INTERNSHIP REPORT

ON

POWER GENERATION, TRANSMISSION, DISTRIBUTION AND PROTECTION SYSTEM OF SIDDHIRGANJ 2×120 MW PEAKING POWER PLANT.

By

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Submitted to the

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

Spring, 2013

Approved By

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Approval Letter

ELECTRICITY GENERATION COMPANY OF BANGLADESH LIMITED

(An Enterprise of Bangladesh Power Development Board)

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Office of the General Manager

Ref No.: 319/DGM (Op)/2x120MW /EGCB/2012. Date: 15.9.2012

CERTIFICATE

This is to certify that **Syed Shahed Hasan Rommel** son of S.M Obaidullah, **Student ID.2009-2-80-015**; Department of Electrical & Electoronic Engineering, East West University have successfully completed Industrial Training (105 hours) at **Siddhirgong 2x120MW Peaking Power Plant** of Electricity Generation Company Of Bangladesh Ltd from **12.08.2012 to 08.09.2012.** During his training period he was familiarized with operation and maintenance of GE Frame 9E Gas Turbine, Gas Booster Compressor, Instrument Air Compressor, Water Treatment plant, Switch-Gear, Transformer, Sub-station, etc.

We wish him all success in life.

(Md. Atiar Rahman)
Deputy General Manager (Operation)
Siddhirgong 2x120MW Peaking Power Plant,
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Siddhirgong, Narayangong.

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This is to certify that **Md. Al-Amin** son of Md. Mobarak Hossain, **Student ID.2009-2-80-023**; Department of Electrical & Electoronic Engineering, East West University have successfully completed Industrial Training (105 hours) at **Siddhirgong 2x120MW Peaking Power Plant** of Electricity Generation Company Of Bangladesh Ltd from **12.08.2012 to 08.09.2012.** During his training period he was familiarized with operation and maintenance of GE Frame 9E Gas Turbine, Gas Booster Compressor, Instrument Air Compressor, Water Treatment plant, Switch-Gear, Transformer, Sub-station, etc.

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Acknowledgment

We wish to convey our heartfelt gratitude to Almighty Allah for His help to complete the internship successfully at the very outset. We also thank the management of Siddhirganj 2×120 MW Peaking Power Plant for providing us such opportunity to accomplish our industrial training.

We want to thank all those people who helped to complete our internship successfully. In this process our special thanks go to Engr. A.K.M Zillur Rahman, Engr. Ashis Kumar Biswas, Engr. Nandipan Das, Engr. Md.Yamin Ali who coordinated our internship program and helped us to get acquainted with other engineers. They helped us to learn the scheduled topics which were presented during our internship training.

We would also like to mention the name of Dr. Mohammad Mojammel Al Hakim, Chairperson, Associate Professor of the Department of Electrical & Electronic Engineering, East West University.

We take this opportunity to extend our sincere thanks and gratitude to our supervisor Dr. Anisul Haque, Professor, Department of Electrical & Electronic Engineering, East West University for giving his valuable time for us to complete this report successfully.

Executive Summary

We did our internship at Siddhirganj 2×120 MW Peaking Power Plant located at Siddhirganj, Narayanganj on the bank of the river Shitalakkha from 12th August to 8th of September 2012 and this internship report is the result of those 15 days attachment. During our internship period we gathered practical experiences over the topics related to power generation, switchgear protection and power distribution which we have learned inside the class room or from books. In this report we have focused on the processes which are used in Siddhirganj 2×120 MW Peaking Power Plant.

For power generation, natural gas is used in Siddhirganj 2×120 MW Peaking Power Plant. Protection and controlling of the equipments of the power station is a very important and complicated task. With the help of the plant engineers we observed the control room and protective equipments, such as, relays, circuit breakers very closely and understood the functions and controlling system of those equipments.

We acquired knowledge about various types of transformers, isolators, circuit breakers, lightning arresters, current transformers, potential transformers and other equipments of the power station which were clearly taught and shown by the engineers of the Siddhirganj 2×120 MW Peaking Power Plant.

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Chapter 1

Introduction

We got the opportunity of doing internship at Siddhirganj 2×120 MW peaking power plant, under Electricity Generation Company of Bangladesh Limited (EGCB) in the summer semester of 2012. We started our internship on 12thAugust 2012 and completed on 8th September 2012. From Siddhirganj 2×120 MW peaking power plant we have gathered practical experience over power generation process, power generating equipment, protection and power distribution system. Before this internship we had only theoretical knowledge over these topics but on completion of internship at Siddhirganj 2×120 MW peaking power plant we had the opportunity to experience the process of power generation, switchgear protection and power distribution system and got the chance to observe the industrial environment. It is a light fuel power plant, basically uses gas. The total capacity of Siddhirganj 2×120 MW peaking power plant is 240 MW which is generated by 2 units. Each unit produces 120 MW. The owner of the Siddhirganj 2×120 MW peaking power plant is Bangladesh Government but the maintenances and operations are done by EGCB.

1.1 Objective of the Internship

The first objective is to complete EEE499 course which is an essential part for completing the B.Sc. in Electrical and Electronic Engineering at East West University. After completion of internship in Siddhirganj 2×120 MW power plant we have earned practical knowledge. The following list summarizes our internship goals.

- Understanding company management.
- Understanding industrial environment.
- Acquiring practical knowledge about power generation.
- Acquiring practical knowledge about power distribution.
- Acquiring practical knowledge about switchgear protection.
- Acquiring practical knowledge about protection system equipment.
- Idea about safety.

1.2 Scope and Methodology

1.2.1 Scope

This report is based on the internship program where we reviewed the basic process of power generation, power distribution, switchgear protection and protection system equipment. It also contains descriptions of various mechanical and electrical equipments which are used to generate and distribute power. The report contains other relevant information about the Siddhirganj 2×120 MW power plant which we observed during the internship program.

1.2.2 Methodology

We have organized our report mainly in different chapters which are switchgear, transformer, gas turbine, control system and operating process of the plant.
This report has been prepared on the basis of:

- **Primary information:** The information is gathered by personal observation and working with the plant engineers at Siddhirganj 2×120 MW power plant.
- **Secondary information:** The company website and various single line diagrams provided by the engineers whom we worked with.

1.3 Training Schedule

Our internship started on 12th of August 2012 and ended on 8th of September 2012. The training schedule at Siddhirganj 2×120 MW Peaking Power Plant is given in the table 1.1.

Table 1.1: Training schedule of Siddhirganj 2×120 MW Peaking Power Plant [1].

Day	Duration	Division	Trainer
Monday 13.08.2012	9 AM to 4 PM	Electrical	Engr. Nandhipan Das Asst. Manager (Technical)
Tuesday 14.08.2012	9 AM to 4 PM	Control unit	Engr. Nadir Chowdhury Asst. Manager (Operation)
Saturday 25.08.2012	9 AM to 4 PM	Control unit	Engr. Siddiqur Rahman Asst. Manager (Operation)
Sunday 26.08.2012	9 AM to 4 PM	Control unit	Engr. Siddiqur Rahman Asst. Manager (Operation)

Day	Duration	Division	Trainer
Monday 27.08.2012	9 AM to 4 PM	Operation	Engr. A.K.M Zillur Rahman Asst. Manager (Technical)
Tuesday 28.08.2012	9 AM to 4 PM	Fire Fighting	Engr. K.M.H Kabir Manager (Environment & Safety)
Wednesday 29.08.2012	9 AM to 4 PM	Electrical	Engr. Ashis Kumar Biswas Asst. Manager (Technical)
Thursday 30.08.2012	9 AM to 4 PM	Electrical	Engr. Nandhipan Das Asst. Manager (Technical)
Saturday 01.09.2012	9 AM to 4 PM	Electrical	Engr. Nandhipan Das Asst. Manager (Technical)
Sunday 02.09.2012	9 AM to 4 PM	Mechanical	Engr. Yamin Ali Asst. Manager (Technical)
Monday 03.09.2012	9 AM to 4 PM	Mechanical	Engr. Yamin Ali Asst. Manager (Technical)
Tuesday 04.09.2012	9 AM to 4 PM	Electrical	Engr. Ashis Kumar Biswas Asst. Manager (Technical)
Wednesday 05.09.2012	9 AM to 4 PM	Electrical	Engr. Nandhipan Das Asst. Manager (Technical)
Thursday 06.09.2012	9 AM to 4 PM	Electrical	Engr. Saiful Islam Manager (Electrical)
Saturday 08.09.2012	9 AM to 4 PM	Mechanical	Engr. Yamin Ali Asst. Manager (Technical)

Chapter 2

Company Profile

The Meghnaghat Power Company (MPC) Limited has been re-named as Electricity Generation Company of Bangladesh (EGCB) on 16th February 2004. It was incorporated with registrar of joint stock companies on 16th February, 2004 to produce and sale of electricity. EGCB has a plan to become a leading electricity generation company across the country [1].

2.1 History

The construction of Siddhirganj 2×120 MW power plant project has been completed on the bank of the river Shitalakhya within the Siddhirganj power station funded by Asian Development Bank.

Electricity Generation Company of Bangladesh Limited signed a contract with Bharat Heavy Electricals Limited (BHEL) as contractor for the above project on 31th January, 2007. First Unit was put on test run on 20th November, 2009. The 2nd Unit was put on test run on 26th May, 2010. Commercial operation date of both units was from 5th February, 2012.

A Power Purchase Agreement (PPA) for 2×120 MW Peaking Power Plant at Siddhirganj was signed between EGCB Limited and Bangladesh Power Development Board (BPDB) on 29th August, 2011 for a period of 22 years [1]. Overview of the Siddhirganj 2×120 MW Peaking Power Plant is given in table 2.1.

Table 2.1: Details of Siddhirganj 2×120 MW Peaking Power Plant [1].

Item	Particulars
Contractor	Bharat Heavy Electricals Limited (BHEL), India
Site	Siddhirganj, Narayanganj
No. of Unit	2 (Two)
Capacity	211.76 MW (2 × 105.88 MW)
Fuel	Natural Gas
Contract Signed	31th January, 2007

2.2 Mission and Vision

The mission of EGCB Limited is “To excel in electricity business by generating efficient, reliable and cost effective electricity in an environmentally responsible manner to satisfy customers”.
The vision of EGCB Limited is “Generation of quality electricity for the betterment of the nation”.

2.3 Future Plans of EGCB

There are different future plans of EGCB for more power generation and distribution. EGCB is expecting to finish the work in 2015. These are given below.

- **335 MW Combined Cycle Power Plant**

The construction of the Siddhirganj 335 MW Combined Cycle Power Plant is underway. This project is expected to be completed by 2014-2015. The construction process is also underway. The Government of Bangladesh and International Development Association (IDA) are jointly financing the power plant project [1].

- **Haripur 360 MW Combined Cycle Power Plant**

This project is being financed by the Japan International Cooperation Agency (JICA). The construction of Haripur 360 MW combined cycle power plant and associated substations are being implemented by EGCB Limited. The overall generation capacity of this power plant is expected to be 412 MW [1].

Chapter 3

Switchgear

We spent three days at the switchgear section in our internship. In this section we will discuss about the switchgear, the types of switchgear, different types of circuit breakers, panels and relays. Switchgear is a general term covering a wide range of equipment concerned with switching and protection. Switchgear and protection panels are installed at each voltage level for normal routine switching, control and monitoring. The automatic switching works during abnormal and fault condition such as short circuit.

3.1 Different Types of Relays

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a low power signal with complete electrical isolation between control and controlled circuits. Several circuits must be controlled by one signal.
In Siddhirganj 2×120 MW Peaking Power Plant we have mainly learned about two types of relays.

- Buchholz relay,
- 86 master trip relay.

3.1.1 Buchholz Relay

A Buchholz relay is a safety device used in oil filled power transformers and reactors. It senses the dielectric failure. It is constructed with an external overhead oil reservoir called a conservator. The Buchholz relay is used as a protective device. The relay detects the failure of a transformer depending on the model. It forces the oil level down. It also detects the oil leaks. There is a switch which is used for alarm signal. In Siddhirganj 2×120 MW Peaking Power Plant Buchholz relay is used in 11 KV/132 KV transformers.

Figure 3.1: Buchholz relay in 132 KV transformers [2].

In figure (3.1) we can see the Buchholz relay in the pipe line between the top of the transformer main tank and the conservator.

3.1.2 86 Master Trip Relay

86 Master trip relay is the main trip relay. The breakers can trip only through this relay. In transmission and distribution line there are many protective relays such as distance relay, over current relay, earth fault relay and differential relay. If any of the protective relays senses a fault, it will energize the master trip relay and the master trip relay will trip the breaker.

In Siddhirganj 2×120 MW Peaking Power Plant 86 master trip relay is used in switchgear control room. Its function is important because tripping of the breakers depends on 86 Master trip relay.

3.2 High Voltage (HV) Switchgear

High voltage switchgear is used for power control and distribution systems. It has rated working voltage up to 132 KV. Components which are essential for HV switchgear are as follows.

- Insulator,
- Isolator,
- Bus bar,
- Current transformer,
- Potential transformer.

3.2.1 Insulator

An insulator prevents undesired current flowing electricity. In insulating materials valance electrons are tightly bonded. So it resists the flow of electron. These materials are used in electrical equipment as insulator. There were two types of insulators at Siddhirganj 2×120 MW Peaking Power Plant are as follows.

- **Pin type:** This type of insulator is used in 132 KV transmission line.
- **Shackle type:** This type of insulator is used in low voltage transmission line.

Figure 3.2: Pin type insulator [3].

In figure (3.2) we can see a pin type insulator which can be used in different transmission lines.

3.2.2 Isolator

Isolators are used to isolate a certain portion of a system after switching of circuit breakers. It is very important for maintenance purpose. In Siddhirganj 2×120 MW Peaking Power Plant isolators are used in high voltage switchyard of 132 KV transformers. Isolators are placed before and after circuit breakers in series. Isolators are used to isolate some part of transmission line for maintenance. In Siddhirganj 2×120 MW Peaking Power Plant automatic and manual isolators are used.

Figure 3.3: Picture of isolator in high voltage switch yard [2].

In figure (3.3) we can see isolators for 11 KV/132 KV transformers in high voltage switchyard.

3.2.3 Busbar

Busbar is a thick copper bar that conducts electricity. Busbar is used to carry large current and to distribute current. In a busbar voltage and phase sequence remain same. The size of busbar determines the amount of current that it can carry.

There are several types of busbars. These are as follows.

- Single busbar,
- Double busbar,
- Ring busbar.

Siddhirganj 2×120 MW Peaking Power Plant uses double busbar system. Double busbar has several advantages. These are as follows.

- Cost of installation is less,
- Cost of equipment is less,
- Requires less space.

3.2.4 Current Transformer

A current transformer (CT) is used for measurement of electric current. When current in a circuit is too high a current transformer produces a reduced current accurately proportional to the current in the circuit. In Siddhirganj 2×120 MW Peaking Power Plant the ratio of current transformer is (800:1) of 132 KV Line.

Figure 3.4: Picture of current transformer used in Siddhirganj Power Plant [2].

In figure (3.4) we can see three phase current transformer in high voltage switchyard.

3.2.5 Potential Transformer

Potential transformers are used for metering and protection in high voltage circuits in Siddhirganj 2×120 MW Peaking Power Plant. It steps down the high voltage to low voltage. Potential transformer core is bulky. The ratio of potential transformer is (1200:1) of 132 KV Line.

Figure 3.5: Picture of potential transformer used in Siddhirganj Power Plant [2].

In figure (3.5) we can see three phase potential transformer in high voltage switchyard. Potential transformer also sends signal to relays.

3.3 Circuit Breaker

Circuit breaker is a protective device which separates a circuit from the rest of the system under fault condition. Circuit breaker is operated automatically. Its basic function is to detect a fault condition and protect the electrical circuit. When any fault occurs, circuit breaker receives signal and disconnect the circuit to protect an electrical circuit or device from being damaged. In Siddhirganj 2×120 MW Peaking Power Plant we have seen Air Blast Circuit Breaker (ABCB), SF6 Circuit Breaker, Air Circuit Breaker (ACB), Miniature Circuit Breaker (MCB) and Molded Case Circuit Breaker (MCCB).

3.3.1 Air Blast Circuit Breaker (ABCB)

Air blast circuit breakers are used in Siddhirganj 2×120 MW Peaking Power Plant to reduce damage if fault occurs. The rated voltage is 72.5 KV or higher. In the power plant air blast circuit breaker are used in AC motor feeders. In the air blast circuit breakers the arc interruption is done by directing a blast of air at high pressure and velocity to the arc. The contacts are opened by air blast. The air blast cools the arc and sweeps away the charged particles to the atmosphere. The air blast circuit breaker is a high voltage circuit breaker.

The advantages of ABCB are as follows.

- The arcing voltage rating of the breaker is increased. The arc voltage is increased by cooling the arc plasma. The temperature of the arc plasma is decreased. So the mobility of the particle in arc plasma is reduced. Thus voltage rating is increased to maintain the arc.
- There is no chance of fire caused by oil.
- Requires less maintenance.

The disadvantages of ABCB are as follows.

- Expensive,
- Complicated construction.

3.3.2 Sulfur Hexafluoride (SF6) Circuit Breaker

Sulfur Hexafluoride circuit breakers are used in Siddhirganj 2×120 MW Peaking Power Plant in high voltage. The SF6 gas is an electro negative gas and has a strong tendency to absorb free electrons. In the power plant SF6 circuit breakers are used in 11 KV/132 KV transformer and generator. The three phases are maintained by one control board. The generator circuit breaker is 10000 A where generator output is 7125 A.

Figure 3.6: SF6 circuit breaker used in Siddhirganj Peaking Power Plant [2].

In figure (3.6) we can see SF6 circuit breaker which can be used in the substation.

The advantages of SF6 are as follows.

- Relatively smaller size,
- High interrupting capacity.

The disadvantages of SF6 are as follows.

- SF6 breakers are costly due to the high cost of SF6.

3.3.3 Air Circuit Breaker (ACB)

The air circuit breaker is a medium voltage circuit breaker. The rated current is up to 10,000 A. The rated voltage is up to 72 KV. In Siddhirganj 2×120 MW Peaking Power Plant air circuit breakers are used in AC motor feeders and AC busbar. It is usually electrically controlled but some are microprocessor controlled. The air circuit breakers are easy to maintain.

Figure 3.7**:** ACB used in Siddhirganj Peaking Power Plant [2].

In figure (3.7) we can see an ACB which can be used in different motors.

The advantages of ACB are as follows.

- Relatively inexpensive,
- Simple construction,
- Simple maintenance requirements.

The disadvantages of ACB are as follows.

- Limited interrupting capacity,
- Chance of loss of air pressure due to leakage from air pipe junctions.

3.4 Programmable Logic Controller (PLC)

PLC is very important for controlling a system. In PLC a computer is being used for automation of electromechanical processes. It was developed to replace the necessary sequential relay circuits of controlling system. PLCs are used in many industries and machines. It takes inputs and analyze states and gives outputs.
In Siddhirganj 2×120 MW Peaking Power Plant PLC is used in instrument air compressor, Nitrogen plant, instrument air dryer and water treatment plant. The type of PLC is Allen-Bradly Micro-logix TM-1000, Model No: 1761-L10BWA and the Series is 'F', FRN 1.1.

3.5 Automatic Voltage Regulator (AVR)

The automatic voltage regulator is a device which regulates the voltage. It is used to convert varying voltage level into a constant voltage level. The automatic voltage regulators are useful for AC applications. This device is also called power stabilizer. The power stabilizer is an automatic voltage regulator combined with one or more other power capabilities. There are different types of automatic voltage regulators for different application.
These are given below.

- Single phase automatic voltage regulator,
- Motor automatic voltage regulator,
- Electronics automatic voltage regulator.

In Siddhirganj 2×120 MW Peaking Power Plant AVR control panel is used in switchgear control room.

3.6 Metering and Measuring Panel

We found that many types of equipment are used for the metering and measuring panel in Siddhirganj 2×120 MW Peaking Power Plant. Current transformers, voltage transformers, relays, auxiliary equipments, and protection relays are used in metering and measuring panels. In the bus bars there are over voltage and under voltage protection. In the feeder there is over current protection, earth fault current protection, voltage and current measuring, active power and reactive power measuring system available. In the power plant there is also metering and measuring panel in gas conditioning skid to maintain gas pressure. There are some panels for different motors and oil pumps in turbine and generator control room.

3.7 DC System

The DC system is used to convert the AC supply into DC supply for the equipments needing DC power. Normally the DC power is supplied through rectifiers through the battery package as backup in case of supply failure. There is a battery control room for supplying the load for a limited time, and if it is discharged then diesel generator will start. Normally the rectifier supplies the load. The battery bank supplies the load for a limited time if the main supply is interrupted. The batteries are typically sized for 8 or 12 hours and type of batteries is Lead acid.

In Siddhirganj 2×120 MW Peaking Power Plant equipments which need DC supplies are given below.

- All field instruments (24 V DC),
- Circuit breaker module control power supply (110 V DC),
- Gas turbine emergency drive panel (125 V DC),
- Mark VI control system for gas turbine (125 V DC),
- All gas turbine solenoids (125 V DC).

3.8 Low Voltage (LV) Switchgear

The low voltage switchgear is used for all the auxiliary power needs such as motors (pumps), fans, heaters etc. In Siddhirganj 2×120 MW Peaking Power Plant, low voltage switchgear distributes power from station transformers to auxiliary units and power plant's internal network.

3.8.1 Voltage and Current Levels

There are some rated current levels in Siddhirganj 2×120 MW Peaking Power Plant for the equipments. These are mentioned below.

- Rated normal current: 630/800/1250/1600/2000/2500/3150 A.
- Rated short time withstand current and duration: 3 sec.
- Rated short circuit breaking current: 25/31.5/40/44 KA.

There are some rated voltage levels also. These are given below.

- Nominal voltage level: 230 V/400 V/6.6 KV/11 KV/132 KV.
- Low voltage level: 230 V.
- High voltage level: 132 KV.

3.8.2 Miniature Circuit Breaker (MCB)

Rated current of MCB is not more than 100 A. It can be used for both single phase and three phase power systems. The tripping characteristic is not adjustable normally. Thermal or thermal magnetic mechanism is used in this circuit breaker. There is no fixed time for the thermal operation.

3.8.3 Molded Case Circuit Breaker (MCCB)

Molded case circuit breaker (MCCB) has also thermal or thermal-magnetic operation. In MCCB the tripping characteristic is adjustable. Normally it is used for three phase power system. Rated current is up to 2500 A.

The MCB and MCCB are low voltage circuit breakers.

Chapter 4

Transformer

4.1 Introduction

Transformer is one of the most important equipments in the power supply and distribution. It is a power converter which is used to change the voltage. When current flows through the primary coil, it generates a magnetic flux. This magnetic flux cuts the secondary coil. This varying magnetic field induces a varying voltage in the secondary winding. Thus the voltage is being changed. In our internship we went to see transformer for only one day. We saw the basic function of transformer, types of transformers, construction and maintenance.

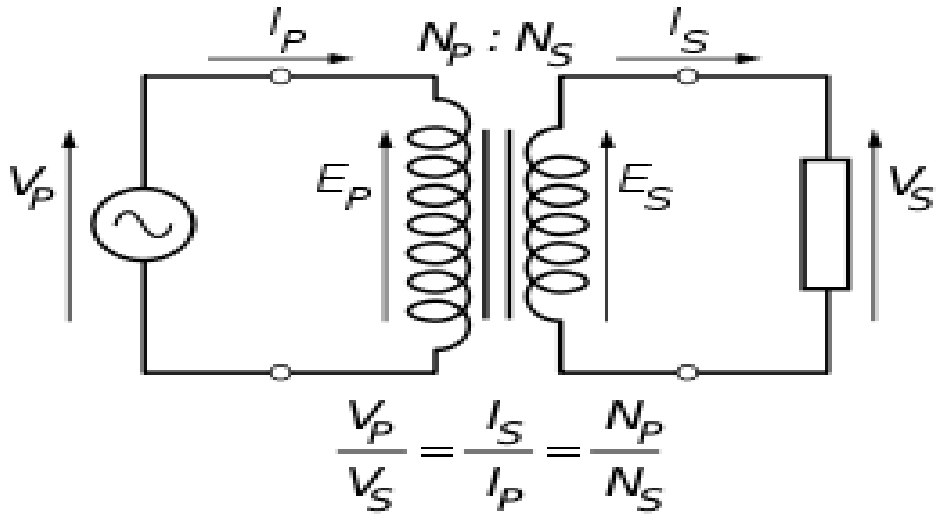

Figure 4.1: Ideal transformer as a circuit element [4].

In figure (4.1) we can see internal circuit diagram of a transformer.

4.2 Construction of Transformer

The construction of transformer is very simple. Transformers are mainly outdoor, there must be a cooling system, and it may be three phase or single phase depending on the rating. We saw two 11 KV/132 KV power transformers in Siddhirganj power plant and each has rated power 102 MVA.

The main parts of the transformer are given below.

- Main tank,
- Radiators,

- Conservator,
- Explosion vent,
- Lifting lugs,
- Air release plug,
- Oil level indicator,
- Tap changer,
- Wheel,
- High voltage/low voltage bushings,
- Filter valve,
- Buchholz relay,
- Oil filling plug,
- Cable box,
- Silica gel.

4.3 Power Transformer

Different types of power transformers are used in power system. In a power plant, mainly distribution transformers, power transformers, current transformer (CT), and potential transformer (PT) are needed. In the power plant different types of transformers are used for different purposes.

In Siddhirganj power plant, the power transformers were 3 phase. All of them were Y/Δ. Power transformer is used for the transmission purpose at heavy load, at high voltage greater than 33 KV and for high efficiency. It is larger in size as compared to distribution transformer. It is used in generating station and transmission substation. These transformers primary is connected to the generator.

Figure 4.2: 11 KV/132 KV transformer used in Siddhirganj Peaking Power Plant [2].

In figure (4.2) we can see 11 KV/132 KV transformers. There are two 11 KV/132 KV transformers in the power plant. In table 4.1, some characteristics of the transformers are enlisted.

Table 4.1: Transformer rating (11 KV/132 KV) [7]:

Line current(Secondary side)	743.55 A (maximum)
Temperature rise in oil	50° C (maximum)
Temperature rise in winding	55° C
Weight of the oil	54120 kg
Oil quantity	60800 liter

4.4 Vector Group

The vector group indicates how the winding is to be connected and what should be the phase position of their respective voltage vectors. It consists of letters identifying the configuration of the phase windings and the number indicating the phase angle between the phase-to-neutral voltages of the windings.

In table 4.2 the vector groups of the transformers of Siddhirganj power plant are as follows.

Table 4.2: Vector groups of transformer [7]:

Rating	Vector Group
11 KV/132 KV transformer	Ydn11
0.44 KV/6.6 KV transformer	Dyn11

Ydn11: Y connected high voltage winding, Delta connected low voltage winding with neutral brought out and low voltage is leading high voltage with 30° (voltage).

Dyn11: Delta connected high voltage winding, Y connected low voltage winding with neutral brought out and low voltage is leading high voltage with 30° (voltage).

4.5 Polarity

Transformer Polarity is the relative direction of the induced voltages between the high voltage terminals and the low voltage terminals. It is very important to run two transformers in parallel.

A transformers high-voltage winding terminals are identified by H, and the low-voltage winding terminals by X. In the case of a two-winding transformer, the pair of high-voltage terminals are marked H_1 - H_2, and the pair of low-voltage terminals are marked X_1 - X_2.

When the potential of high-voltage terminal H_1 goes positive, if low-voltage terminal X_1 also goes positive at the same time then the transformer is an additive polarity transformer. If terminal X_2 goes positive at the same time as H_1 then the transformer is a subtractive polarity transformer.

4.6 Overloads of Transformers

Overload of transformer increases heat as waste in transformer. The heat generated in transformer operation causes temperature rise in the internal structures of the transformer. This reduces transformer life.

In Siddhirganj power plant the working engineers described about the overload of transformer. When overload occurs, three kinds of protection are activated and the circuit breaker trips. They are differential current protection, over current protection and earth fault protection.

4.7 Different Types of Faults

We have found that certain faults can occur in a transformer in Siddhirganj 2×120 MW Peaking Power Plant. These faults are discussed below.

4.7.1 Faults between Medium Voltage Winding Turns

Fault between medium voltage winding turns is the most frequent fault in the transformer. This kind of fault occurs due to thermal or dielectric stresses and is difficult to detect.

4.7.2 Faults between Low Voltage Windings

Fault between low voltage windings is usually exceptional since these windings are placed closest to the core and are surrounded by medium voltage windings. In case of multiple low voltage windings on the same magnetic core column (zigzag coupling) there exists a possibility of fault. Progression can be rapid due to the presence of an arc of significant intensity.

4.7.3 Faults between Medium Voltage and Low Voltage Windings

This fault occurs between windings and can also lead to a contact between primary and secondary sections. This will lead to the appearance of a dangerous potential on the low voltage side.

4.7.4 Faults between Medium Voltage Windings and Earth

This fault usually originates from a break in insulation due to over voltage. This can also be a result of mechanical type faults.

4.8 Testing of Transformers

Siddhirganj 2×120 MW Peaking Power Plant uses three types of tests for transformers. These are type test, special test and routine test.

4.8.1 Type Test

There are two type tests are conducted in Siddhirganj 2×120 MW Peaking Power Plant. These are Lightning impulse test and Temperature rise test. The purpose of lightning impulse test is to confirm that the transformer insulation withstands the lightning over voltage which may occur in service.

The power transformers used in high voltage systems at any time may be affected by the atmospheric discharges. The magnitudes of the lightning voltages always depend on the impulse current and impulse impedance where the lightning impulse occurs. This value is several times the operating voltage. In the transformer, maximum seven times greater of rated operating voltage of the winding is applied to check its insulation.
Temperature rise test is a kind of type test. The oil and winding temperatures are tested to measure whether these are in accordance with both standards and technical specifications.

4.8.2 Special Test

We have come to know that this test measures the ability of the transformer to withstand the mechanical and thermal stresses caused by the external short circuit in Siddhirganj 2×120 MW Peaking Power Plant.
The following tests are under Special Test.

- Additional impulse test,
- Short circuit test,
- Measurement of zero phase sequence impedance test,
- Measurement of harmonics of the no load current test,
- Magnetic balance test.

4.8.3 Routine Test

Routine test is the most important test for the transformer. In Siddhirganj 2×120 MW Peaking Power Plant we came to know that there are many types of tests under routine test. These are given below.

- Measurement of winding resistance test,
- Measurement of insulation resistance test,
- Separate source voltage withstand test (high voltage tests and low voltage winding),
- Induced over voltage withstand test (double voltage double frequency test),
- Measurement of no load loss and current test.

4.9 Maintenance and Protection of Transformer

Preventive maintenance is always cost effective and time saving. Any failure to the transformer can extremely affect the whole functioning of the organization. The maintenance factors of a transformer are given below.

4.9.1 Oil

Oil level and oil acidity of transformers must be checked at regular intervals in any power plant. If acidity is between 0.5 mg to 1 mg KOH (potassium hydroxide), oil should be kept under observation. Insulation resistance of the transformer should be checked once every 6 months.

Figure 4.3: Oil testing machine-Megger OTs100F [2].

In the figure (4.3) we see the oil testing machine-Megger OTs100F. In Siddhirganj Megger OTs100F is used to test the breakdown voltage of oil.

4.9.2 Bushing

Bushings should be cleaned and inspected for any crack. Dust and dirt deposition, salt or chemical deposition, cement or acid fume depositions should be carefully noted and rectified. Transformer should be continuously checked for any loose connections of the terminations of high voltage and low voltage side. Conservator should be cleaned from inside after every three years.

4.10 Transformer Protection

Various types of protection schemes are applied to ensure the safety and smooth operation of transformer. Following is the list of protection schemes that are being used by the Siddhirganj power plant authority for transformer protection.

- Fused protection,
- Differential current protection,
- Over current protection,
- Over excitation protection,
- Over voltage protection,
- Over flux protection,
- Over heating protection,
- Earth fault protection,
- Over current earth fault protection.

Chapter 5

Gas Turbine

Gas turbine is a type of internal combustion engine. Gas turbine intakes air and air is mixed with fuel. The mixed gas is then ignited in the combustor. It produces high pressure, this pressure is used to rotate the turbine. The turbine rotates the shaft of the generator and electricity is produced.

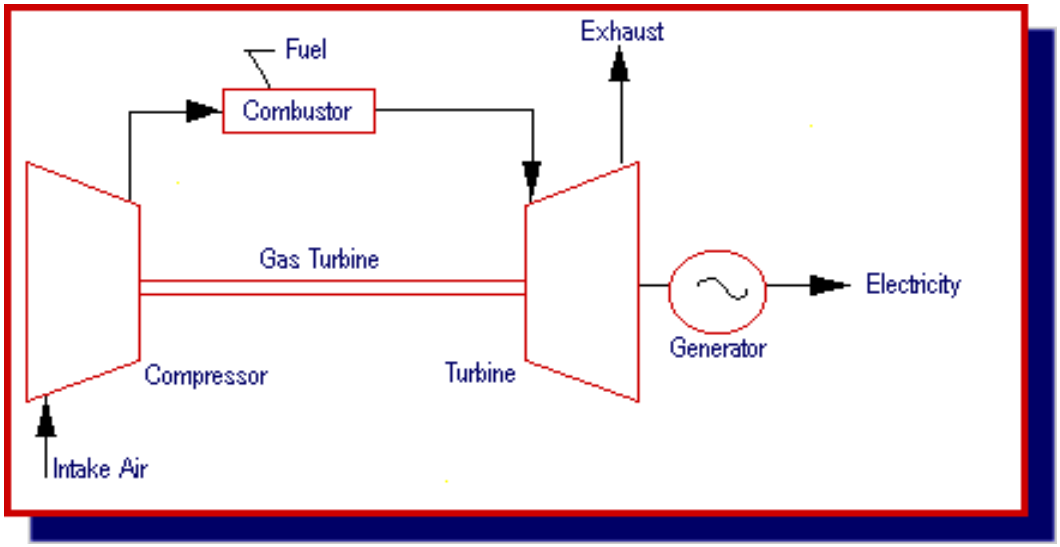

Figure 5.1: Schematic diagram of gas turbine [5].

In figure (5.1) we can see schematic diagram of a gas turbine power plant. The compressor is connected to the combustor. The combustor is coupled with the turbine.

There are two GE- 9E gas turbines operating in Siddhirganj 2×120 MW Peaking Power Plant. Each generator produces 120 MW.

5.1 Gas Turbine Protection

The purpose of the protection system is to avoid undesirable and dangerous operating conditions. The complete protective system is the combinations of sensors, input modules, signal processing, software logic, output modules, relay outputs, and redundant electronic trip devices (ETDs) in the hydraulic system.

A trip action is initiated by the following way.

- An analog signal having exceeded a predetermined limit,
- A sensor detecting a limit crossing condition,

- Each probe can set off an alarm.

5.2 Compressor

Compressor is an important element of gas turbine. The axial flow compressor consists of compressor rotor and the enclosing casing. The compressor casing consists of inlet guide vanes, 17 stages of rotor and 2 exit guide vanes. In the compressor air is compressed in stages by a series of alternate rotor and stator airfoil-shaped blades. The rotor blade supply the force needed to compress the air in each stage and stator blade guides the air so that it enters the following rotor stage at proper angle. The compressed air exits through the compressor discharge casing to the combustion chambers. Air is extracted from the compressor for turbine cooling, bearing sealing and during start-up pulsation control. Minimum clearance (air gap) between the rotor and stator blade gives the best performance, all parts are to be assembled very carefully.

5.3 Combustion System

Combustion system is where fuel or gas is burnt. In GE 9-E, the combustion system is of DLN (dry low nitrogen dioxide) type. It reduces emission from gas turbine.
The combustion system includes 14 combustion chambers. It has following components.

- Flow sleeves,
- Combustion liners,
- Transition pieces,
- Cross fire tubes,
- Flame detectors,
- Fuel nozzles,
- Spark plugs.

Figure 5.2: Combustion chamber of GE 9E [2].

In figure (5.2) the combustion chamber of GE 9E is shown. The picture is taken at Siddhirganj 2×120 MW Peaking Power Plant. In the picture we see different combustion chambers.

5.4 Turbine

Turbine is the section where highly pressurized gas supplied by the compressor and combustor is used to rotate the prime mover. And then the mechanical energy is transferred to the generator shaft. Turbine has three sections.

- Rotor,
- Buckets,
- Stator.

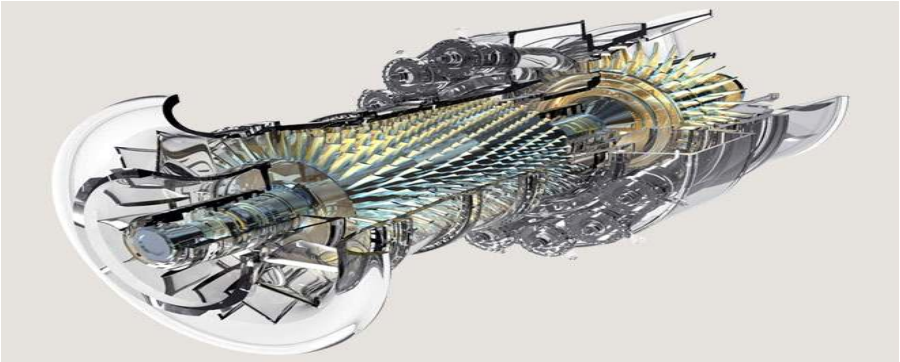

Figure 5.3: GE 9E gas turbine [6].

In figure (5.3) we can see the GE 9E gas turbine.

5.5 Gas Turbine Fuels

Titas gas is used as main fuel in Siddhirganj plant. In GE 9E universal fuel nozzle is used to burn residual fuels, as well as cleaner fuels. The operating turbines in Siddhirganj, intakes natural gas from Titas and increase its pressure 130% in the gas booster. Pressure increment is done as per load demand.

5.6 Gas Turbine Generator

Generator is the part which converts mechanical energy into electrical energy. The generator of GE 9E turbine is of '9A5 (Elin)' type. Its operating frequency is 50 Hz, produces maximum 127.1 MW in open cycle operation. Its rated terminal voltage is 15 KV, with nominal speed 3000 rpm. Its efficiency is 98.5%. In Shiddhirganj, the turbine generators are operated at 11 KV.

5.7 Generator Protection

Generator protection is used to prevent the generator from operating in undesirable or dangerous condition. For various types of faults, many protection measures are taken.
Among many of the fault protection systems the following are most common in every power plant.

- Generator differential protection,
- Loss of excitation protection,
- Generator under voltage protection,
- Generator over voltage protection,
- Generator over current protection,
- Under frequency protection,
- Over frequency protection.

Chapter 6

Distributed Control System (DCS)

A control system of a manufacturing system process is called distributed control system (DCS). It is a dynamic system. It is being used throughout the system. Each component of sub-system is controlled by one or more controllers. It is a computerized control system. The entire system of controllers is connected by networks for communication and monitoring. Distributed control system is used in electrical power grids and electrical generation plants.

6.1 Gas Turbine Controls

Gas turbine has a number of protection and control systems for safe and efficient operation. As the load and pressure of the gas varies every moment, overall control over the power generation is required. In GE 9-E, overall control is maintained by the "Speedtronic MARK VI Turbine Control System". It provides overall protection and control of the turbine.
The control system is mainly based on the Control Module, the Control Module contains.

- Input/output card,
- An internal communication card,
- A main processor card,
- Flash disk card.

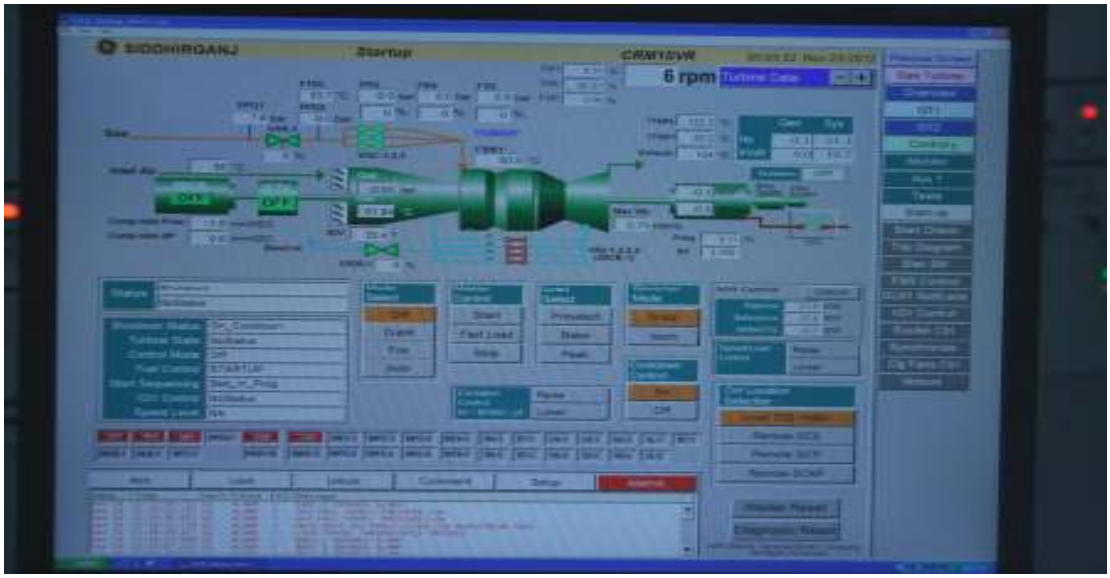

Figure 6.1: Control system overview of MARK VI [2].

In figure (6.1) we can see the MARK VI software control of the system. It measures various parameters of the turbine like speed, exhaust pressure, inlet pressure, temperature etc. Measuring these, control module takes necessary steps if any fault occurs.

6.2 GE Mark VI Control System

Mark VI turbine control for GE turbine is designed as a complete integrated control. It uses for protection and monitoring system. It is mainly used in generator and mechanical drive applications of gas and steam turbines. It is also an ideal control system for integrating all power plants. Mark VI control systems are available for small applications and large integrated systems. Mark VI is the third generation of triple redundant control systems that were produced in 1983. General purpose input/output is used for both turbine applications and process control. Turbine specific input/output is used for direct interface. It also reduced long term maintenance. All controls and protections in the Mark VI control allow humans to control the system. It can be replaced with the process running with no impact on the control system. The HMI (Human Machine Interface) communicates with the main processor card in the control module.

Chapter 7

Operating Process of the Power Plant

7.1 Introduction

The operating process mainly depends on the gas turbine. Gas turbine is a modern power generating equipment. It takes air from atmosphere and compresses it to high pressure. The pressurized air is then utilized for combustion. It takes place in combustion chamber by addition of fuel. The combustion chamber has two regions, primary and secondary. There are also primary and secondary nozzles from which the fuel enters into the combustors. To operate in different modes, the fuel and flame position changes inside the combustors.

7.2 Different Operating Modes

Siddhirganj 2×120 MW Peaking Power Plant operates the gas turbine in three different modes for producing electricity.
The three different modes are given below.

- Primary mode,
- Lean-lean mode,
- Premix steady state mode.

7.3 Primary Mode

This is the basic primary mode for gas turbine. When the gas supply is not available, the turbine works in primary mode. It is not good for the machine, total process and also for the turbine. The fuel is supplied to the primary nozzles only. This mode of operation is used to ignite, accelerate and operate the machine over low to mid-loads, up to a pre-selected combustion reference temperature. Primary mode normally produces 45 MW.

7.4 Lean-Lean Mode

This is the secondary mode for the gas turbine. When the gas supply is limited, the turbine works in lean-lean mode. The fuel is supplied to both the primary and secondary nozzles. This mode of operation is used for intermediate loads between two pre-selected combustion reference temperatures. Lean-lean mode normally produces 65 MW.

7.5 Premix Steady State Mode

This is the best mode for the gas turbine and also for the plant. When machine gets available supply of gas it works in this mode. The fuel is supplied to both primary and secondary nozzles. This mode of operation is achieved at and near the combustion reference temperature design point. Optimum emissions are generated in premix mode. Premix steady state mode normally produces 85 MW up to 120 MW.

The flow of fuel to the combustors for different modes of operation is controlled by 1 speed/stop ratio valve (SRV) and three gas controlling valves (GCV).

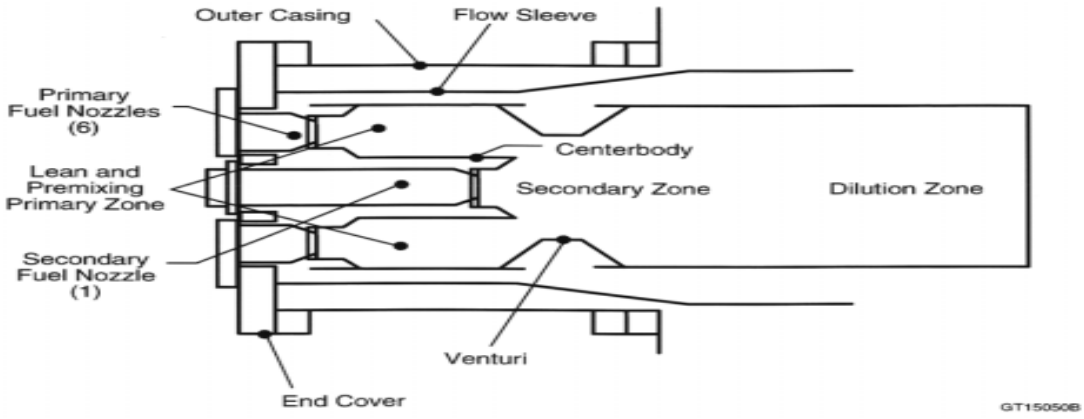

Figure 7.1: Dry low nitrogen oxide (NOx) combustor [2].

In figure (7.1) we can see the operating process of the plant. It is divided into primary zone, secondary zone and dilution zone.

Chapter 8

Fire Protection

Fire protection is very important for any power plant especially for gas turbine power plant. The equipments used in power station are valuable. In Siddhirganj 2×120 MW Peaking Power Plant water, carbon dioxide (CO_2) gas and fire extinguishing powder are used for fire protection.

The following fire protection systems are used in Siddhirganj 2×120 MW Peaking Power Plant.

- **Sensor system:** There are sensor systems to detect any kind of fire.
- **Alarm system:** An automatic alarm system will activate if any kind of fire is detected.
- **Fire extinguisher:** Different types of fire extinguisher systems are used in the plant.

The water type extinguisher is the basic extinguisher in the power plant. When the fire detector detects fire it is activated automatically. This type of extinguisher is used around the transformer in the plant.

The carbon dioxide (CO_2) fire protecting system is designed to extinguish fire. Carbon dioxide **(**CO_2) reduces the oxygen content of the air when it is released. Carbon dioxide **(**CO_2) discharges from a high pressurized cylinder by a discharging nozzle.

Ammonium phosphate, potassium bicarbonate are used as fire extinguishing powder. Fire extinguishing powder is mostly used in Siddhirganj 2×120 MW Peaking Power Plant. The total system helps to extinguish the fire as quickly as possible.

Chapter 9

Conclusion

We have got practical knowledge about switchgear, control and protection system, power system engineering and its equipments from this internship. We have got the practical knowledge about the process of power generation and transmission at Siddhirganj 2×120 MW Peaking Power Plant during our internship program. In Siddhirganj 2×120 MW Peaking Power Plant we have experienced the practical application of the theories which we have learned from our university. Our communication skills also improved through communicating with different mentors. Our achievements from Siddhirganj 2×120 MW Peaking Power Plant are as follows.

- Industrial training enriched our practical knowledge.
- It has opened our eyes about practical operation of different equipments.

The authorities in Siddhirganj 2×120 MW Peaking Power Plant were very concerned about all kinds of safety. The friendly environment encouraged us to co-operate with them. We have learned a lot and obtained practical knowledge from our internship which will help us in our future life.

9.1 Discussion

We had only theoretical knowledge about power station and power station equipments before this internship. We observed arrangement of power plant equipment of Siddhirganj 2×120 MW Peaking Power Plant and learned how they work in real life. We also got information about capacity of different equipments used in Siddhirganj 2×120 MW Peaking Power Plant. In Siddhirganj power plant electricity is generated through open cycle gas turbines. There is two switchgear and three control rooms to control the overall system of producing power. Various types of relays used for protective purposes which are also controlled by these control rooms. From the control room they observe data continuously to check the stability of the system. In the turbine compartment, we learned about the different parts of the turbine and how it work. Gas is first burned, and the produced hot gas is used to rotate the turbine for generating power. Protective relays are also used and controlled using the switchgear room. Isolators are used to secure the distribution of power from the plant through the transmission lines. The authorities at the plant were very concerned about all kinds of safety. We have also learned about the fire protecting system which is a necessary step to protect power station equipments from fire. The friendly environment at the plant encouraged us to co-operate with

them. We learned a lot and obtained practical knowledge from our internship in Siddhirganj Power Plant, which will help us in our professional life.

9.2 Problems

We have faced some problems during our internship program. Those are given below.

- The time of internship was only 15 days. It is not possible to learn all the sections of the power plant in 15 days.
- In the power plant we had spent 3 days in mechanical section. But we do not have any mechanical engineering course in the university. So we faced problems in mechanical section.
- The safety equipments are not available and information is not easy to collect.

9.3 Recommendations

After finishing internship we want to recommend something which are given below.

- The duration of internship should be increased.
- Before internship students should complete power station related courses such as power station and switchgear
- A mechanical engineering related course should be included in our syllabus.
- Everyone should know about the precautions of a power station.
- The safety equipments should provide by the authority.

References:

[1] Power Plant details- Siddhirganj 2×120 MW Peaking Power Plant. [Online]. Available: http://www.egcb.com.bd/index.php.

[2] Picture provided from Siddhirganj 2×120 MW Peaking Power Plant.

[3] Image of pin type insulator. [Online]. Available: http://www.o-digital.com/wholesale-products/2179/2198-1/Pin-Type-Insulator-FPQ-91445.html.

[4] Ideal Transformer as a circuit element. [Online]. Available: http://en.wikipedia.org/wiki/Transformer.

[5] Schematic diagram of Gas Turbine. [Online]. Available: http://www.cogeneration.net.

[6] Image of GE 9E gas turbine. [Online]. Available: http://www.ge-energy.com.

[7] Data provided from Siddhirganj 2×120 MW Peaking Power Plant.

Appendix

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:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	~~13/08/12~~ 13/08/12
Start time/End time	3:00 - 4:00
Location:	SIDDHIRGANJ, NARAYAGANJ
Mentor:	Engr. Ashis Kumar Biswas

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 of the day's activities was about different type of sensor devices, vibration control of gas turbine & the cycle of lubeoil in this power plant.

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.

We were taught the different sensor and the reading of the Transmitter ~~Sense~~ meter and we visited the different sensor of the Gas compressore turbine and the function of the lube oil at ~~GEB~~ GBC And the cooling process of the ~~EGBC~~. We visited the different motors of gas supply line.

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

This practical activity I gained ~~not~~ was related with ~~this~~ the academic course.

13/08/2012

Signature of the mentor with date
Name: Engr. Ashis kumar Biswas
Designation: Assistant E Manager (Technical)
Contact Phone #: 01912598109

10.09.2012

Signature of academic supervisor with date
Name: ANISUL HAQUE
Designation: PROFESSOR, EEE, EWU

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

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Name of the company:	EGCB
Name of the student:	Syed Shaked Hasan Rommel
ID:	2009-2-80-015

Date:	14.08.12
Start time/End time	9:00 – 4:00
Location:	SIDDHIRGANJ, NARAYANGANJ
Mentor:	NADIR CHOWDHURY

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)

The objective of the day was the control system of the power plant.

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.

~~We learned~~ We learned about the control system of the power plant, We were tought about Brayton cycle and knows about the P-V diagram as well as the T-S diagram of the power plant. And we also visit the control room and saw the circuit breakers of the plants.

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

It is related to our switchgear and Protection course and the other courses.

14/8/12
Signature of the mentor with date
Name: Nadir Chowdhury
Designation: Asst. Manager
Contact Phone #: 01722-020360

10.09.2012
Signature of academic supervisor with date
Name:
Designation: **Dr. Anisul Haque**
Professor
EEE Department
East West University
Dhaka, Bangladesh.

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EEE 499
Industrial Training
Daily Activity Report

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Name of the company:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	25.08.12
Start time/End time	9:00 – 4:00
Location:	Siddhirgonj, Narayangonj
Mentor:	Siddiqur Rahman

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.

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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)

The objective of the day was the study of single line diagram of the power plant (2X120MW) and the transmission of these 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.

We were explained the operation such as generation & distribution of the power plant from a single line diagram of the power plant. The explanation included which transformer connected to which bus and which place we use which circuit breaker. We draw the diagram of the power plant. We visit the transformer of steps. And get the practical knowledge about it.

Today mainly we get the knowledge about the operation of the power plant.

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

I studied the single line diagram of the power plant.

Signature of the mentor with date
Name: Md. Siddiqur Rahman
Designation: Assistant Manager (Tech)
Contact Phone #: 01917283381

10.09.2012
Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh

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Industrial Training
Daily Activity Report

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Name of the company:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	26.08.12
Start time/End time	3:00-4:00
Location:	Siddhirganj, Narayanganj
Mentor:	

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 of the day's activities was learned about MARK VI control system.

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.

On this's day we learned about the brief idea about Gas Booster compressor and its electric control system and how to control the system with pc. We got the total idea of the balance of the power plant. We also know about the condition of start permissive of gas compressor. We also learn about the trip logic of the gas compressor.

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

Today's knowledge was related with the academic course but Mark VI is totally new software and we were not familier with the software.

28/8/12

Signature of the mentor with date
Name:
Designation:
Contact Phone #: 01717-283380

10.09.2012

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:	EGCB
Name of the student:	Syed Shaked Hasan Rommel
ID:	2009 - 2-80-015

Date:	27.08.12
Start time/End time	9:00-4:00
Location:	Siddhirganj, Narayanganj
Mentor:	Engr. AKM. Zillur Rahman

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)

The objective of the day's activities was get familier of different kind of valve (SRV, IGV, GCV) and the function of the valve and its working 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.

We were learned about different type of hydralic valve and GCB valve, we learned the operating condition at different cases and modes (Primary, lean-lean and premix steady state). We visited the corosponding places.

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

Today's activities were matched with our academic courses.

27/08/12

Signature of the mentor with date
Name: Engr. A.K.M. Zillur Rahman
Designation: Assistant Manager (Technical)
Contact Phone #: 01739664236

10.09.2012

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:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	28.08.12
Start time/End time	9:00 – 4:00
Location:	Shiddirgonj
Mentor:	KAZI M H KABIR, PhD

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 of the day was the fire fighting a safety process of a power plant.

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.

We attended the training ~~of the~~ about fire fighting and safety process.

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

This practical activity with the theoretical knowledge I gained in the respective academic course is related to the academic course.

28/8/12
Signature of the mentor with date
Name: Mazi M. H. Kabir, BRS
Designation: Manager Environment
Contact Phone #: 8124197-Ext-110

10.09.2012
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:	EGCB
Name of the student:	Syed shahed e Hasan Rommel
ID:	2009-2-80-015

Date:	29. 08. 2012
Start time/End time	9:00 - 4:00
Location:	Siddhirganj, Narayanganj.
Mentor:	Eng. Ashis kumar Biswas.

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)

The objective of the day's activity was to understand the gas conditioning skid.

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.

We learned about the different parts of the gas unit. The use of condenser and gas purification system are learned today. Gas ~~busts~~ boosting process and gas cabling process we leaned in this day. We visited the related units.

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

We learned many new things in this day and it is relatively new & and while ~~similitaries~~ similarities with my academic course.

29/8/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

10.09.2012
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

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Name of the company:	EGCB
Name of the student:	Syed Shahid Hasan Rommel
ID:	2009-2-80-015

Date:	30/08/12
Start time/End time	9:00-4:00
Location:	SIDDHIRGANJ, NARAYANGANJ
Mentor:	NANDHIPAN DAS

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 of the day's activities was the overview of the different transformer of the power plant.

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.

We were ~~getting~~ got the practical knowledge of the transformer. We know about the vector group, fire fighting of the transformer & the generator principle.

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

Today's work is very much related with the Electric Machine course.

30.08.2012

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

10.09.2012

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

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Name of the company:	EGCB
Name of the student:	Syed Shahid Hasan Rommel
ID:	2009-2-80-015

Date:	~~31/08/12~~ 01/09/12
Start time/End time	9:00 - 4:00
Location:	SIDDHIRGANJ. NARAYAGANJ .
Mentor:	NANDHIPAN DAS .

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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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 of the day's activity was the exciting system and a field visit of the generator unit.

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.

We learn about the generator of the power plant. We also learn the exciting system of the machine.

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

Today's work was related with the Electric Machine course.

7.9.2012
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

10.09.2012
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:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	02.09.12
Start time/End time	9:00-4:00
Location:	Shiddirgonj
Mentor:	Md. Yamin Ali

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.

Designation: Assistant Manager (Tech.)
Contact Phone #: 01929301768

EEE Department
East West University
Dhaka, Bangladesh

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 of the day's activity was understanding the mechanical parts of the power plant.

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.
We were tought about the mechanical pasts of the power plant. We studied o the gas tarbine, gas buster ~~tarbine~~ compressor. We know about the bearing and the efficiency of the power plant.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.
The practical activity with the theoretical knowledge I gained was related to our academic course.

02.09.12

Signature of the mentor with date
Name: Md. YAMIN ALI
Designation: Assistant Manager (Tech.)
Contact Phone #: 01929301768

10.09.2012

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:	EGCB
Name of the student:	Syed Shaked Hasan Rommel
ID:	2009-2-80-015

Date:	03.09.12
Start time/End time	9:00-9:00
Location:	SIDDHIRGANJ, NARAYANGANJ
Mentor:	Md. YAMIN ALI

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)

The objective of the day was learn different valve, mistelemenator and gas tarbine protection.

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.

We were taught about solinoid valve, gear box, mist elemenator. We also learn different tarbine protection. We visited the related machines.

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

We learned about tarbine and its protection and different valve. These ~~are course~~ matched with our academic course.

25.09.12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

10.09.2012
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

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Name of the company:	EGCB
Name of the student:	Syed Shakeb Hasan Rommel
ID:	2009-2-80-015

Date:	04.09.12
Start time/End time	9:00-4:00
Location:	Siddhirganj, Narayanganj
Mentor:	Eng. Ashis kumar Biswas.

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 of the day's activies was to get familiarn with the Distribution control system (DCS) and we also revisit the transformer.

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 Distribution control system software is called maxDNA. With this software the powers plant can be controlled, we saw the database system and how we saw the instantinuous data from the PC.

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

Today's Practical activitivity is was highly related with the control system Engineering (EEE402) course.

9/9/12

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

10.09.2012

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:	EGCB
Name of the student:	Syed Shakeb Hasan Rommel
ID:	2009-2-80-015

Date:	05.09.12
Start time/End time	9:00-4:00
Location:	Siddhirganj, Narayanganj
Mentor:	Siddiqur Rahman

General Instructions:

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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)

The objective of the day's activitees was to visit AVR (Automatic Voltage Regulation), Thyristor, Generator relay Pannel (GRP), and the Emergency Battery and Emergency lighting charger and its function.

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.

We visited the control room and visit the AVR, Thyristor and generator relay Pannel and battary and we saw the different types of control and alarm system and protection. We learn how the voltage produced.

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

The practical activity was highly related with our academic course. And we gained the practical knowledge.

5.9.2012
Signature of the mentor with date
Name: Md. Siddiqur Rahman
Designation: Assistant Manager (Tech)
Contact Phone #: 01717283380

10.09.2012
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:	EGCB
Name of the student:	Syed Shaked Hasan Rommel
ID:	2009-2-80-015

Date:	06.09.12
Start time/End time	9:00-4:00
Location:	Siddhirganj
Mentor:	Md. Saiful Islam

General Instructions:

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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)

The objective of the day's activities was to visit and gain the knowledge about the switchgear room, generator relay pannel & Battery room.

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.

↳ switchgear room
↳ Different Circuit Breaker
→ Generator Relay pannel
→ Battery room.

We visit the switchgear room and we see different Circuit breaker and some relay like 86 relay (Master trip relay), 87 relay (differential relay) and we see the functions of the relays. And we see the battery room which is used to backup DC supply. We see different protection of the plant.

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

The theoretical knowledge is highly related with our switchgear course.

Signature of the mentor with date
Name: Md. Saiful Islam
Designation: Manager (Electrical)
Contact Phone #: 01730359532

10.09.2012
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
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Industrial Training
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Name of the company:	EGCB
Name of the student:	Syed Shahed Hasan Rommel
ID:	2009-2-80-015

Date:	08.09.12
Start time/End time	9:00-4:00
Location:	Siddhirganj, Narayanganj
Mentor:	Md. Yamin Ali

General Instructions:

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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)

The objective of the day's activities was to learn the air compressor and the water point and the GBC. And we also visit the relative plants.

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.

↳ Air compressor
↳ IA | PA compressor (Instrument Air | Plant Air)
↳ N_2 compressor.
↳ GBC, Air filter.

We see the IA|PA (Instrument Air| Pannet Air) compressor and N_2 Air compressor and we see how the Air compressed and how we make the air moisture & unnecessary partical free. We see the water plant and ~~how it processed. to view~~ the working process of the plant.

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

The topic was related with our academic course.

08.09.12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

10.09.2012
Signature of academic supervisor with date
Name: Dr. Anisul Haque
Designation: Professor
EEE Department
East West University
Dhaka, Bangladesh