S_2+S_3+S_4+S_5+S_6)$

= (162.77–154) mm

=9 mm

Let, Core width=75mm

$S_8 = \sqrt{((186)^2 - (75)^2)} - (S_1+S_2+S3+S4+S5+S6+S7)$

= (170.20–163) mm

=7mm

$S_9 = \sqrt{((186)^2 - (60)^2)} - (S_1+S_2+S_3+S_4+S_5+S_6+S_7+S_8)$

= (176.05–170) mm

=6mm

Now, we need to select the Area,

At first we need to find out per core Area, A_1=Width*thickness

= 180*46

= 8280

A_2=165*40

= 6600

A_3= 150*24

= 3600

A_4= 135*18

=2430

A_5=120*14

=1680

A_6=105*12

=1800

A_7=90*9

=810

A_8=75*7

=525

A_9=60*6

=360

Area= Total Area/100

=(A_{1+} A_{2+} A_{3+} A_{4+} A_{5+} A_{6+} A_{7+} A_8 +A_9)

=26085/100

=260.85mm

Per turns voltage = $4.44*f*Bm*A*10^{-4}$ [we can select Bm from 1.5-1.7]

$= 4.44*50*1.60*260.85*10^{-4}$

= 9.265V

Where, f= frequency

Bm= Flux density

A= Area

LT Turns=Secondary phase voltage / Per turns voltage

=240/9.266

=25.90

= 26 turns

Conductor Area Selected for 500kVA Transformer

Secondary Coil/LT Winding

Secondary Winding type=Helical Winding

Secondary Current, P=√3VI

I= P/√3V

I=KVA*1000/√3*415

I=00*1000/√3*415

=695.6A

Current density for Cu in Oil Maximum 3.5

Let, We Consider,

Cu Current density =3.03

Here,

We need LV side current=695.6A

[We select conductor which current capacity is 695.7 which comes from this equation calculating value= 8.9*4.3*6*3.03]

Arrangement of conductor=3*2

Conductor=8.9*4.3

Insulation=0.5mm

Overall Size of Conductor=9.4*4.8

Total Turns=26

Layer = 2

Per layer turns = 26/2

=13

Inter layer insulation = 0.5mm

In Diameter of coil LV= (186+6) mm

=192mm

Height of the Coil= (9.4*3)*(13+1) [1 coil Extra for Helical Windings]

= 393+ (17+17+6) [Side ring/side gear upper17mm and lower 17mm

= 393+40 Conductor per turn air gap=6]

∴ Height of the Coil = 433mm

Out Diameter of LV = {(4.8*2) *2 + (4.8*2) *2} +In diameter

=38.4+192

=230.4 +0.6 [layer insulation 0.8]

=231

Conductor Weight= (In diameter+ Out diameter)/ 2 [Mid diameter= In dia + Out dia/2]

= (192+ 231)/2

= 211.5

= 211.5*3.1416*26 [Length=mid diameter* π *LT Turns]

= 17275.65*8.9*4.3*6 [width=8.9, thickness=4.3, Conductor number=6]

\ = 3966836.682*0.0000089 [0.000089=constant density of copper]

= 35.30*3 [3coil]

= 105.91+10[10=starting and finishing lead]

= 115.91 kg

Primary Coil/HT Winding

In Diameter= 254[LT to HT gap 23mm, but we can take maximum 25

∴ Out diameter of LT + gap=231+23=254 in diameter of HT]

Current density= 3.11 Primary Current, P=√3VI

∴ I =P/√3V

=500*1000/11000*√3

= 26.24

= 26.24A [Line Current]

= 26.24/√3

= 15.15 [Phase Current]

Table 4.2: Size of Wire

SWG	In	mm	SWG	In	mm
1	.300	7.620	21	.032	.813
2	.276	7.010	22	.028	.711
3	.252	6.401	23	.024	.610
4	.232	5.893	24	.022	.559
5	.212	5.385	25	.020	.5080
6	.192	4.877	26	.018	.4572
7	.176	4.470	27	.0164	.4166
8	.160	4.064	28	.0148	.3759
9	.144	3.658	29	.0136	.3454
10	.128	3.251	30	.0124	.3150
11	.116	2.946	31	.0116	.2946

12	.104	2.642	32	.0108	.2743
13	.092	2.337	33	.0100	.2540
14	.080	2.032	34	.0092	.2337
15	.072	1.829	35	.0084	.2134
16	.064	1.626	36	.0076	.1930
17	.056	1.422	37	.0068	.1727
18	.048	1.219	38	.0050	.1524
19	.040	1.106	39	.0052	.1321
20	.036	.914	40	.0048	.1219

For this Transformer,

We use 12.5 SWG(TPC) = 2.49mm [from the table]

Conductor area= $\pi D^2/4$

$= 3.1416*(2.49)^2/4$

$= 4.86$

Current density= 3.11A [Maximum current density=3.5]

Tapping for 2.5% to -7.5%

Primary turns =LV turns* Ratio

=26*45.9 [Ratio=$\sqrt{3}$Vp/VC =1.732*11000/415 =45.9]

=1193.4

= (1193.4*2.5%) +1193.4

=29.83+1193.4

=1223.23=1223

Turns /section =1223/6

=203.87=204

Type of Coil=6 [normal coil 4, Tap coil =2]

We use paper covering Copper Wires,

Insulation=0.5mm

Overall Size=2.49+0.5

=2.99

Arrangement of Conductor =1

Height of coil=59

Layer =11

In diameter =254

Out diameter = Conductor thickness*layer + Inter layer insulation

= (2.99*2)*11+1.08

=43.92+1.08

=66.86+2254 [254=HT In diameter]

=320.86 = 321mm

Conductor Weight= (In diameter + Out Diameter)/2 [Mid diameter= (In Dia + Out Dia)/2]

= (254+321)/2

=287.5

=287.5*3.1416*204 [Length= Mid diameter* π *HT Turns]

=184254.84*4.86 [Area of Wire= 4.86]

=895478.52*0.0000089 [0.000089=Constant density of copper]

=7.97*18 [18 coil]

=143.46 kg

4.2 Core Calculation

Window height=453 mm [20mm more than LT coil]

Limb center=332 mm [11ml extra from out diameter of HT; it can take maximum 20]

Diameter of core =186mm

Table 4.3: Core plates dimension with quality

S/N	$Length_1$	Width	$Length_2$	Stack
A Core				
A_1	453	180	813	46
A_2	453	165	783	40
A_3	453	150	753	24
A_4	453	135	723	18
A_5	453	120	693	14
A_6	453	105	663	12
A_7	453	90	633	9
A_8	453	75	603	7
A_9		60	573	6

	453			

B Core

B_1	453	180	633	23
B_2	453	165	618	20
B_3	453	150	603	12
B_4	453	135	588	9
B_5	453	120	573	7
B_6	453	105	558	6
B_7	453	90	543	4.5
B_8	453	75	528	3.5
B_9	453	60	513	3

C Core

C_1	152	180	844	46
C_2	167	165	829	40

C_3	182	150	814	24
C_4	197	135	799	18
C_5	212	120	784	14
C_6	227	105	769	12
C_7	242	90	754	9
C_8	257	75	739	7
C_9	272	60	724	6

4.3 The Process of Transformer Manufacturing:

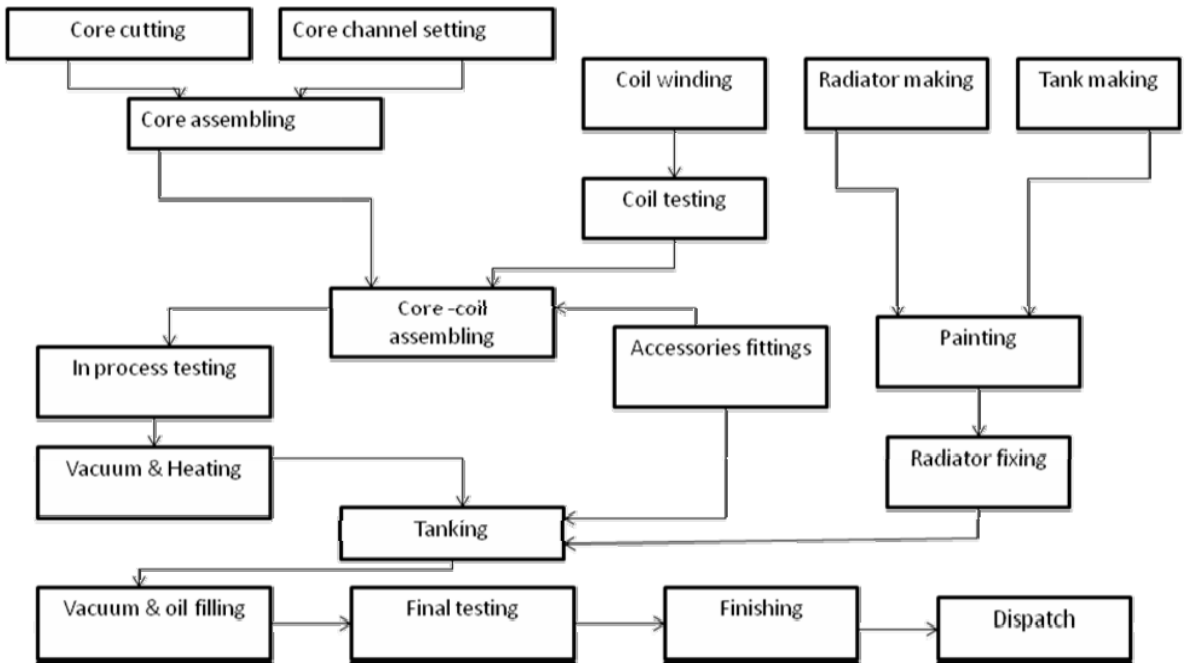

Figure 4.1: The flow chart for Manufacture of transformer

4.4 Cutting of core:

In the wake of ascertaining the estimation of the center we cut the center by utilizing an alternate machine to get our necessary shape. The center is made of Cold-Rolled High Grained Oriented (CRGO) silicon steel. The center cut of a point 900 fit and 450 for MITRED shape additionally cut "V" score. Marking and Wound center 0.27 mm thick M4 grade silicon steel.

4.5 Assembling of Core:

The centers mitered and collected in sync lap arrangement. The mitered joints are given a base hole. The bracing design is a created steel outline produced using standard points, channels, or plate development. In the wake of orchestrating the center, we straighten out the center with 4 channels and tie the poles and screw them as demonstrated in fig 5. After close up the center cotton tape will be splashed appeared in fig 6. Subsequent to straightening out the center, the upper two channels and C center are open for setting the two curls (LT and HT) into the center. Prior to putting the center, over the cotton tape, there is 6mm protection paper is wrapped into two sections (3mm+3mm); which is utilized for protection among the center and curl and give a base separator inside the three centers what isolated among loop and channel

4.6 The system of making transformer winding:

There are two windings twisted over the transformer center which are shielded from one another. Windings comprise not many turns of copper curls bundled together, every bundle is related in arrangement to the type of windings. The low voltage twisting is fit as a fiddle; the high voltage twisting is in barrel-shaped or foil type. HT and LT windings are only the determined loop type of copper wire. So it will have an adequate limit gotten against a short out and make the attractive circuit more sensible. The winding conductor is attracted to different sizes in round and rectangular shapes. The decision of conductor and protection covering relies upon the voltage class, current, cooling, and protection clearances. The

cross-segment of the winding gives the vital region to deal with the current. The conductor is twisted into loops. The windings are planned to guarantee decreased pivotal burdens in Short Circuit conditions and furthermore to withstand drive and over-voltages. Some standard types of curl windings are twisting, helical, interleaved circles, and plain plates. For Power Transformers, both low voltage and high voltage windings are plate type, which gives the most elevated obstruction against impeding. It is guaranteed that appropriate pressure is given on the twisting for unbending nature.

4.7 Assembling Coil into the transformer core frame:

The transformer encounters dynamic powers because of continuous stacking and dumping. The unexpected stacking and withdrawal of burden make pliable weight on the twisting in type of clasping powers or blasting powers. The development of the CCA (Core Coil Assembly) by giving adequate spiral and pivotal backings keeps the pressure from making any harm the windings. Subsequent to setting the loop in the center it would seem that fig 10. The Head of the leg is tight by cotton and afterward again press board is set on top of the curl for protection between the loop and upper channel. The Press board is sliced by space between one center leg to another leg. Subsequent to setting the press board C sort of center is set in the center legs to finish center plans.

4.8 Working process of Tap changer:

Tap change from + 2.5% to - 7.5%

For our first worth, we get tap after 2.5% of all out turns for 10V pretty much. Since we know essential voltage consistently not the equivalent once in a while it might change. It will direct the yield voltage by adjusting the number of turns and in this manner changing the turn proportion of the transformer. We brought out 1 wire after each 32 abandons the all-out turns of High-pressure twisting, after diverting out six wires from four stages we will interface those by a tapped transformer from 1 to 5 tap.

For making a star association on the LT side, we need to make a 3 stage association and regular nonpartisan with three loops. Therefore, we need to contact wire and contact material to interface with bushing.

For the most part, the Transformers are either Δ to Y or Y to Δ associated. In the event that the High voltage side Delta associated, the low voltage side Y associated, and the other way around. We associated HT side is Delta association and LT side is star association.

After Δ to Y Connection, we associate HT side with HT side Bushing and LT side with LT Side Bushing

Subsequent to orchestrating every one of these things at long last, the information and yield focuses are associated with the copper bars. Copper bars are covered firmly with cotton tape in the wake of welding. At that point, the transformer is all set for the following stage of connecting bushing materials and for going to the warmth chamber.

Chapter 5

Transformer Test

5.1 Transformer testing process:

Various tests are needed to truly decide the electrical qualities of the force and dissemination transformer. The accompanying test is finished by Basic Power Engineering are given underneath:

- Test for transformer oil
- Test for voltage ratio
- Test for cupper Resistance
- Test when transformer is no load condition
- Test when transformer is full load condition
- Test for Megger
- Test for high voltage

5.2 Test for transformer oil:

Testing Method: Electric Breakdown Voltage

Oil Brand Name: Spiral

At the hour of oil testing, we take oil in a pot at that point offer it to the oil test machine. It shows the oil breakdown voltage. We do exactly the same things multiple times and discover the Mean Breakdown voltage.

Table 5.1: Statics Oil test

Sample No	Breakdown Voltage in KV	Withstand Time	Average Value in KV	Remark
01	41.50	30 Sec	48.55	Satisfactory
02	45.11	30 Sec		
03	49	30 Sec		
04	52.31	60 Sec		
05	55.26	60 Sec		

Comment: Breakdown Voltage 32kV is viewed as good. Beneath this level oil is recommended to be centrifuged.

5.3 Test for voltage ratio:

Estimating the voltage proportion, we utilize a voltage proportion test machine. From the outset, we need to set the proportion meter and multiplier. At that point we associate the wire in three-stage off the transformer and match the deliberate proportion with the determined proportion.

Table 5.2: Test for voltage ratio

Tap Position	HT Voltage	LT Voltage	Calculative Ratio	Measured Ratio		
				Phase-H1	Phase-H2	Phase-H3
1	11275	415	27.16	15.27	15.25	15.26
2	11000	415	26.5	15.65	15.64	15.65
3	10725	415	25.84	16.05	16.04	15.06
4	10450	415	25.18	16.48	16.47	16.49
5	10175	415	24.51	16.92	16.91	16.95

Comments: The Voltage Ratio between the HT and LT side of the Transformer for each Tap position is OK Polarity of the Transformer is Subtractive.

5.4 Test for cupper Resistance:

For the obstruction test, initially we need to direct the meter to gauge HT side opposition then we simply hang on the test of the cinch on the meter to the HT lead like - AB, BC, CA and discover the outcome for this side. We should rehash a similar methodology for getting the consequence of the LT side too.

Table 5.*3*: Resistance for LT Side

Phase to Neutral Connection	Measured Value (m ohm)
X1-N	0.00126
X2-N	0.00125
X3-N	0.00126
Average	0.001256

Table 5.*4*: Resistance for HT Side

Phase to Neutral Connection	Measured Value (m ohm)
H1-H2	5.06
H2-H3	4.08
H3-H1	5.11
Average	5.083

5.5 Test when transformer is no load condition:

The no-load test is known as an open circuit test. This test has been managed without load. In this test LT impartial terminal and HT terminal are kept open. For testing the no heap from the start we associate the three-stage supply to LT terminals and we need a watt meter and brace meter.

Table 5.5:Test when transformer is no load condition

Applied Voltage(V)	Rated RMS Voltage (V)	No-Load Current (A)	Wattmeter Reading (W)
415	415	I_1=4.95	551.43
		I_2=4.82	537.01
		I_3=4.94	550.38
		Average	546.27

No Load Loss = 546.27 W

Comment: Result is Satisfactory

5.6 Test when transformer is full load condition:

A full burden is otherwise called a short out test. This test is utilized for estimating copper misfortune. The test is led on the high voltage (HV) side of the transformer where the low voltage (LV) side or the optional side is shorted. For this test, we need a watt meter and cinch meter.

Table 5.6: Test when transformer is full load condition

Rated Current (A)	Applied Current (A)	Impedance Voltage (V)	Wattmeter Reading (W)
20.99	I_1=20.99	V_1=441	4600
	I_1=20.98	V_2=457	
	I_1=20.99	V_3=448	

Full Load Loss = 4.6 KW

Comment: Result is Satisfactory.

5.7 Test for Megger:

At the point when we do the Megger trial of a transformer from the outset, we clutch the test of the HV side with Earthling then the LV side with Earthling, and afterward the HV side with the LV side for 30 seconds. We do exactly the same things again for 60 seconds. By doing this interaction we get the qualities which are appeared in table 5.6

Table 5.7: Test for Megger

Megger Test (Gega Ohms)			
Time	HT-E	LT-E	HT+LT
30 Sec	9.99	12.9	16.8
60 Sec	11.57	14.69	20.32

Comment: Result is Satisfactory.

5.8 Test for high voltage:

For doing a High Voltage test at HV winding we need to short the three-stage terminal of the HV side, LV side, and body/tank with the fundamental earthling. From the start, we have given 28kV from the High Voltage test seat, at that point it goes to the boundary. From that point forward, it was gone through the HT side of the transformer. We need to apply 28kV for 1 min to the Transformer. In the event that the transformer stays to withstand in the wake of saving this voltage for 1 min then it demonstrates that the transformer keeps secure in voltage floods which might be brought about by lightning or other over voltage.

Comment: Result is Satisfactory.

Chapter 6

Strengthening Part

6.1 Recommendation:

Inside my temporary position period, I accumulate all reasonable information about transformers producing from Basic Power Engineering Limited. In spite of the fact that they need to build a few offices:

They should expand the assembling quality.

They have insufficient specialists and labor, accordingly, they can't convey a tremendous measure of items all at once. In this way, they ought to choose more labor.

They should expand their testing number for more exact effectiveness.

They didn't have an adequate measure of testing meters. Along these lines, they should expand the number of testing meters.

6.2 Conclusion:

This internship has given me very crucial practical experience in transformer manufacturing which gives me confidence in the practical field. I have gained new knowledge, skills and met so many new people. I got an insight into professional practice. The demand for practical work

experience has no other alternative in today's job market. This was a great opportunity for me to achieve this experience. The internship was also good to find out what my strengths and weaknesses are. I feel very proud to be an intern at Basic Power Engineering Limited. It is a great chance to gather knowledge of the corporate world before entering the job field. I think that the practical experience that I gathered in Basic Power Engineering Limited will help me in my professional life.

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