INTERNSHIP REPORT
ON
SUBSTATION, VOLTAGE REGULATORS & BACKUP POWER SYSTEMS
AT
NAVANA ELECTRONICS LTD.

By

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Submitted to the
Department of Electrical and Electronic Engineering
Faculty of Sciences and Engineering
East West University

in partial fulfillment of the requirements for the degree of
Bachelor of Science in Electrical and Electronic Engineering
(B.Sc. in EEE)

Summer, 2014

Approved By

________________	______________________
Academic Advisor	Department Chairperson
Dr. Anisul Haque	Dr. Halima Begum

COMPLETION CERTIFICATE

NAVANA

NAVANA Electronics

Navana Electronics Limited

Date: 27 July 2014

Acknowledgement

This is to certify that S.A.N. Shams Rishad, son of SK. Abu Jafar Shamsuddin and Mrs. Nasreen Jafar, Being ID No.: 2008-3-80-004 from Electrical and Electronics Engineering Department of East West University has attended the industrial training on Production process (Substation, Voltage Regulators and Backup Power Supplies) in the factory of Navana Electronics Ltd. of Navana Group from the date 15th May 2014 to 15th June 2014.

27/7/14

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ACKNOWLEDGMENT

In the beginning, I express my gratitude to Allah, for His help to complete this report successfully. I had a remarkable time during my internship at Navana Electronics Ltd. I solemnly acknowledge the encouragement and assistance given to me by the staffs and I am grateful to Navana Electronics Ltd. for giving me the opportunity to pursue my internship. I want to specifically mention Mr. Sujit Kumar Mondal, Senior Factory Manager, Navana Electronics, for his support and mentoring during my industrial training.

I would like to mention my honorable academic supervisor Dr. Anisul Haque, Professor, Department of Electrical and Electronic Engineering, East West University (EWU), who advised me to undertake industrial training. He managed his valuable time providing me with guidance and suggestions throughout the industrial training as well as the report writing process. I would also like to mention the name of Dr. Halima Begum, Chairperson and Assistant Professor of Electrical and Electronic Engineering, EWU, who monitored my overall progress.

Finally, I would like to thank all the personnel of Navana Electronics, who helped me collect related data for my report and helped me understand related matters diluting their precious time whenever I approached.

EXECUTIVE SUMMARY

During my internship, I had gathered practical knowledge of Substations, Voltage Regulators, and Backup Power Systems. I had training on the basic theory behind every product, how the designs are done, how the manufacturing is performed, and finally how the final products are tested in the Quality Control process. These experiences are the content of this report.

I have obtained a comprehensive overview of how a power is distributed from grid to the household over the substation. I have achieved hands on experience on Distribution Transformers, Low Tension (LT) & High Tension (HT) Switchgears, Power Factor Improvement (PFI) Plant and Distribution Board. In the process, I have also learnt the use of various types of circuit breakers and protective relays.

Apart from substation, I had training on two types of voltage regulators- Auto Voltage Regulator (AVR) and Industrial Voltage Stabilizer (IVS). These two products stabilize supply voltage and ensure safety of the apparatus. I have written my experiences on two types of Backup Power Systems- Instantaneous Power System (IPS) and Uninterruptible Power Supply (UPS). These two products deliver emergency power in the event of power outage from the grid. Sections written on these nine products contain my learning and experience on theories, designs, manufacturing, and quality control process.

TRAINING SCHEDULE

Date	Time	Section	Mentor
15.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	All Sections, Introduction	Mr. S. K. Mondol Senior Factory Manager
16.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Distribution Transformer	Mr. S. K. Mondol Senior Factory Manager
17.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Distribution Transformer	Mr. S. K. Mondol Senior Factory Manager
18.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Distribution Transformer	Mr. S. K. Mondol Senior Factory Manager
20.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IPS, Box	Mr. S. K. Mondol Senior Factory Manager
22.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IPS	Mr. S. K. Mondol Senior Factory Manager
23.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IPS	Mr. S. K. Mondol Senior Factory Manager
24.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	UPS	Mr. S. K. Mondol Senior Factory Manager
25.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	UPS	Mr. S. K. Mondol Senior Factory Manager
27.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	UPS	Mr. S. K. Mondol Senior Factory Manager
29.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	PCB, Box	Mr. S. K. Mondol Senior Factory Manager
30.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IVS	Mr. S. K. Mondol Senior Factory Manager
31.05.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IVS	Mr. S. K. Mondol Senior Factory Manager
01.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IVS	Mr. S. K. Mondol Senior Factory Manager
03.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	IVS	Mr. S. K. Mondol Senior Factory Manager
05.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Distribution Transformer	Mr. S. K. Mondol Senior Factory Manager

06.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	AVR	Mr. S. K. Mondol Senior Factory Manager
07.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	AVR	Mr. S. K. Mondol Senior Factory Manager
08.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Substation	Mr. S. K. Mondol Senior Factory Manager
10.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	HT Switchgear	Mr. S. K. Mondol Senior Factory Manager
12.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	LT Switchgear	Mr. S. K. Mondol Senior Factory Manager
13.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	PFI plant	Mr. S. K. Mondol Senior Factory Manager
14.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	Distribution Board	Mr. S. K. Mondol Senior Factory Manager
15.06.2014	10:00AM-01:30PM; 02:30PM-04:00PM	All sections, Overall process	Mr. S. K. Mondol Senior Factory Manager

The Industrial Training was on 24 working days. Each day entailed 5 hour long training. The accumulated duration was 120 hours.

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CHAPTER 1: INTRODUCTION

1.1. Objective of the Internship

I had decided to undergo industrial training at Navana Electronics Ltd. in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering (B.Sc. in EEE). The objective of the internship was to see and learn the real world applications based on the theories taught throughout B.Sc. Engineering program.

1.2. Scope and Methodology

The internship program and its time schedule was firmed up prior to actual commencement. The training was to be accomplished by spending a minimum of 100 hours distributed over a period of minimum 15 days. There were a few practical limitations in setting the time schedule. The weekly holiday at Navana Electronics and my university classes had to be considered.

Scope of the internship program

Within this available time, the overall scope of my internship program entailed the following:

- Plan and design the internship program within a time frame;
- Get acquainted with the institutional setting of Navana Electronics;
- Explore and be informed about the products and services of Navana Electronics;
- Observe, learn and take part where feasible in the production processes;
- Observe and go through the risk factors as well as the safety measures at different production sites;
- Explore, learn and review the quality control provisions at the factory; and
- Prepare a comprehensive report on the outcomes of this internship.

Methodology followed

The broad based approach and methodology was primarily to develop a repository with relevant information. Sources of these information were basically of two types- primary and secondary. The detail methodology followed to accomplish my assignment is mentioned in the following paragraphs.

I started off with some secondary information sources. A good number of catalogs for various products were collected, studied and reviewed in consultation with concerned professionals of the factory. This exercise gave me a sound basis prior to acquiring practical knowledge of manufacturing different products through my personal visits and intensive interactions with the concerned personnel. It was a regular and routine activity on my part to report to the respective section of the factory as per my approved time schedule. It was a normal practice to have detailed discussions with the personnel of the concerned section on the topics put forward from my end for clarifications. These were the primary sources of information and the process continued till my activities in all the sections were completed.

In order to facilitate my training, I had to use and rely on various modes and tools. Relevant courses from my academic syllabus were consulted whenever necessary. I also had to extensively depend on the Internet as a quick and ready source of knowledge. Important observations and learning points were noted on a regular basis. In addition to all these, a sufficient number of photographs were taken throughout the entire period. Some of these photographs were captured for the purpose of preparing this report, while some were for my own personal understanding. Moreover, to enrich my information base, sometimes I also recorded important discussions with the aid of voice recorder.

1.3. Company Profile

Navana Electronics Ltd., a prospective company of NAVANA GROUP is running its business since October 1996 under the prominent leadership of Mr. Shafiul Islam Kamal, the successful Chairman of the group. Formerly, Navana Electronics was part of Navana Computers & Technologies Ltd. till year 2000. After successful completion of the first step, it emerged into a separate physical entity as Navana Electronics Ltd. from Navana Computers & Technologies Ltd. [1]

Navana Electronics is headed by a General Manager. At the factory level, the ‘management and professional’ responsibilities are bestowed upon the Factory Manager. Under the Factory

Manager, there are a number of sections in accordance with respective products. Responsibility of each Section is taken care of by individual Section In-charge who in turn supervises the activities of Senior Technicians and Junior Technicians.

During the internship, I had the opportunity to explore the entire process followed in the factory. Although I have discussed the salient aspects in the Chapters 2, 3, 4, I feel it necessary to add this section to comprehensively portray the overall process. This overall process starts from the First-Step, i.e., 'Procurement of Production & Supply Assignment', and concludes in Last-Step, i.e., 'Product Delivery to Clients'. A diagram furnishing the overall process is shown in **Figure-1.1.**

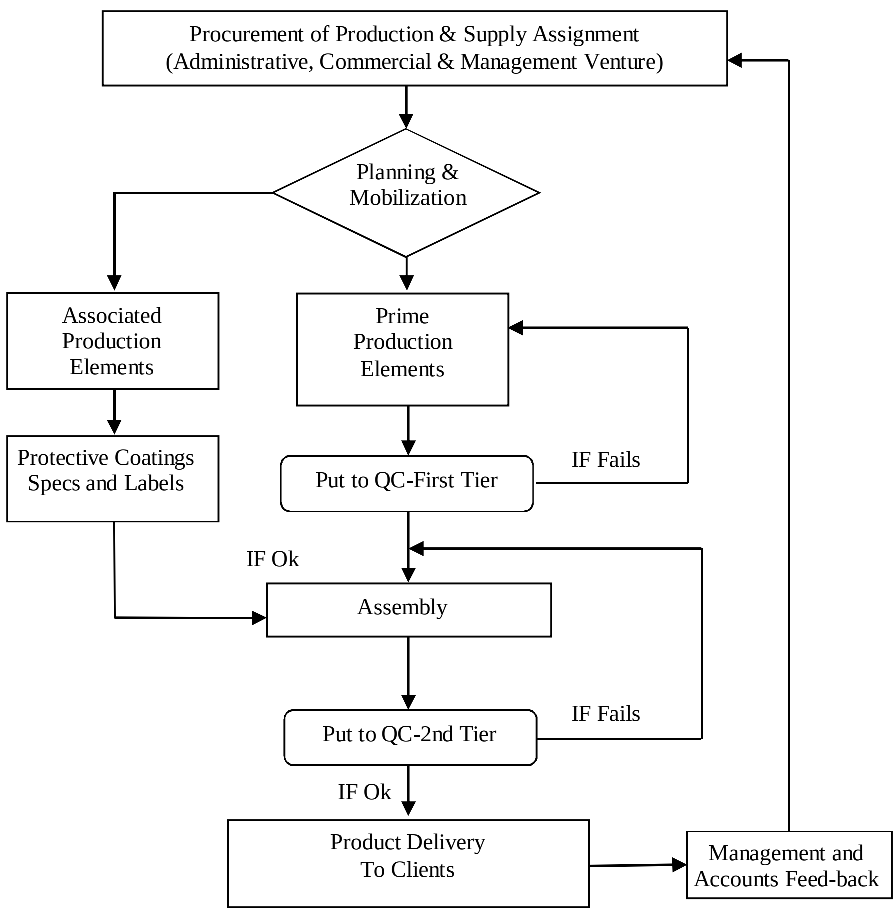

Figure 1.1: *Overall process diagram of Navana Electronics Ltd.*

1.4. Organization of the Report

The report is comprised of five chapters. It starts with Introduction as Chapter 1. This chapter is segmented further into: Objective of the Internship, Scope and Methodology, Company Profile, and Organization of the Report.

Chapter 2 deals with Substation components. Its contents are Low Tension Switchgear, High Tension Switchgear, Distribution Transformer, Power Factor Improvement plant and Distribution Board. Chapter 3 is written on Voltage Regulators. Two types of Voltage Regulators are discussed in this chapter: Auto Voltage Regulator (AVR) and Industrial Voltage Stabilizer (IVS). Chapter 4 is dedicated to Backup Power Systems, which includes Uninterruptible Power Supply (UPS) and Instantaneous Power System (IPS).

The Quality Control (QC) process has been included as subsection for each of the products.

Problems, Recommendations and Conclusions are reflected in Chapter 5. Finally, scanned copy of my daily activity reports are attached as Annex-I.

CHAPTER 2: SUBSTATION

2.1. Introduction

The main products of Navana Electronics are Substation equipments. These consist of Distribution Transformer, Low Tension (LT) Switchgear, High Tension (HT) Switchgear, Power Factor Improvement Plant, and Distribution Board.

All of these components are illustrated in **Figure 2.1** maintaining the sequence in which these appear in a power system.

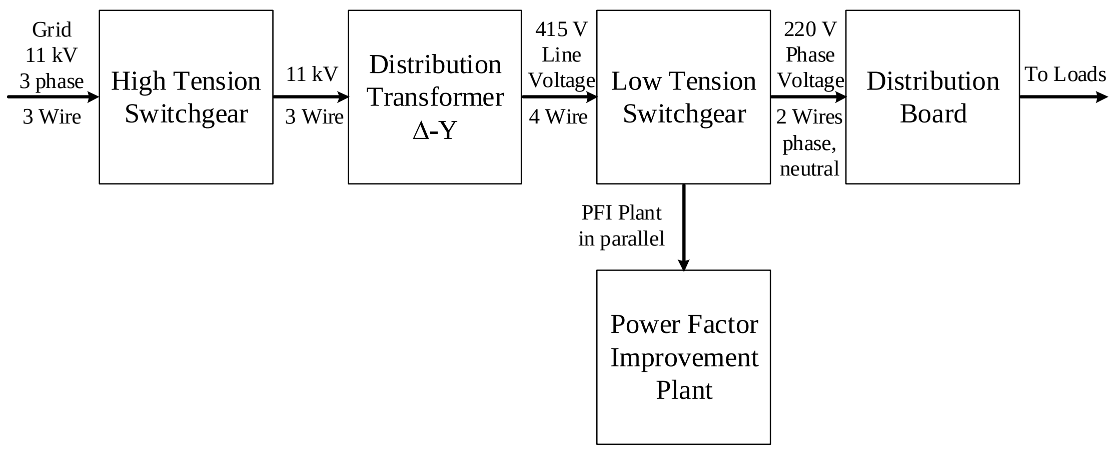

Figure 2.1: *Sequence of the components as these appear in a power system.*

In an electrical power system, a switchgear is a combination of electrical disconnect switches, fuses, protective relays and circuit breakers. The motives are to control, protect and isolate electrical equipment. Switchgears can be classified from several different aspects, such as-current rating, voltage class, interrupting rating, insulating medium, and construction type, to name a few.

Two types of Switchgears are manufactured in Navana Electronics and these are classified by the voltage class. These are Low Tension Switchgear and High Tension switchgear (popularly abbreviated LT Switchgear and HT Switchgear). LT Switchgears belong to low voltage class (less than 1,000V AC) and HT Switchgears belong to medium voltage class (1,000-35,000V AC). Although, the HT Switchgears manufactured in Navana Electronics belong to medium voltage class, these are called HT Switchgears since these are located at the HT side of the distribution transformer. At Navana Electronics Distribution Transformer, LT Switchgear and PFI plant are manufactured as a package. HT Switchgears are manufactured few and far between depending on the demand.

2.2. Low Tension Switchgear

A Switchgear that is designed to operate at 1kV or less is classified as a low voltage Switchgear [2]. However, LT Switchgears are named after their position on the power system. Here, LT signifies the low tension side of the distribution transformer.

2.2.1. Design and Diagram

Since Switchgears are just combinations of various protective devices, there is no single specific design. The sole purpose of the device is to protect, control and isolate circuits. Components used to design LT Switchgear are various types of switches, relays, fuses, magnetic contactors and circuit breakers. All the LT Switchgears manufactured during my internship were three phase and all of these were designed for 415V line to line voltage. LT Switchgear is connected in series with the secondary side of Distribution Transformer as depicted in **Figure 2.1**. **Figure 2.2** shows the circuit diagram of a typical LT Switchgear.

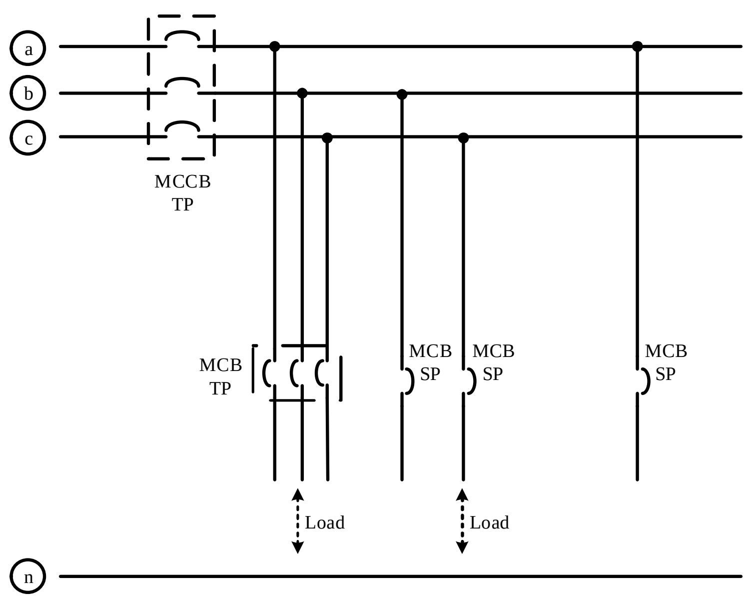

Figure 2.2: *Circuit diagram of LT Switchgear.*

2.2.2. Operating Principle

The primary components of an LT Switchgear are different types of circuit breakers. These circuit breakers trip off when the current through them exceeds the rating. Circuit breakers are simply automatically operated electrical switches. Besides automated tripping off, it is possible to manually switch off any of the circuit breakers. If fuses are used, those serve as an extra layer of protection. Almost always, there is a main circuit breaker through which Y-connected secondary of the distribution transformer is connected to the bus bars of the switchgear. The loads are connected to the bus through smaller circuit breakers.

All of these circuit breakers including the main circuit breaker observes the same voltage across them, but these have different current ratings. The main circuit breaker must have a current rating which is around the summation of individual current ratings of all other circuit breakers. This is a practical example demonstrating Kirchhoff's Current Law.

2.2.3. Technical Specifications

Technical data of a typical LT Switchgear are given in **Table 2.1** [3]**.**

Table 2.1: Technical specifications of a typical LT Switchgear.

Specification	**Value**
Rated Voltage	Up to 660V
Rated current	Up to 3600A
Rated current for components	Up to 5000A (~140% of rated current)
DOL contactor starters	Up to 400V
Contractor type reversers	Up to 400A
Contactor type star delta starters	Up to 700A
Rated Peak Withstand current of Bus bars	176kA
Rated Peak Withstand current of Dropper bars	120kA
Degree of protection	DIN 40050/IEC – Publ. 529

2.2.4. Manufacturing Process

The manufacturing process of LT Switchgear is quite simple and straight forward. The steps are as follows:

- The frame for the switchgear is manufactured in the box section of Navana Electronics Ltd.
- Three bus bars are prepared from thick copper bars, each for a phase.
- A node is made neutral, which is short to the neutral of Y-connected secondary of the transformer.
- Bus bars, circuit breakers, switches and fuses are installed inside the frame using nut-bolts.
- All the devices are wired and labeled correctly.
- The front cover and the side covers of the frame are also manufactured in the box section. These are coated, colored and labeled properly and then assembled.

Figure 2.3 shows the frames for switchgears under construction. **Figure 2.4** shows a partially completed LT Switchgear.

Figure 2.3: *Frames for Switchgears.*

Figure 2.4: *Circuit breakers and other components getting installed.*

2.2.5. Quality Control

In the Quality Control process, individual circuit breakers are tested if those are tripping off when supposed to. More loads are connected in parallel to draw more current and it is observed whether a circuit breaker trips off when the current rating is exceeded.

2.3. High Tension Switchgear

Among all products manufactured in Navana Electronics, HT Switchgears are the most infrequent. Distribution Transformers, LT Switchgear and PFI plant are quite regular and these three are manufactured as a set, but HT Switchgears are occasionally manufactured on call. I have come to know that only about 3-5 HT Switchgears are manufactured on an average each year at Navana. I had been unfortunate that during my training period there was no such order and I did not get the opportunity to see the manufacturing process of HT Switchgears.

HT Switchgears are technically same as the LT Switchgears, with difference in the voltage class. These are designed for rated voltage of 11kV and rated current of 630A to 800A. HT Switchgears are only used when the system in question handles more than 500kVA of power. Below this, HT Switchgears need not be used and the lines coming from grid can directly be connected to the primary side of the distribution transformer, unless specified otherwise.

2.3.1. Design and Diagram

Unlike LT Switchgear where there are several circuit breakers of different types, HT Switchgear has just one giant circuit breaker. This circuit breaker is usually either Vacuum Circuit Breaker (VCB), Minimum Oil Circuit Breaker (MOCB), or Load Break Switch (LBS). Air Circuit Breaker (ACB) is also another possibility.

Instrument transformers are used to measure the voltage and current. This is done by means of calibration. Two Potential Transformers (PT) are used to measure the phase voltages, three current transformers (CT) are used to measure the line currents. Through the circuit breaker and CTs, lines coming from the grid are connected to the Δ-connected primary winding of the Distribution Transformer. PTs are set parallel to phases. The circuit diagram is shown in **Figure 2.5**.

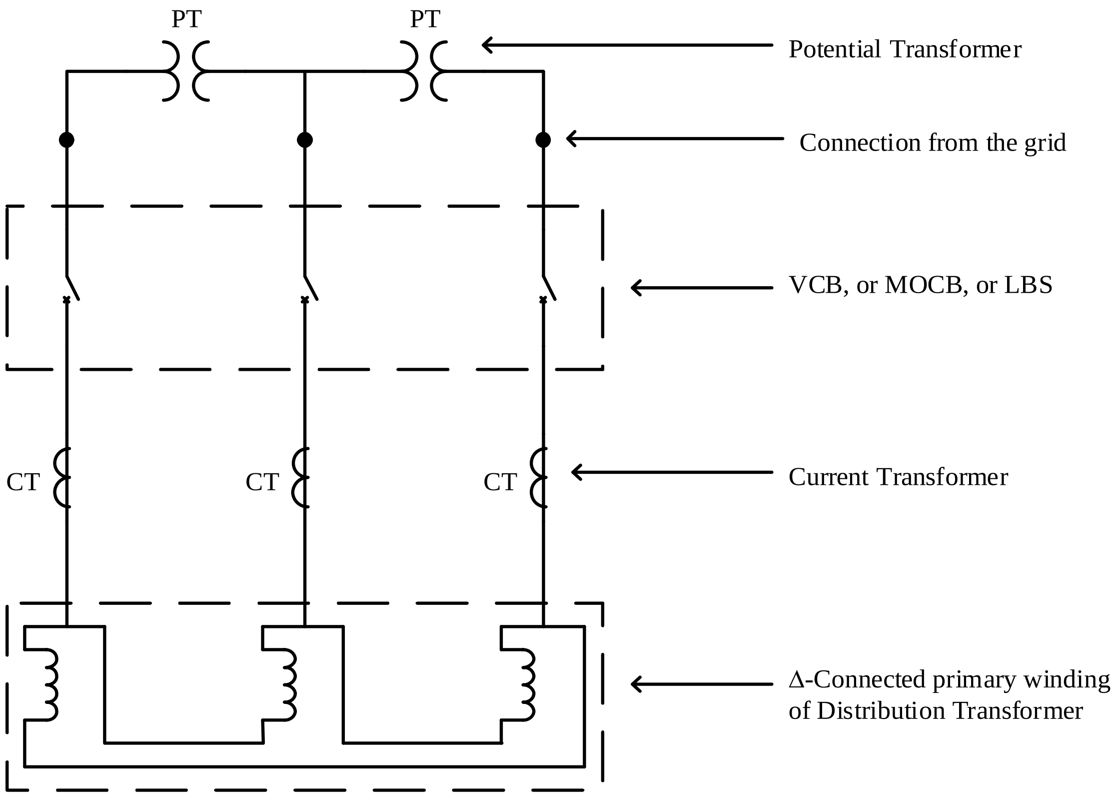

Figure 2.5: *Circuit diagram of HT Switchgear.*

2.3.2. Technical Specifications

Technical specifications of HT Switchgears are given in **Table 2.2** [4].

Table 2.2: Technical specifications of HT Switchgears.

Specification Of HT Switchgear	**Vacuum Circuit Breaker(VCB)**		**Minimum Oil Circuit Breaker (MOCB)**		**Load Break Switch (LSB)**	
Model	PNN10	PNN11	PNN20	PNN21	PNN30	PNN31
Rated Voltage	12KV	12KV	12KV	12KV	12KV	12KV
Rated Current	630A	800A	630A	800A	630A	800A
Rated Short Time Current for 3 sec.	20KA	20KA	20KA	20KA	20KA	20KA
Basic Impulse Level	75KV	75KV	75KV	75KV	75KV	75KV
Making Current	50KA	50KA	50KA	50KA	50KA	50KA

2.3.3. Components

The components of HT Switchgear are given as follows.

- Load bar (to connect to the primary side of Distribution Transformer),
- Potential Transformer (PT),
- Current Transformer (CT),
- Circuit breaker
    - Vacuum Circuit Breaker (VCB), or
    - Minimum Oil Circuit Breaker (MOCB), or
    - Load Break Switch (LBS), or
    - Air Circuit Breaker (ACB).

All these are set up according to design. I did not get to see the actual physical device, but I have learnt that these are very bulky.

2.3.4. Quality Control

- The instrument transformers (PT, CT) are checked individually.
- The circuit breaker is checked manually.

2.4. Distribution Transformer

A transformer is an electrical device that transfers energy from one circuit to another through magnetic coupling. The main purpose is to step up or step down the voltage keeping the energy and the frequency same at either end.

2.4.1. Operating principle

Transformers work on the principle of Faraday's law of induction, i.e.

- A current-carrying coil produces a magnetic field around it; and
- A time-changing magnetic field induces a voltage in a coil if it passes through that coil.

The AC voltage applied to the primary side produces a time-changing magnetic field, which remains confined within the Ferromagnetic material (the core). This time-changing magnetic field induces AC voltage in the secondary side.

2.4.2. Design and Diagram

Navana Engineers design Distribution Transformers in accordance with the customers' specifications. All the distribution Transformers manufactured during my internship step down 11kV to 415V. However, these are of various sizes depending on the amount of power these are designed to handle.

These are three phase Transformers. The core is designed to have three legs, each for a phase. Each leg will have both primary (HT) and secondary (LT) windings of the same phase. At each leg, there are four HT windings connected in series to form a single HT winding. Several taps are protruded from the HT windings and these are connected in series through the tap changer, effectively forming a single primary winding. Primary and secondary windings are designed to be Δ-connected and Y-connected respectively.

The winding configurations are categorized by Vector Groups (also known as Phasor Groups). Vector Group is the International Electrotechnical Commission (IEC) method for categorizing the high tension winding and low tension winding in three-phase Transformers [5][6]. The vector group designation indicates the windings configurations and the difference in phase angle between them. All the distribution transformers designed by Navana Electronics belong to Dyn11 vector group. **Figure 2.6** and **Figure 2.7** show the configurations of primary and secondary windings.

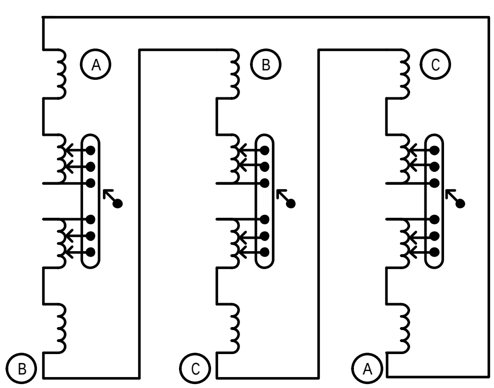

Figure 2.6: Δ-*connection of HT Winding with taps.*

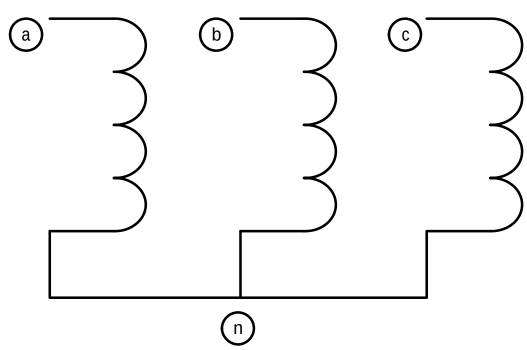

Figure 2.7: *Y-connected secondary winding.*

2.4.3. Technical Specifications

The following table contains technical specifications of a typical 250kVA Dyn11 distribution transformer [7].

Table 2.3: Technical specifications of a typical Dyn11 Transformer.

Specifications	**Value**
Rated Power	250kVA
Standard	BS-171
Class	A
Rated frequency	50 Hz
Type of cooling	ONAN
Duty	Continuous
Vector Group	Dyn11
Impedance	4.1%
Total weight	1120kg
Oil weight	215kg
Manufactured	2009
Core	Silicon-steel CRGO
Rated voltage HT (on Load)	11,000V
Rated current HT (on Load)	13.12A
Rated voltage LT (on Load)	415V
Rated current LT (on Load)	347.81A

2.4.4. Manufacturing Process

<u>Core Material, Core Cutting and Core Assembly</u>

Navana uses two types of laminated silicon-steel alloy sheets. These are Cold Rolled Grain Oriented (CRGO) and Non CRGO. CRGO sheets have higher efficiency of carrying magnetic flux than non-CRGO sheets. For all the distribution transformers, Navana Electronics uses CRGO sheets. The non-CRGO type is used for smaller transformers that are used in UPS, IPS, AVR and IVS. For these small transformers, non-CRGO serves the purpose. To prepare the core of Distribution Transformer, CRGO sheets are cut in accordance with the design. Then these are assembled and thus a three legged core is formed. **Figure 2.8** and **2.9** shows the CRGO sheets cut and assembled to form the core.

Figure 2.8: *CRGO sheets cut as per the design.*

Figure 2.9: *Assembling the transformer core.*

Windings

Two types of windings are prepared for primary and secondary sides of the transformer. The material used for HT Winding is insulated copper coil. It comes insulated and requires no further insulation. Using Machines, the coils are turned precise number of times as per the design. The LT Winding material is thick copper strip. The strip comes readily insulated with paper wrappings. To strengthen the insulation, it is then manually wrapped with cotton threads. Then machines are used to turn the coil. Turn numbers are precisely maintained just like before. **Figure 2.10** and **Figure 2.11** shows HT and LT windings.

Figure 2.10: *HT coils after turns are complete.*

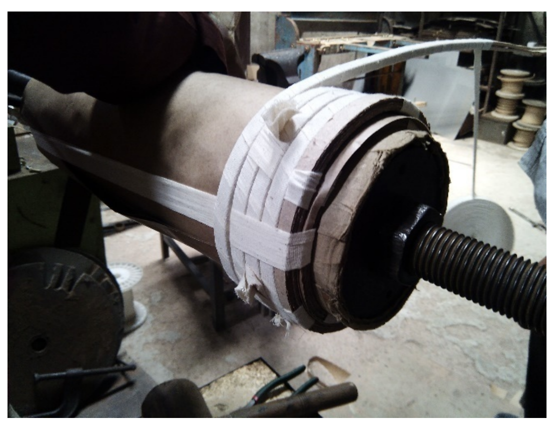

Figure 2.11: *Making of LT winding.*

Three LT windings are prepared, each for a leg. A total of twelve HT windings are prepared, four for each leg. Following the design, tapping points are brought out from the HT windings of each leg. Significant difference between the cross-sectional areas of these two windings is expected. It has to be this way, because, for the same power delivered, LT side has to endure much higher current than HT side.

After HT coils and LT coils are made with appropriate number of turns, these coils are put around the legs of transformer core. Three legs for three phases. First the LT coils are put on each leg. These three coils are then further twofold insulated, first with cotton threads and then again with boards. Next, four HT coils are put on top of each LT coil. Taps are connected to the tap changer. The same procedure is followed for all three legs.

Tap Changer

Tap changer is a connection point selection mechanism that allows a variable number of turns to be selected in discrete steps [5]. These discrete steps are the taps brought out earlier from the HT winding. The Tap changer has six positions for the six taps. This makes it possible to switch to the appropriate tap in HT winding to obtain the desired output in the LT winding.

Figure 2.12 shows the coils put around the core. **Figure 2.13** shows the transformer after windings are configured and tap changer is installed.

Figure 2.12: *The core after the windings are put.*

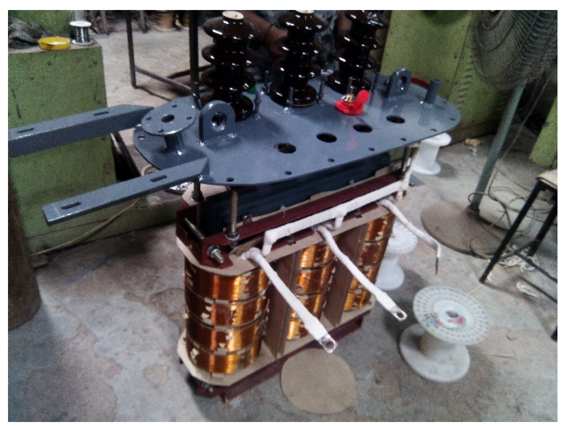

Figure 2.13: *After windings configured and tap changer installed.*

Drying

After the windings are properly configured and the tap changer is installed, the transformer is placed inside a vacuum heat chamber. In this chamber, the transformer undergoes drying process at around 130^0C for around 6 hours. This process ensures that no water vapor or moisture remains left. This step is crucial before introducing the oil, which is discussed separately in subsequent section.

Tank

The Tank is the casing which contains the transformer within. It is formed by welding three pieces of metal plates together. The tank gives mechanical protection to the windings and holds oil which serves as coolant and insulator. After welding is done and the parts are merged, the tank is washed and two layers of protective coatings are applied to prevent rusting. A reservoir, which is also a part of the tank, holds reserved transformer oil. **Figure 2.14** shows the manufacturing of the tank.

After the drying is complete, the transformer is immediately mounted inside the tank with the aid of chain pulley. This has to be a fast process, otherwise the transformer will capture water molecules from the environment and the resistance will go down. This is unwanted and the transformer is to be completely sealed inside the tank and submerged in oil within twenty minutes, before losing significant amount of resistance. **Figure 2.15** shows the transformer being mounted to the tank using pulley.

Figure 2.14: *Welding the tank.*

Figure 2.15: *Transformer being mounted inside the tank.*

Transformer Oil

Transformer oil is highly refined mineral oil. This oil is stable at high temperatures and has excellent insulating property. Because of its ability as a good insulator, this oil is also known as insulating oil. This is utilized both as coolant and high quality insulator. Before pouring down inside the tank, the dielectric strength of the oil is tested [8]. The expected breakdown field is somewhere in between 12-16kV/mm. In general, a transformer will run around 6-8 years before it is necessary to change the oil again.

2.4.5. Quality Control

At Quality Control, the newly manufactured transformer is put through a series of tests. The data from these tests are crosschecked with the expected values. If a transformer passes these tests within the tolerance, it is good to be delivered to the client.

Insulation Test

This is the first and most important test of all. In this test, resistances are measured in between HT & LT, HT & body, and LT & body. This test is crucial because this test reveals the fault, should the body be accidentally short to any winding. Besides making sure that the body is not short, this test also attests whether the transformer meets the insulation standard set by Bangladesh Power Development Board (BPDB). The insulation standard is ≥2,500MΩ. Distribution Transformers of Navana Electronics usually have 7,000-10,000MΩ insulation, well above the requirement.

Ratio test

In this test, the voltage ratio of the two sides is measured by applying an arbitrary voltage, which is much smaller than the actual operating voltage. Whatever the arbitrary voltage is, the ratio of the input to output ought to be equal (or very close) to 11000:415, since the transformer steps down from 11kV to 415V.

Polarity test

This test is to determine the instantaneous phasor polarity of the primary and secondary winding of the transformer. Instantaneous polarity is imperative when we want to parallel two or more transformers.

<u>Load test</u>

This test is also known as Short Circuit test. In this test, the Y-connected secondary windings are short and 3-phase balanced voltages are applied to the primary. The voltages on primary are increased until the rated current is flowing through the secondary winding. In other words, the transformer is tested with the highest ampere that it can withstand safely. The transformer is observed for several minutes in this state. If there is significant vibration, humming, or anything unusual, the transformer is rejected and becomes subject to troubleshoot.

<u>No load test</u>

This test is also known as Open Circuit test. In this test, 3-phase 415V (line) voltage is applied to the secondary side of the transformer. The primary side is left open (this is the reason why it is also known as Open Circuit test).With 415V applied to the LT side, around 11,000V is essentially present in each of the phases of HT side. This is the most dangerous of all tests mentioned above. During this test, it is potentially hazardous to get anywhere near the proximity of HT side. In practice, all the personnel consciously stay away from the HT side during this test. The current flowing through the LT side is measured carefully with clamp ammeter. To pass the No load test, this current must be below 5% of the current at full load.

2.5. Power Factor Improvement Plant

Most industrial loads are resistive and inductive. Resistive loads draw real power (W) from the source. Inductive loads draw both real power and inductive reactive power (VAR) from the source. Capacitive reactive power is opposite in polarity from inductive reactive power. Simply stated, when an inductor and a capacitor are in a circuit, the capacitor acts a source and provides reactive power to the inductor, which decreases the reactive power the source must provide.

This is the main idea behind power factor correction. Power factor correction brings the power factor of an AC power circuit closer to unity by supplying reactive power of opposite sign. Capacitors are added to cancel out inductive loads. Inductors have lagging power factor and capacitors have leading power factor. For this reason, inductors are said to ‘consume’ reactive power and capacitors are said to ‘supply’ it. By adding capacitors (leading power factor), it is possible to draw reactive leading currents, balancing out some of the lagging current, and making the effective load approach a resistive load. A high power factor is generally desirable in a transmission system.

2.5.1. Design and Diagram

Most of today's power factor correction modules are microcontroller based. Navana imports these modules from different countries. During my internship period, I have seen the company to use EPCOS Power Factor Controller & EPCOS Capacitor Banks. The controller and the capacitor banks are designed to be connected through magnetic contactors and High Rupturing Current (HRC) fuses. Either six or twelve capacitor banks can be operated by the controller. The magnetic contactors are triggered by the controller module and accordingly capacitor banks get paralleled to the load. Navana PFI panels are designed and assembled in accordance with IEC-7070 regulation [9]. The components of PFI plants are chiefly imported from UK, Germany, France, Italy and Japan [9]. **Figure 2.16** shows the BR-6000 EPCOS Power Factor Controller [10]. Circuit diagram of the PFI plant is shown in **Figure 2.17.**

Figure 2.16: *EPCOS BR-6000 module.*

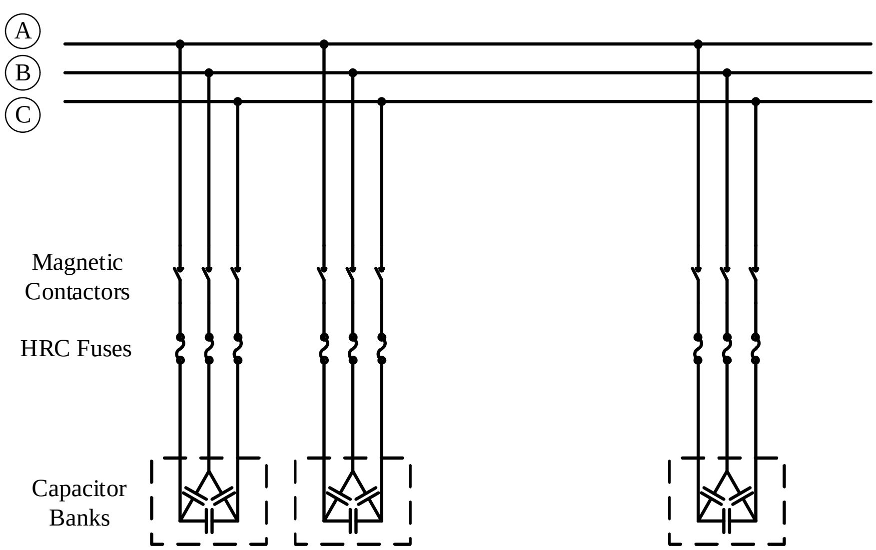

Figure 2.17: *Circuit diagram of PFI plant.*

2.5.2. Operating Principle

Power Factor Improvement (PFI) plant is an automated mechanism to perform the following operations:

- Calculate the power factor of the load (wattmeter-voltmeter-ammeter method) with the means of calibration;
- Calculate the required capacitance to cancel out the reactive power; and
- Parallel the required capacitance (capacitor banks) to the load.

2.5.3. Manufacturing Process

- The casing is manufactured in the box section.
- Capacitors, fuses, magnetic contactors, and the controller module are setup and wired according to the connection diagram that EPCOS provided.
- Besides magnetic contactors, High Rupture Capacity fuse are used for protection.

Figure 2.18 shows the capacitor banks used in PFI plant. **Figure 2.19** shows the inside of a PFI plant with 12 capacitor banks.

Figure 2.18: *Capacitor bank.*

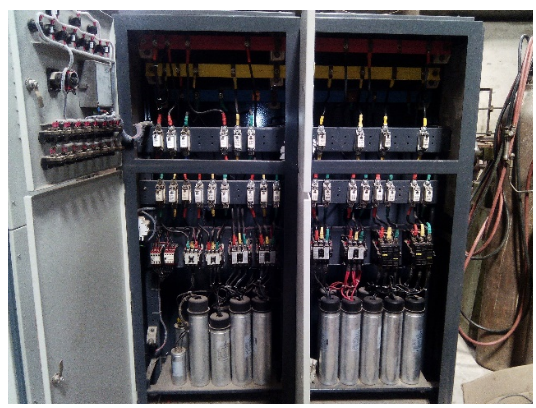

Figure 2.19: *Inside of a PFI plant.*

2.5.4. Quality Control

Power Factor Controller module is thoroughly tested prior to installation. Also is checked if the individual magnetic contactors are working properly in the manual mode. In compliance with the industry standard, the final product is not required to be tested with inductive loads.

2.6. Distribution Board

Distribution board is located at the consumer's end of a power system. It divides an electrical power feed coming from the LT Switchgear into subsidiary circuits, while providing protective fuse, relay and/or circuit breaker for each circuit under a common board. Usually, there is a main circuit breaker and several smaller circuit breakers. The setup is very similar to LT Switchgears. As a matter of fact, it is correct to say that Distribution Boards are just miniature versions of LT Switchgears. Distribution Boards are also known as Panel Boards. Domestic Distribution Boards are usually single phase, but it is also possible to add more phase with some minor changes in wiring.

2.6.1. Design and Diagram

The design resembles that of an LT Switchgear, the major difference being the use of single phase instead of three phases. There are two buses for line and neutral. The line and the neutral are connected to the buses through a main circuit breaker. Several Miniature Circuit Breakers (MCB) are used. One end of an MCB is connected to the live bus. Load is placed in between the other end of MCB and the neutral. Another possibility is to use double pole circuit breakers, where both line and neutral are connected to the two poles and the load is placed in between the other two poles of the circuit breaker. These circuit breakers trip off when the current exceeds rating. The MCBs available are single pole, double pole or triple pole, abbreviated SP, DP and TP. **Figure 2.20** shows the circuit diagram of a typical Distribution Board.

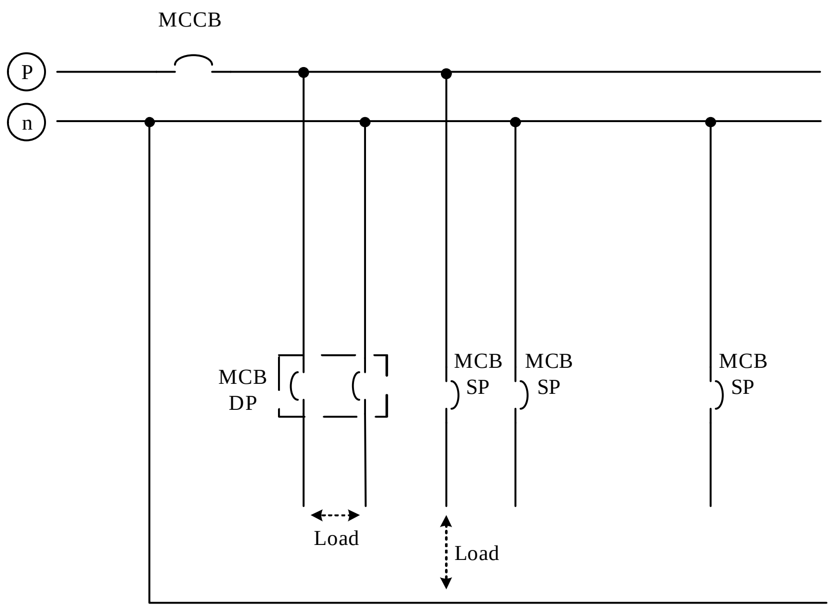

Figure 2.20: *Circuit diagram of a typical DB.*

2.6.2. Technical Specifications

Technical specifications of Distributions Board manufactured in Navana Electronics are given in **Table 2.4** [11]**.**

Table 2.4: Technical specifications of a typical Distribution Board.

Specification	**Value**
Rated Voltage	220V, 415V
Rated current	Up to 1000A
Rated current for components	Up to 1400A (~140% of rated current)
DOL contactor starters	Up to 400V
Contractor type reversers	Up to 110A
Contactor type star delta starters	Up to 200A
Rated Peak Withstand current of Bus bars	50kA
Rated Peak Withstand current of Dropper bars	33kA
Degree of protection	DIN 40050/IEC – Publ. 529

Figure 2.21 and **2.22** show outside and inside of a Distribution board respectively.

Figure 2.22: *DB made by Navana Electronics.*

Figure 2.21: *Inside a typical DB.*

2.6.3. Manufacturing Process

The manufacturing process is also quite similar to that of LT Switchgears. The box is manufactured in the box section, then labeled and colored properly just like the other products. All the magnetic contactors and circuit breakers are installed and wired properly.

2.6.4. Quality Control

The QC process is the same as that of LT Switchgears. Loads are connected in parallel to regulate the current flow and the circuit breakers are checked if those are tripping off when the current exceeds the rating.

CHAPTER 3: VOLTAGE REGULATORS

Voltage regulators are electric devices designed to automatically maintain a constant voltage level. The supply voltage in our country is very erratic and fluctuates between extreme limits. This fluctuation hampers the smooth operation of many equipment and may even cause permanent damage. A consistent voltage level is desirable oftentimes.

3.1. Auto Voltage Regulator (AVR)

Auto Voltage Regulator (AVR) is commonly known as Stabilizer. This is the kind of stabilizer that we use in refrigerators, computers, Hi-Fi amplifiers etc. AVR allows a wide range of fluctuating input voltage and offers a narrow range of discrete stable output voltage. AVRs manufactured in Navana Electronics have input range of 120-300V AC and the output stays within 205-245V AC.

3.1.1. Design and Diagram

A transformer with multiple taps in the secondary winding is the heart of AVR. **Figure 3.1** is the circuit diagram of an AVR, without the electronic circuit that changes the taps. The circuit diagram of the controller circuit is proprietary.

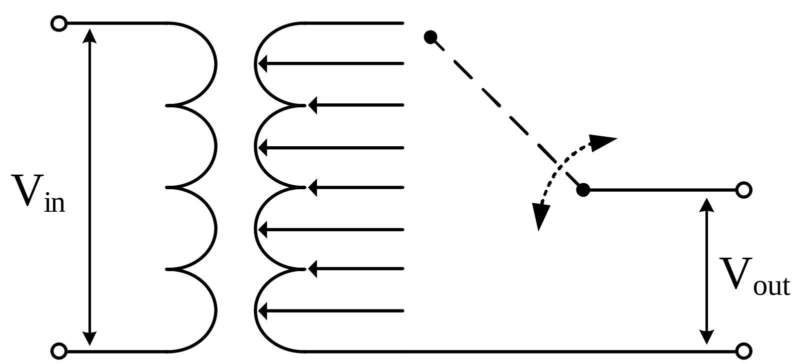

Figure 3.1: *Circuit diagram of AVR.*

3.1.2. Operating Principle

The output is continuously sensed by an electronic circuit and the transformer taps are switched accordingly with the aid of relays. Secondary of the transformer is appropriately tapped so that the output voltage stays inside the acceptable range.

3.1.3. Technical Specifications

There are different models of AVR that have different capacity, from 300VA to 10kVA. A client also has the opportunity to customize the range of input voltage. **Table 3.1** contains the technical specifications of AVR made by Navana Electronics [12].

Table 3.1: Technical specifications of AVR.

Specification	**Value/Range/Remarks**
Output	220V ± 5%~8%
Input	80~260V / 100~270V / 130~300V / 160~260V
Burnout limit	>450V AC
Frequency	50/60Hz
Waveform	Sine wave
Humidity	95%
Ambient Temperature	55^0 C, maximum
Delay time	Computer: 10~20 seconds; Fridge: 3~5 minutes
Protection	Sag, surge, RF noise, transient, spike, impulse, notch & blackout protection

3.1.4. Manufacturing Process

The circuit of AVR is constructed with Printed Circuit Board (PCB). This is not the only product of this company that uses PCB. Besides AVR, PCBs are also used in Industrial Voltage Stabilizer (IVS), Uninterruptible Power Supply (UPS), and Instantaneous Power Supply (IPS). PCB is a way of connecting electronic components using conductive copper tracks, which are etched from a copper sheet laminated onto a nonconductive substrate. It can be one sided (single layer), two sided (double layer), or may have more than two sides (multilayer). Navana Electronics has the facility to manufacture single layer PCBs. Among the products, AVR and IVS (Industrial Voltage Stabilizer) are operated by single layer PCBs which are fabricated in Navana Electronics. The PCBs used in UPS and IPS are double layer. For these, Navana Electronics Ltd. designs the layout and the double layer PCBs are manufactured in India, since such facility is unavailable in Bangladesh. The following paragraph summarizes the PCB making process. Same process is followed for PCBs of both AVR and IVS, and I have referred to section 3.1.4 when I wrote about the PCBs used in IVS.

- At first, the circuit is designed by engineers. The schematic is then optimally routed with the aid of CAD tool. Navana Electronics uses OrCAD (Cadence) to accomplish this. After the routing is done, the invert of this layout is printed on a mesh (silk screen). Consequently the mesh do not let the ink pass, except for the layout that is exposed. This ink must be etch resistant. Ink is forced through the openings with a rubber squeegee and thus the layout gets painted on a copper clad substrate. The exposed copper is etched out with hydrochloric acid. The ink is immune to this etchant and therefore the copper foil underneath the ink remains intact. Once all the exposed copper has been etched out, the board is water washed and dried. The ink is then removed with thinner and desired copper routing is formed over the nonconductive substrate. The components that would be soldered in this circuit are- resistors, capacitors, diodes, relays, variable resistors, ICs, etc. The PCB is drilled accordingly, and all the components are installed and soldered properly. **Figure 3.2** shows different steps of making a single layer PCB.

Figure 3.2: *Different steps of making a single layer PCB.*

- A small transformer is made in the transformer section of Navana Electronics. The same section manufactures other small transformers used in other products such as IPS, UPS, AVR, etc. The core is made of non-CRGO sheets. Several taps are brought out from the secondary side, which are to be tapped by the relays. **Figure 3.3** shows these small transformers.

Figure 3.3: *Transformers for AVR, IVS, UPS and IPS.*

- The box/casing is manufactured in the box section. Then the box is washed, colored and labeled. The manufacturing process is same for the boxes of DB, IPS, UPS, AVR and all other boxes. **Figure 3.4** contains two photographs of different boxes.

Figure 3.4: *Boxes for AVR (also for UPS, IPS).*

- The transformer and the PCB are all set inside the box and wired/soldered appropriately. The AVR is thus manufactured.

3.1.5. Quality Control

In the quality control process, The AVR is tested for the range of voltages that it has been designed for. The following tests are performed:

- It is checked if the AVR cuts off below the lower limit.
- It is checked if the relays are switching the taps properly.

- It is checked if the output stays within the acceptable range.
- It is checked if the AVR cuts off above the upper limit.

Table 3.2 shows the outputs for different inputs. From the shaded boxes, it is clearly visible how the relays change the taps to keep the output inside the acceptable region.

Table 3.2: Input and output of a 600VA AVR.

Input (V)	***Output (V)***
≤120	Low cut (0V)
130	205
140	225
150	240
160	210
170	217
180	225
190	233
200	240
210	245
220	210
230	230
240	240
250	245
260	210
270	220
280	230
290	240
≥300	High cut (0V)

3.2. Industrial Voltage Stabilizer (IVS)

IVS is used in industrial equipments that require a constant stable output. Unlike AVR, IVS do not have discrete outputs. Instead, the output is always stabilized to a constant value. It is fully automatic and servomotor controlled. Even in the prevailing erratic power supply scenarios of the country, IVS renders stabilized output voltage.

3.2.1. Design and Diagram

The components of IVS are variacs, step down transformers, servomotors, toroid coils (if more than one variac per phase), magnetic contactors, and controller circuit. All the IVS that I have seen operated on three phase. To achieve higher capacity, more than one variacs can be used in each phase. **Figure 3.5** is a circuit diagram of a single phase with four variacs. The outputs are connected to the primary side of a step down transformer through toroid coils, and the secondary is connected to the input in buck-boost configuration [13]. This is one phase, and the other two phases are identical.

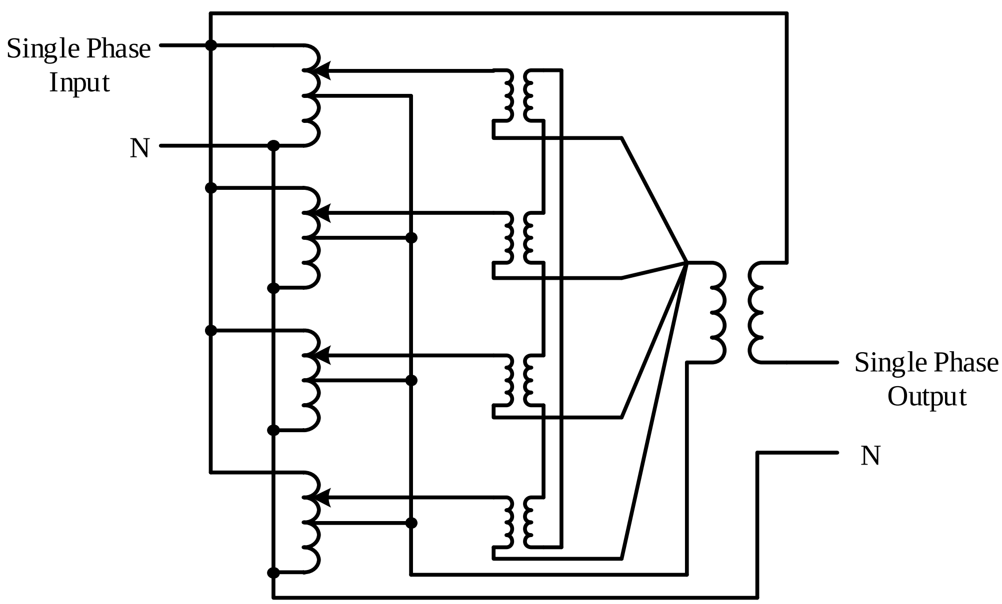

Figure 3.5: *Circuit diagram of a single phase of IVS (with 4 variacs).*

The output of the IVS is connected to the load through a magnetic contactor. The input is directly connected to the load through another magnetic contactor. Only one magnetic contactor operates at an instance, allowing stabilization and bypass respectively. This is depicted in **Figure 3.6**.

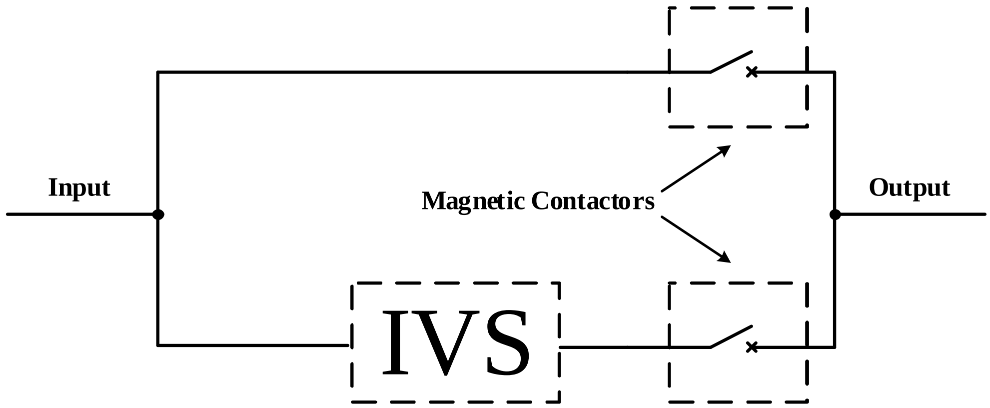

Figure 3.6: *Connection of IVS with the magnetic contactors.*

3.2.2. Operating Principle

The main operative of IVS is variac. Variac is the trade name of variable autotransformer [14]. It is an autotransformer with a single round coil with numerous turns. This single winding serves both as the primary and the secondary of the transformer. The turns are so many in number that it is possible to obtain about any turns ratio with a sliding brush. Technically, these steps are still discrete, but the turns are so many that it can offer an almost continuous control of voltage.

The output from the variac is fed to the primary of a step down transformer, and the secondary is connected with the input in buck-boost configuration. Servomotors [15] are used to rotate the brushes and are operated by a controller circuit.

The controller circuit continuously samples the output. When the output is higher than what we desire, the brush slides down the fixed point to have voltage of opposite instant polarity and consequently this voltage is subtracted from the input (buck). Likewise, when the output is lower than what we desire, the brush slides past the fixed point to have voltage of same instant polarity and consequently the voltage is added to the input (boost). This is the main operating principle.

3.2.3. Technical Specifications

The following table contains the technical specifications for different models of IVS [16].

Table 3.3: Technical specifications of IVS.

Phase	**Single phase**	**Three phase**
Capacity	1kVA – 30kVA	3kVA – 1,000kVA
Input	160V – 260V / 140V – 280V	300V – 460V / 250V – 480V
Output	220V / 230V / 240V	380 V / 400V / 415V
Frequency	50Hz	50Hz
Control system	Servo type	Servo type
Correction accuracy	±1~3%	±1~3%
Correction speed	30 – 50V/s	30 – 50V/s
Transient suppression	>270V	>460 V
Temperature	45^0 C, maximum	
Cooling	Natural air / forced air / oil cooled	
Duty cycle	Continuous	
Protection	High & low voltage, auto restart, phase failure, sag, surge, spike, over load, short circuit, delay time for voltage fluctuation	

3.2.4. Manufacturing Process

Just like distribution transformers, IVS vary in size with the power capacity. I have seen the manufacturing process of a quite large IVS with 830kVA capacity.

The components: variacs, transformers, servomotors, magnetic contactors, controller circuits, copper conductor bars, frame, tank, coolant oil, controller circuits and panel board.

- The frame, the tank and the step down transformers are built in respective sections of the factory. Four variacs are used in each phase since the current is high (~1500A). These three components are shown in **Figure 3.7**.

Figure 3.7: *Variacs, transformers and tank for IVS.*

- Variacs and transformers are mounted into the frame. These are connected to the step down transformers through toroid coils. Depending upon the number of variacs, servomotor with appropriate torque is installed to rotate the brushes. All the connections are properly made with thick copper bars (to handle high current). Magnetic contactors are fixed atop the frame. Different steps of manufacturing are shown in **Figure 3.8**.

Figure 3.8: *Construction of IVS.*

- Controller circuits are single layer PCBs. These are manufactured in the similar fashion of the PCB of AVR (section 3.1.4). The circuits are set and connected appropriately. Connection to the front panel is wired the proper way.
- The IVS is then put inside a tank and submerged into coolant oil. This is the same oil used in distribution transformers.

3.2.5. Quality Control

- The low cut (250V) and the high cut (480V) is checked. These limits are adjustable. Outside this range, the IVS is off.
- The front panel is checked. Meters in the panel are checked if properly calibrated. Magnetic contactors are checked if working properly. Also is checked their delay time.
- It is checked if the output voltage is properly stabilized for different input voltages.

CHAPTER 4: BACKUP POWER SYSTEMS

This chapter is written on two products that supply emergency power to loads in the event of power outage, viz. when the mains power fails. Despite the similarity, the two products also have some differences and are distinguished products. The products are namely Instantaneous Power System (IPS) and Uninterruptible Power Supply (UPS).

The design, the operating principle, the manufacturing process, all are similar except for few differences.

4.1. Instantaneous Power Supply (IPS)

4.1.1. Design and Diagram

The operative circuit is a double layer PCB. Since it is a proprietary item, I was not given access to the circuit diagram. However, it was possible to discuss the operation with respective section in-charge and the technicians to comprehend the operation. I have depicted the working principle with block diagram. The operating principle is more or less the same for both IPS and UPS.

4.1.2. Operating Principle

When the mains power is on and within the operable range, the IPS operates in standby mode. The following is the operating principle in standby mode:

- The mains power is channeled to the output through a built in AVR,
- The voltage is stepped down to 30V AC,
- 30V AC is passed through a bridge rectifier to get 30V DC,
- 30V DC is used to charge the 24V battery.

When the mains power is off, IPS operates in backup mode, delivering emergency power to the load from battery. The following is the operating principle in backup mode:

- 24V DC from battery is inverted to 24V AC using Pulse Width Modulation (IC: SG3525N) [17].
- 24V AC is stepped up to 220V AC and channeled to the output.

Figure 4.1 is a block diagram depicting the operation of IPS. The solid line represents the path when the mains power is on. The dashed line represents the path when the power is out. Only one path is functional at a time. The same diagram is applicable for UPS, the only difference being the use of dry cell battery instead of maintenance battery.

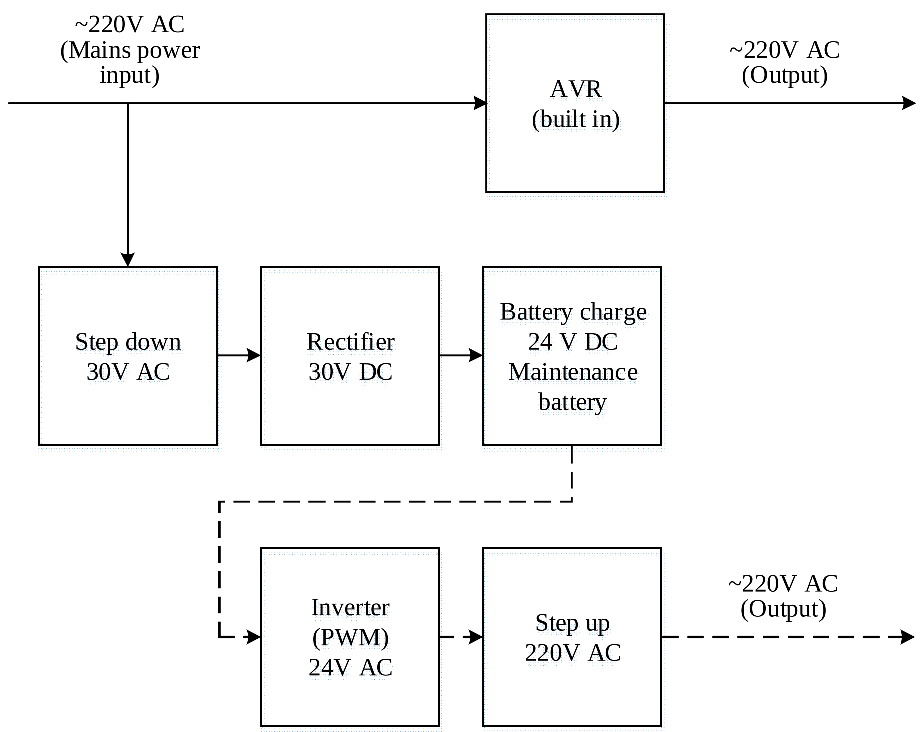

Figure 4.1: *Block diagram of IPS (also of UPS).*

4.1.3. Technical Specifications

Technical specifications of different models of IPS are given in **Table 4.1** [18]**.**

Table 4.1: Technical specifications of IPS**.**

Model		NP301	NP303	NP305	NP307	NP309	NP311	NP313	NP315
Capacity		200VA	350VA	500VA	750VA	1000VA	1250VA	1500VA	2000VA
Input	Voltage range	80 – 290V							
	Frequency range	Input frequency							
Output	Mains on output	Same as input							
	Backup output	220/230 ± 15%							
	Frequency at mains	Same as input							
	Frequency at backup	50 Hz ± 1%							
	Switching time	1 second (typically)							
	Waveform distortion	Square wave							
Battery	Type	Heavy duty battery 24 V; 50Ah to 155Ah (depending on capacity)							
	Quantity (Number of batteries used)	1	1	1	2	2	2	2	3
	Charging Current	10A	10A	10A	10A	10A	10A	15A	15A
Standard backup time (minutes)		May be increased as requested (optional)							
Full load		15	15	15	15	15	15	15	15
Half load		30	30	30	30	30	30	30	30
Protection	Overload protection	Provided							
	Fuse protection	Provided							
	Short circuit protection	Provided							
Others	Operating temperature	45^{0} C							
	Operating humidity	<90% R.H. Non condensing							

4.1.4. Manufacturing Process

- The layout of the double layer PCB is designed by Navana staffs, and manufactured in India. As with double layer, both the faces have copper routings.
- The box is prepared in the box section. Just like other casings, this is colored, punched and labeled prior to assembly.
- All the circuit components are set on one side of the PCB. These are accordingly soldered on the other side. This is a very time consuming process and a PCB takes on an average six hours to be completed from start to end. **Figure 4.2** shows soldering of different components onto PCB.

Figure 4.2: *Soldering components onto the double layer PCB.*

- A transformer is made just like it was done for AVR. This transformer steps down in the standby mode and steps up in the backup mode. The transformer, PCB and other minor components are all put inside the box and then fixed with nut-bolts. The battery resides in a separate box, which is called “battery bank”. The PCB, the transformer and the battery bank all are wired properly. The manufacturing is shown in **Figure 4.3** and battery banks are shown in **Figure 4.4**.

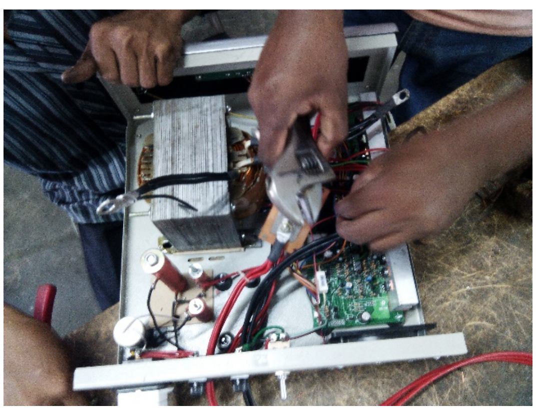

Figure 4.3: *Construction of IPS.*

Figure 4.4: *Battery banks.*

4.1.5. Quality Control

- The low cut and the high cut is checked, which are 80V and 290V respectively.
- When the input voltage is inside this range, the IPS is in standby mode thus delivering the input to the output through the built in AVR. Below 80V and above 290V, the IPS is expected to run on backup.
- The switching delay is checked. It must not be over 1.5 seconds.
- The AVR is also checked if it is stabilizing the output properly within the acceptable range.

- Finally, the IPS is tested with load. These are resistive loads and the required load is calculated using the formula [W] = [VA] × power factor.

4.2. Uninterruptible Power Supply (UPS)

Design, block diagram, operating principle and manufacturing process of UPS are exactly same as those of IPS.

4.2.1. Technical Specifications

Table 4.2 contains technical specifications of different models of UPS [19].

Table 4.2: Technical specifications of UPS.

Model		**NP101**	**NP102**	**NP103**	**NP104**	**NP105**	**NP106**	**NP107**	**NP108**
Capacity		**500VA**	**600VA**	**650VA**	**800VA**	**1kVA**	**1.25kVA**	**1.5KVA**	**2kVA**
Input	**Voltage**	120-240V		150-250V		160-275V		175-300V	
	Frequency	50/60Hz ± 0.5%							
	Voltage AC	220V ± 5% ~ 8%							
Output	**Voltage (inverter)**	220V ± 5%							
	Frequency	50Hz							
	Waveform	Synchronized stepped square							
	Switching time	<300ms							
Battery	**Type**	Sealed lead acid maintenance free battery							
	Recharge time	8 hours to reach full charge							
Protection	**Overload**	AC mode: Fuse Inverter mode: Electronic circuit and shut down							
	Short circuit	AC mode: Fuse Inverter mode: Electronic circuit and shut down							
	Battery	UPS shuts down at 90% discharge							
LED	**Line normal**	Green led							
	Inverter	Yellow led							
	Fail	Red led							
Alarm	**Battery low**	High frequency beep							
	Normal load	Low frequency beep							
Filter	**EMI/RFI filter**	In accordance with IEC 801-3 RF immunity							

Spike/surge protection	Maximum energy: 117 joules / 2 ms, clamped voltage 775 V / 50 A							
Audible noise	<40 dB							
Relative humidity	95% maximum, non-condensing							
Standard backup time (minutes)	May be increased as requested (optional)							
Full load	15	15	15	15	15	15	15	15
Half load	30	30	30	30	30	30	30	30
Special features	Cold start Smart shut off							

4.2.2. Differences between IPS and UPS

The differences between IPS and UPS are as follows:

- IPS has a longer switching delay (1~1.5 seconds) whereas UPS switches near instantly (300 milliseconds)

- IPS provides a longer backup time, usually around 2 hours at full load. This can be further increased by installing battery with more ampere hours. UPS has much shorter backup, around 15 minutes at full load.

- IPS uses heavy duty maintenance battery. These are bulky and needs a separate case which is referred to as “battery bank”. UPS on the other hand uses dry cell battery, and the battery is stationed inside the same casing.

- Both IPS and UPS have built in AVR, but the one integrated with UPS circuit operates more relays, offering better stabilization.

CHAPTER 5: PROBLEMS, RECOMMENDATIONS AND CONCLUSION

5.1. Problems and Recommendations

There are few hurdles that I faced during my training, and these are the content of this section. At the same time I shared what I recommend to overcome these problems.

- Because of my own time constraints, I had training for a total of 120 hours, just above the minimum requirement (100 hours) set by EWU. I would learn in more detail if I could manage more time.
- I faced some difficulty in collecting relevant data for some of the products. Also, many of the designs and circuit diagrams were beyond my reach, since these were proprietary.
- Different products are manufactured based on orders and these orders are totally unpredictable. Somedays, manufacturing of two important products were in progress at the same time and I had to go back and forth in different sections. While, there were days when there were very little workload and I had almost nothing to learn from.
- Not all the products are manufactured in the same regularity. It is very unlikely for a trainee to come by all the products in this short period of time. For example, I could not have training on HT Switchgears during my internship.

5.2. Conclusion

Navana Electronics is an uprising brand in Bangladesh. I consider myself to be lucky to have completed industrial training in an ISO certified company. The authority in Navana is very strict to maintain good quality of products. Their goal is making products with “Zero defect” and they strive to maintain it.

Provision of Industrial Training within the purview of Internship Program as a partial requirement of B.Sc. Engineering degree extends an excellent opportunity to come in touch with the real life situation of the subject. It helps to establish a bridging link between the academic environment and the practical field. Moreover, the process of gradually developing the report builds a remarkable confidence to gather data, undertake studies etc. and write those in text form compatible for the report. This in fact imparts knowledge and skill to work independently and take care of necessary documentation through report preparation. I have learnt a lot of things in the process and experienced many of my theoretical knowledge in the practical form, which I believe will help me somewhere down the road in my career.

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ANNEX-I: DAILY ACTIVITY REPORTS

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	15 May 2014
Start time/End time	10:00AM – 01:30PM ; 02:30PM – 04:00PM
Location:	Navana Electronics, Shahzadpur
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective was to get introduced to different product lines as well as a brief overview of Navana Electronics Ltd.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

The product lines visited are-
1. Distribution transformers
2. LT Switchgear, HT Switchgear
3. UPS (Uninterrupted Power Supply)
4. IPS (Instantaneous Power System)
5. AVR (Auto Voltage regulator)
6. IVS (Industrial voltage stabilizer).
7. PFI plant (Power Factor Improvement Plant).

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

This day's observation relates to electrical machines course, EEE301

15.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	16 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, Ground Floor
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to study the core window of a distribution transformer, to learn how the core is made, how it is set up

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: (1) The material of the core is laminated CRGO strips. This is ~~iron~~-silicon steel alloy. CRGO stands for Cold Rolled Grain Oriented. This is soft magnetic material. Small hysteresis area and high permeability.

(2) There is also non CRGO strips, which are cheaper and not used in distibution transformers because the core loss will be quite high. Non CRGO strips are used in small transformers, where loss is not a critical issue.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: These relate to Electric Machines course EEE301.

16.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name:
Designation: Dr. Anisul Haque
Professor
EEE Department
East West University
Dhaka, Bangladesh.

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	17 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, Ground floor
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to study and observe the transformer windings in detail. How the high tension side and low tension side are desingned with respect to one another, difference of coils, material, and calculation

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: In Low tension side (415 Volts)

a. LT coil is used
b. Thick insulated copper, less turns (because the current is higher in low side)
c. High current, low voltage.

In High tension side (11,000 Volts from grid)

a. HT coil is used.
b. Thin insulated round copper, more turns (current is lower in this side)
c. Low current, high voltage.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

These all relate to Electric machine course, EEE301.

17.05.14
Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager.
Contact Phone #:

16.06.2014
Signature of academic supervisor with date
Name:
Designation: Dr. Anisul Haque
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East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	18 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics; Ground Floor
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: The objective of today was to install the winded transformer core inside the tank case, pour transformer oil (coolant, insulator), installing the reserve oil tank, wiring and labling. This is a Δ−Y system. Grid → Δ, Transformer output Y

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: (1) The previously prepared core with appropriate windings are wired the way it should be
(2) Using chain pully, the core is mounted inside the transformer casing (which is prepared separately.
(3) The container (box/case) is filled up with Transformer oil, which is tested
(4) The final wiring is such that the Transformer takes 3φ input from Δ network (no neutral) and the output is a 3φ. Y network. 11,000V stepdown 415 V. (220 phase)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Todays activity relates to EEE201, 3φ circuits, EEE301, transformer section.

18.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name:
Designation:

Dr. Anisul Haque
Professor
EEE Department
East West University
Dhaka, Bangladesh.

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	20 May 2014
Start time/End time	10:00AM – 01:30PM; 02:30PM – 05:00PM.
Location:	Navana Electronics, IPS Section & Box section.
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: The objective was to see the manufacturing Process of IPS (Instant Power Supply), to understand its operation and to see how the end product goes through quality control. The total process will take approximately 2~3 days.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: (1) PCB (Printed Circuit Board) layouts, designed by Navana Engineers are used to Print PCB. Printing takes place in India (double layer PCB).
(2) All the components (MOS, diode, R, C, heat sink, IC) are soldered one by one. This is a very time consuming process and takes more than one day.
(3) Three transformers are manufactured separately. Two of them are in the PCB. ~~This~~ These two are very tiny in comparison to the 3rd one, which is installed to step down from 220V to 12~15V AC.
(4) The box (case) is made, coulored, labled separately.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: I relate today's activity to EEE102, EEE202, (Electronic circuits) and there are also elements from EEE301 (electric machines).

29/5/14
Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager.
Contact Phone #:

16.06.2014
Signature of academic supervisor with date
Name:
Designation: Dr. Anisul Haque
Professor
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Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	22 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, IPS Section.
Mentor:	S K Mondol.

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's activity is a direct continuation of the last day. The same objective stands. Today the component filled PCB along with the step down transformer will be installed inside the box/case and the device will be wired in the proper way.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: ① The incomplete PCB is completed.
② The PCB is installed inside a box/case which is manufactured, coloured and labled separately.
③ The PCB, Tx and the box is wired in accordance with the circuit diagram.
∴ The IPS is ~~ou~~ now ready to go to QC (Quality Control) and be connected to the battery bank, which will take place tomorrow.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Today's practical activity relates to Electronic circuits and Electric machines. (EEE102, ~~EEE209~~ EEE202, EEE301)

28.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	23 May 2014
Start time/End time	10:00AM – 01:30PM; 02:30PM – 04:00 PM
Location:	Navana Electronics; IPS Section.
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today is the last day of IPS manufacturing which started 2 days ago. This is a direct continuation of what started 20 may. Today's objective is to observe the operation of IPS, observe the QC (Quality Control) process, and battery bank installation.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans:

Operation	QC	Battery Bank.
Mains Power on: 220VAC → output (bypassing) → step down → DC (inverted) Battery charger	Load test... [VA] × 0.8 = [W] p.f = 0.8.	200VA – 800VA → 12 Volts
	Switching delay must not be over 2.5 seconds.	1000VA 800VA – 2kVA → 24 Volts
mains Power off: Battery → Oscillator (inverter) DC AC output ← step up ←	Fan check, Bypass check.	3kVA → 48 Volts. Maintainance Battery used. Every month watering (distilled H_2O with H_2SO_4)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electronic Circuits I & II (EEE102, 202)
Electric machines (EEE301)

23/5/14
Signature of the mentor with date
Name: S. K. Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014
Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
Professor
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Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	24 May 2014
Start time/End time	10:00AM-01:30PM; 01:30PM-04:00PM
Location:	Navana Electronics UPS Section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: Today's objective was to go through the manufacturing process of UPS (Uninterruptible Power Supply) in detail, understand its operation, and observe the quality control measures. (~3 days approx.)

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Circuit layouts designed by Navana Engineers are printed as PCB (printed circuit board). The process of making and the operation is quite similar to those of IPS.

Today's progress:

1. PCB made. (separately)
2. All the components are soldered. (Takes more than a day)
3. The case (box) is made, labled and coloured (separately).
4. Two Tx is prepared (separately)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Related courses: Electronic Circuits I & II (EEE102, EEE202)
Electric Machines (EEE301)

[signature] 24.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory manager.
Contact Phone #:

[signature] 16.06.2014

Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
Professor
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East West University
Dhaka, Bangladesh.

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Narana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	25 May 2014
Start time/End time	10:00 AM – 01:30 PM ; 02:30 PM – 04:00 PM
Location:	Narana Electronics, UPS section.
Mentor:	S K Mondol.

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: This is a direct continuation of 24 may, 2014. Today, the soldering of components are completed, the transformers are installed, the components filled PCB along with Tx and heat sink are placed inside the case and wired properly.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: (1) The incomplete PCB is completed.
(2) The PCB (filled with components) is placed inside the case, which is made, coloured and labled previously. A battery is installed.
(3) The PCB, battery, transformers are wired inside the box the proper way.
(4) Expert Technicians perform some quick tests and see if it is alright to go to the next step: Quality control (Tomorrow).

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electronic Circuits I & II (EEE102, EEE202)
Electric Machines (EEE301)

[signature] 25.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

[signature] 16.06.2014

Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
Professor
EEE Department
East West University
Dhaka, Bangladesh.

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Narana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	27 May 2014
Start time/End time	10:00AM – 01:30PM; 02:30PM – 04:00PM
Location:	Narana Electronics, UPS section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to observe the Quality Control process of UPS (which is manufactured in the last two working days, 24 and 25 May 2014). I've also closely observed the operating principle and seen how it differs from IPS.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Operation	Quality Control:	Major Difference: IPS	UPS
Mains Power On: 220V, AC → AVR → o/p; ↳ step down → DC (invert) ↓ Battery charge	1. Cold start test 2. Low cut test at 160V (around) 3. High cut test around at 270V. 4. LED indicator test.	① Slower switching (~2 sec) ② Longer Backup ③ maintenance Battery	① Very fast switching ② Shorter Backup ③ Dry cell Battery
Mains Power off: Battery DC → Oscillator (AC, invert) → step up → o/p	5. LOAD test (UPS made in Navana – 500VA, 650VA, ~~800VA~~, 1KVA, 1.5KVA, 2KVA)	④ No AVR in bypass mode	④ Built in AVR.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electronic Circuits I & II (EEE 102, EEE 202)
Electric Machines (EEE 301).

[signature] 27.05.14

Signature of the mentor with date
Name:
Designation:
Contact Phone #:

[signature] 16.06.2014

Signature of academic supervisor with date
Name:
Designation: Dr. Anisul Haque
Professor
EEE Department
East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	29 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, PCB Section, Box Section.
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: Today's objective was to explore two important sections - (1) Box/Case, & (2) PCB (printed circuit board). The motive was to see the making of these from scratch.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans:

PCB	Box/Case
(1) 1st, the schematic is drawn using CAD. ? (cadence)/orcad	(1) Raw material: Steel sheet.
(2) The PCB routing is done using the CAD, which ensures least area and no overlapping.	(2) Box is made according to desired dimensions.
(3) Skin is made; Prints on copper layered plastic.	(3) Punched wherever needed
(4) Acid wash to etch copper.	(4) Soldered to join segments.
(5) Thinner to remove prints. PCB is ready.	(5) Acid wash
	(6) Coloured, dried.
	(7) Labled using skinprinting.
	Tx tank is coloured twice to make sure it's rust-free.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Todays activity doesn't relate to any specific course content that I was taught. However, in Electronic Circuits II (EEE202) project work, I've designed and made a PCB in a similar fashion.

[signature] 29.05.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

[signature] 16.06.2014
Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
Professor
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East West University
Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	30 May 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM.
Location:	Navana Electronics; IVS Section.
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

Address the following points briefly (Use additional page if necessary)

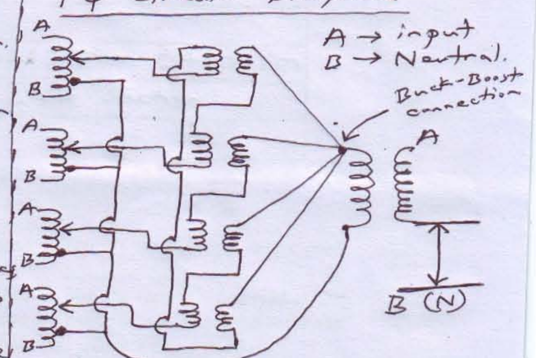
1 What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: (Direct Continuation of 30 May 2014). Today the design was done, and all the parts, i.e the frame, Tank, Tx, Variacs, motors and controller circuit - those were separately prepared. This is a big IVS (1000 kVA), and 3φ.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: (1) Frame and Tank are built in the box section.
(2) 3 step down Tx are built in transformer section.
(4) 12 variacs are made (4 in each phase). This is because the current will be quite large.
(5) Because of multiple variacs toroidal coil was necessary to parallel them.
(6) Controller circuits are made in the similar fashion of PCBs.

1φ circuit Diagram



3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: These relate to Electric Machines, EEE301. Some concepts of Electric Circuits were also applied.

31.05.14
Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014
Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
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Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	01 June, 2014
Start time/End time	10:00 Am-01:30 PM ; 02:30 pm-04:00 pm
Location:	Navana Electronics, IVS Section.
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
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Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: (Direct Continuation of 31 May 2014).
Today, all the parts will be assembled and wired. This is a rigorous process and takes hours, (even days if limited man power).

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Each of the phases are identical.
(1) First off, The frame made by box section is Filled with Variacs, toroidal coils and Txs.
(2) These are assembled, (nut-bolts, welding) and wired in accordance with the circuit diagram. Servo motors are connected to rotate.
(3) The controller circuits is made in PCB section are setup. These sense the o/p and operates the servo motors.
(4) Copper bars are made/shaped as conductors. (These will draw ~1500A!!!)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric Machines, EEE301.

04.06.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager.
Contact Phone #:

AHaque 16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
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Name of the company:	Narana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	03 June 2014
Start time/End time	10:00 AM - 01:30 PM : 02:30 PM-04:00 PM
Location:	Narana Electronics : IVS Section
Mentor:	S K Mondol.

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

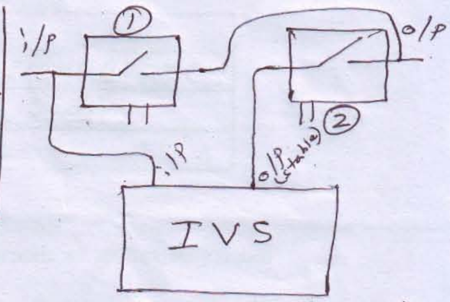
Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: (Direct Continuation of 1st June 2014)
Today's objective is to complete the IVS set up the magnetic contactors and finally go through QC process.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Each phase copper bars are taped in different colours, so it is traceable. 1 circuit operates the relays magnetic contactor and front panel and the other controls the motor.



Quality Control:
1. Low cut check
2. High cut check
3. Stabilization check. (~400V)

when ① is on, ② is off
when ① is off, ② is on.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric Machines, (EEE301).

03.06.14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	~~2008-3~~ S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	05 June 2014
Start time/End time	10:00AM - 01:30PM; 02:30PM - 04:00PM
Location:	Navana Electronics, Distribution Tx section.
Mentor:	S K Mondol.

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

Address the following points briefly (Use additional page if necessary)

1. What was the objective of the day's activities? (If applicable, list multiple objectives)

Ans: The objective of today was to observe and learn the quality control process of a distribution transformer. (DY11). 5 tests are performed – ① Insulation test (AKA Megger test) ② Ratio test, ③ Polarity test, ④ Load test (Short ckt test) and ⑤ No Load test (Open circuit test).

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: ① Insulation test / Megger test:

Body, LT, Body, HT, LT, HT

PDB requires >2500MΩ. Typical: 5000~10,000 MΩ.

② Ratio test: 11K : 415 ≃ 315 : 12 (315 ← Applied in HT side; 12 ← Observed in LT side)

③ Polarity test: Instantaneous polarity checking. One of the phases are short. DYn11

④ Load test: 100kVA Tx. Rated current 140A check.

⑤ No Load test: Apply 415 in LT. must be < 5% of rated I.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric Machines, EEE301

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager.
Contact Phone #:

Signature of academic supervisor with date 16.06.2014
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	06 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, AVR Section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

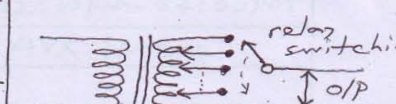
Ans: The objective of today was to see the manufacturing process of AVR (Auto Voltage Regulator), also known as AVS (Auto Voltage Stabilizer), best known as simply "Stabilizer". The operating principle is different from that of IVS, which is also a stabilizer.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: I've seen the manufacturing process of a COOVA AVR.

Steps: ① The Auto Tx with multiple tappings is made. The core is made of non-CRGO silicon-steel alloy.
② Properly wired to the relays.
③ Box making and final assembly is done in a fashion similar to that of IPS and UPS

Circuit Diagram:



A controller ckt is used to switch the relays, the output is sensed and relay is switched to appropriate tapping to meet the desired output range (200~245 V)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric Machines, EEE301

6/06/2014

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
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Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	07 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics; AVR Section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to test and perform the QC process of the AVR manufactured in the last day (06 June 2014). In QC process, I saw how the relays switch tappings to keep the o/p voltage within operating range (200~245V).

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans:

i/p (V)	o/p (V)	
120, <120	Low cut: 0V	↕ (1)
130	205	
140	225	
150	240	↕ (2)
160	210	
170	217	
180	225	
190	233	
200	240	
210	245	↕ (3)
220	210	
230	230	
240	240	
250	245	↕ (4)
260	210	
270	220	
280	230	
290	240	↕ (5)
300, >300	High cut: 0V	

The tappings are switched using relays, which is done in such a way that for a 120~300V i/p, the o/p stays within the range of 205~245, thus ensuring stabilization.

Below 120V and above 300V, stabilization is not possible in this particular AVR design. Beyond the operating range, AVR is cutoff.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric Machines (EEE301)
Electrical Services Design (EEE200)

[signature] 7/06/14

Signature of the mentor with date
Name:
Designation:
Contact Phone #:

[signature] 16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
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Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	08 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, Distribution Section.
Mentor:	S K Mondol.

General Instructions:

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East West University

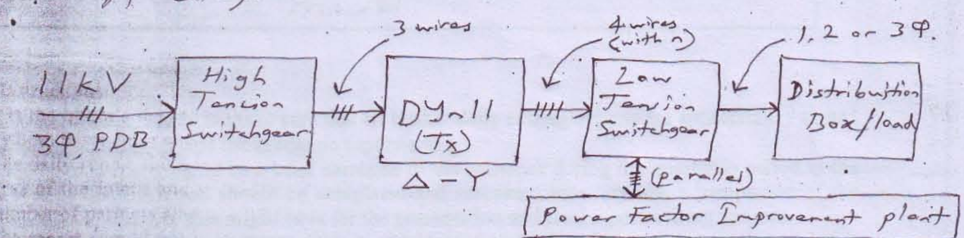
Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: ~~So~~ So far, among Power System equipments, I've seen the manufacturing process of the distribution transformer (DYn11) in detail. Today and the following 5 days (i.e.- till the end of my internship) are dedicated to other Power System components - HT Switchgear, LT Switchgear, PFI plant, DB.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Today, I've learnt about the power flow and how the components fit in the flow. A diagram would be best to describe it:



3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electrical Services Design, EEE200
Electric Circuits, EEE101, EEE201.

8/06/2014

16.06.2014

Signature of the mentor with date
Name: S. K. Mondol
Designation: Senior Factory Manager
Contact Phone #:

Signature of academic supervisor with date
Name:
Designation:

Dr. Anisul Haque
Professor
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East West University
Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	10 June 2014
Start time/End time	10:00Am-01:30pm; 02:30pm-04:00pm
Location:	Navana Electronics, Distribution Section.
Mentor:	S K Mondol.

General Instructions:

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Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

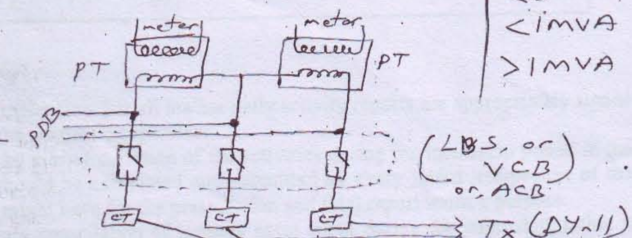
Ans: Today's objective was to learn about High Tension Switchgears. These are rare and mostly manufactured on call for industrial purpose. Unfortunately, in my time during internship, there was no such call, so I had to depend on theory.

2. **List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.**

Ans: HT Switchgears are only used for loads more than 500KVA. Below this, the PDB is directly connected to the Tx.

< 500KVA → LBS
< 1MVA → VCB
> 1MVA → ACB

Diagram:



3. **Relate your practical activity with the theoretical knowledge you gained in the respective academic course.**

Ans: Electrical Services Design (ESS 200).
Some concepts of ESS 211 & ESS 301 were also applied. (Calibration).

[signature] 16/6/14 [signature] 16.06.2014

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	12 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics; Distribution Section
Mentor:	S K Mondol

General Instructions:

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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

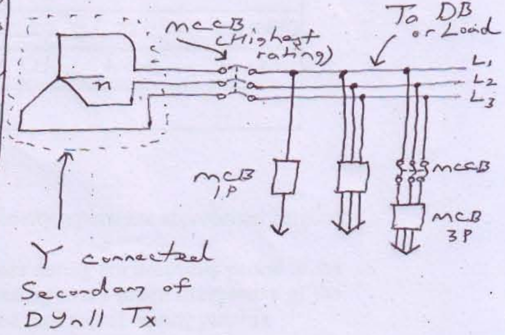
Ans: Today's objective was to observe the manufacturing process of LT Switchgear, to get acquinted with the operating principle, and see the QC process. (The frame, bus bars and the case is prepared in the box section.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: LT Switchgear is mostly a combination of various types of circuit breakers, ~~magnetic contactors~~, fuses and protective relays. The main 2 types of CBs used –

1. MCCB: Molded Case Circuit Breaker (Ampere 2.5KA)
2. MCB: Miniature Circuit Breaker (Below 100A)

Circuit Diagram



3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course. 3. ACB

Ans: Electrical Services Design, EEE200

[signature] 12/06/14

[signature] 16.06.2014

Signature of the mentor with date
Name: S. K Mondol
Designation: Senior Factory Manager
Contact Phone #:

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
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Dhaka, Bangladesh

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Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	13 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics, Distribution Section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to observe the manufacturing process of a Power Factor Improvement plant (PFI plant). Narana Electronics uses EPCOS power factor correction module and EPCOS capacitor banks.

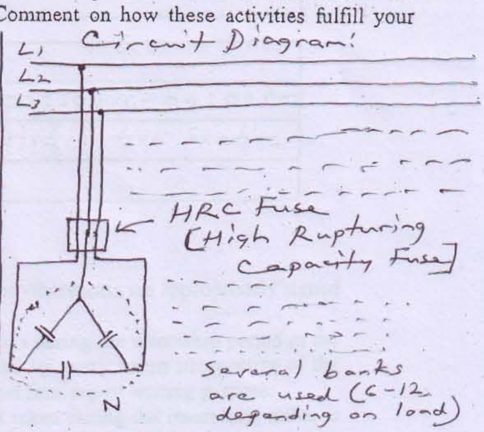
2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: $\cos\theta = \frac{\text{Real Power}}{\text{Apparent Power}}$

[VA] = [Watt] + [VAR]

The objective is to make it 0. [reduce as much as possible]

- Capacitors are Δ connected inside the capacitor bank.
- PFI plant is installed in parallel to LT-Switchgear



3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electric circuits II (EEE201)
Power Factor Correction.

13/06/14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Navana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	14 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Navana Electronics; Distribution Section
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
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Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

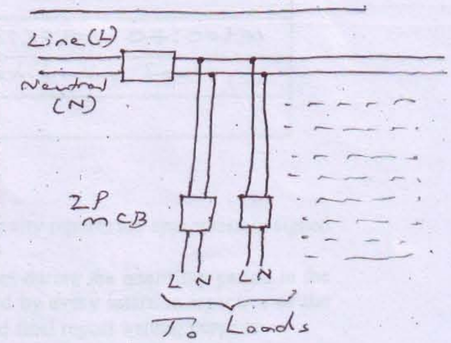
1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: Today's objective was to see the construction of a distribution board (DB). These are mostly single phase (used in residence), but can also be setup to support Two phase or Three phase.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: Individual loads are connected to the bus bars through MCB/MCCB. And there is a main circuit breaker (higher A rating) through which the buses are connected to the phase coming from LT Switchgear.

Circuit Diagram:



3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: Electrical Services Design, EEE200

14/6/14

AHaque 16.06.2014

Signature of the mentor with date	Signature of academic supervisor with date
Name: S K Mondol	Name: Dr. Anisul Haque
Designation: Senior Factory Manager	Designation: Professor, EEE Department, East West University, Dhaka, Bangladesh
Contact Phone #:	

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Narana Electronics
Name of the student:	S. A. N. Shams Rishad
ID:	2008-3-80-004

Date:	15 June 2014
Start time/End time	10:00AM-01:30PM; 02:30PM-04:00PM
Location:	Narana Electronics
Mentor:	S K Mondol

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

Ans: This is the last day of my 24 days long internship at Navana Electronics. I felt it necessary to dedicate this last day comprehending the company's process flow.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

Ans: A flow-chart depicting the overall process is attached with this report. Please turn over to see it.
(The space is inadequate to draw it here).

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Ans: MGT321

15/6/14

Signature of the mentor with date
Name: S K Mondol
Designation: Senior Factory Manager
Contact Phone #:

16.06.2014

Signature of academic supervisor with date
Name:
Designation:
Dr. Anisul Haque
Professor
EEE Department
East West University
Dhaka, Bangladesh

Overall Process Diagram of Various Products of Navana Electronics

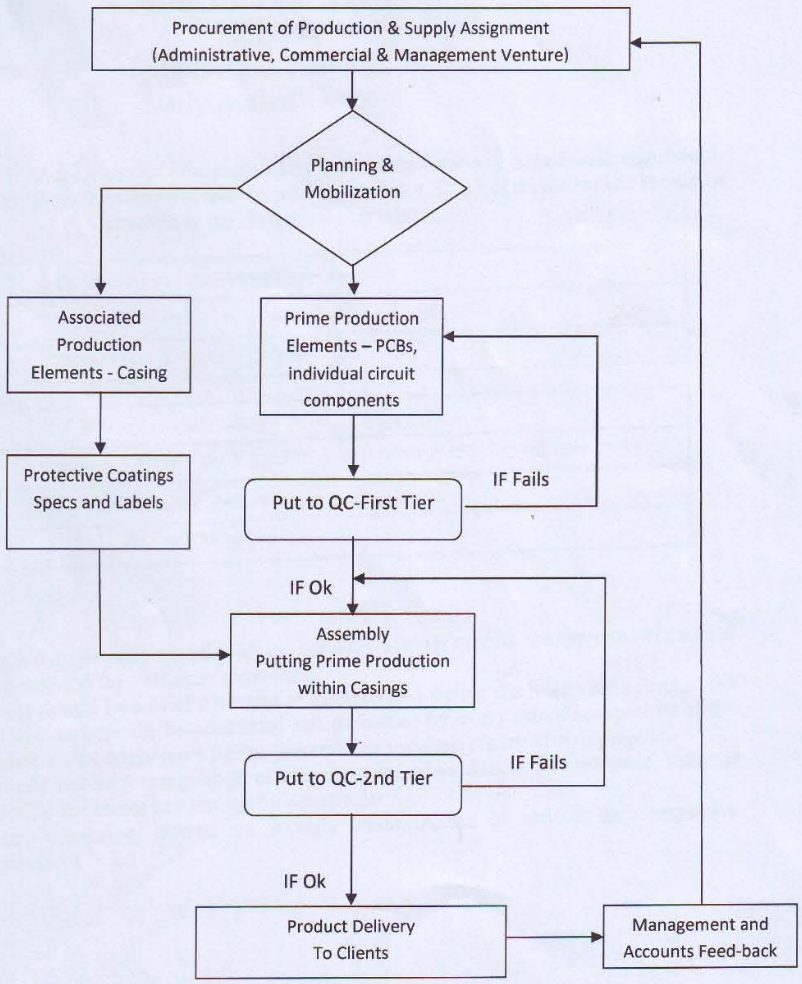

Figure: 1. Procurement of Assignment to Delivery of Finished Product