INTERNSHIP REPORT

ON

INSTRUMENTATION AND CONTROL DIVISION OF ASHUGANJ POWER STATION COMPANY LIMITED (APSCL)

By

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ASHUGANJ POWER STATION COMPANY LTD. (APSCL)

(An Enterprise of Bangladesh Power Development Board)

Certificate

For

Industrial Attachment Training Program

This is to certify that Md. Atikur Rahman , ID No. 2008-1-86-010 ,the Student of B.Sc in Electrical and Electronic Engineering from East-West University , Dhaka has successfully completed the Industrial Attachment Training Program held from 24-08-2012 to 07-09-2012. During the training period , he paid due attention to the practical work.

I wish him every success in life.

Manager (HRD)
Ashuganj Power Station Company Ltd.
Ashuganj, B-Baria.

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Manager (HRD)
Ashuganj Power Station Company Ltd.
Ashuganj, B-Baria.

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We would also like to thank our advisor Dr. Anisul Haque, Professor and Mr. Fakir Mashuque Alamgir, Lecturer, Department of Electrical and Electronic Engineering, East West University, Bangladesh.

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At last we want to give thanks to all our teachers and friends for their inspiration and co-operation throughout our whole academic life in East West University.

EXECUTIVE SUMMARY

A shortage of electric energy is the biggest problem to the economical growth of any country. The power sector of Bangladesh faced various problems, such as, lack of supply capacity, frequent power cuts, unacceptable generation of power, and poor financial and operational performance etc.

In Bangladesh, the present maximum demand of electricity varies from 4,500 MW to 5,600 MW and it is expected to rises up to 7,000 MW within the next two years. But maximum generation available is between 3,800 MW and 4,600 MW. The difference between maximum demand and maximum generation of power is approximately 2,000 MW, due to old set-up and de-rated efficiency of the maximum power plants.

APSCL (Ashuganj Power Station Company Limited), where we have done our internship, has 9 units with installed capacity of 777 MW. But its present de-rated capacity is 731 MW and dependable capacity at a delivery point 573 MW. APSCL fulfills about 15% of power requirements of the total country. Manpower at APSCL is almost 517 on regular basis, which plays a vital role in the job market of developing country.

Through this internship, we observed how a power station can generate and transmit power and also how a power station can protect it's equipments. We also learned about different systems and equipments, which are used for power generation, transmisson, distribution and protection. We worked in instrumentation and control section for 15 days, we observed unit 1 and 2 steam turbine generators (64 MW) and protection system. In combined cycle power plant section, we observed gas turbine 1, gas turbine 2, steam turbine and generation system, protection system and working principle. We observed the operation of sub-station equipments and protection of these equipments, such as, power transformer, auxilary transformer, bus bar, current transformer, potential transformer, circuit breaker (SF6, minimum oil, MCCB), isolator, insulator and different types of cables. By this internship, we have merged our theoretical knowledge with practical experience.

Schedule of the internship work

Date	Division	Time (1st & 2nd session)	Duration	Mentor
24-08-2012	Total plant overview.	8am to 4pm	7 hours	Engr. Shafiqul Islam
25-08-2012	I & C and steam turbine.	8am to 4pm	7 hours	Engr. Shafiqul Islam
26-08-2012	P & ID, observe condenser, boiler feed, cooling water pump.	8am to 4pm	7 hours	Engr. Shafiqul Islam
27-08-2012	Signal conditioning, observe boiler firing.	8am to 4pm	7 hours	Engr. Shafiqul Islam
28-08-2012	Burner and feed water pump.	8am to 4pm	7 hours	Engr. Shafiqul Islam
29-08-2012	Logic gates and flip flop.	8am to 4pm	7 hours	Engr. Shafiqul Islam
30-08-2012	Control system, elements of control loop.	8am to 4pm	7 hours	Engr. Shafiqul Islam
31-08-2012	Fault of circulating water pump.	8am to 4pm	7 hours	Engr. Shafiqul Islam
01-09-2012	Control parameters and logic cards.	8am to 4pm	7 hours	Engr. Shafiqul Islam
02-09-2012	Different protection control and test.	8am to 4pm	7 hours	Engr. Shafiqul Islam
03-09-2012	Component and maintain of boiler.	8am to 4pm	7 hours	Engr. Shafiqul Islam
04-09-2012	Turbine control and protection.	8am to 4pm	7 hours	Engr. Shafiqul Islam
05-09-2012	Unit-5 power plant.	8am to 4pm	7 hours	Engr. Shafiqul Islam
06-09-2012	Control room of unit-5, fault analysis.	8am to 4pm	7 hours	Engr. Shafiqul Islam
07-09-2012	Familiarize with components of substation.	8am to 4pm	7 hours	Engr. Shafiqul Islam

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CHAPTER 1

INTRODUCTION

Power generation sector is the most important sector for any nation, because the economical growth vastly depends on this sector. It is a great opportunity to accomplish the internship in Ashuganj Power Station Company Limited (APSCL). It is the second largest power station in capacity in the country. APSCL plays a major role to the national power and national economy by producing the 15 % power of total national grid. There are three types of power plants in APSCL, such as, thermal power plant, gas turbine power plant and combined cycle power plant. So, here is a lot of opportunity to learn about various types of power plants. During our internship we closely observed the instrumentation and control (I and C) section. Here it concludes the idea about I and C division of Ashuganj Power Station Company Limited, including the background, present capabilities and future plan.

1.1 Vision of APSCL

The vision of APSCL is to become the leading power generation company in Bangladesh and generate electric power and dispatch same through transmission line of PGCB Limited and ultimately to BPDB and to utilize available resources and capacity so that it can contribute towards the national economy through increasing generation of power aiming at maximization of net worth of the Company [1].

1.2 Mission of APSCL

The mission of APSCL is to ensure long-term uninterrupted supply of quality power to the consumers in future [1].

1.3 Background of APSCL

In 1966 government decided to set up a power station in Ashuganj. Ashuganj is situated near Titas gas field and on the bank of the river Meghna. So, it was the most favorable place for power station because of availability of natural resources for power generation. For this purpose about 311 acres land at 1 kilometer north-east from the Meghna railway bridge was acquired.

In the same year with the financial assistance of German Government, the establishment work of two units (Unit 1 and Unit 2), each of 64 MW, was started. These two units were

commissioned in July 1970. M/S BBC (Germany) and M/S Babcock & Wilcox (Germany) supplied the turbo-generator and boiler equipments. These two units played an important role in post-liberation war economic development in Bangladesh.

To face the growing requirements for power in the country, Government of Bangladesh (GOB) decided to set up another two units (Unit 3 and Unit 4), each of 150 MW, in Ashuganj. IDA, KfW (Germany), ADB, Kuwait and OPEC provided the financial assistance for these projects. Contracts had been made for supplying and installation of turbo-generator, boiler and other main equipments for these two units with M/S BBC (Germany), M/S IHI (Japan), M/S KDC (Korea) and M/S PCC (Korea). After the agreement signing with the contractors, government found that another unit of 150 MW can be established from the left over funds by the donors. With the consent from the donors, Government decided to set up another 150 MW unit (Unit 5). The work for installation of Unit 3 and Unit 4 was started in 1984 and Unit 5 in 1985. Unit 3, Unit 4 and Unit 5 were commissioned in December 1986, May 1987 and March 1988 respectively.

During the planning of installation of Unit 3 and 4, it was decided to install a Combined Cycle Power Plant (CCPP) by financial assistance of British Government. According to that decision, works of two gas turbine units (GT1 and GT2) of 56 MW each and one steam turbine unit (ST1) of capacity 34 MW (with waste heat recovery boiler) had been started. GT1, GT2 and CCST were commissioned in 1982, 1984 and 1986 respectively [2].

1.4 Company profile

As a part of the power sector development and reform program of the Government of Bangladesh (GOB), Ashuganj Power Station Company Limited (APSCL) has been included under the Companies Act 1994 on 28th June, 2000. Ashuganj Power Station (APS) complex had been transferred to the APSCL through a provisional vendor's agreement. The agreement had been signed between BPDB and APSCL on 22nd May, 2003. All the activities of the company started on 1st June, 2003. From that day, the overall activities of the company are vested upon a management team. The team consists of the managing director, the director (Technical) and the director (Finance). According to the articles of association of the company, 51% of total shares are held by BPDB and the rest 49% shares are distributed among ministry of planning, power division, MOPEMR & energy division, MOPEMR of GOB [2].

1. Name : Ashuganj Power Station Company Limited (APSCL),

2. Corporate Office : Ashuganj, Brahmanbaria-3402,
3. Registration Date : 28 June 2000,
4. Company Status : Public Limited Company,
5. Main Work : Power Generation,
6. Number of Generation Units : 9 (6 Steam Turbines + 2 Gas Turbines + 1 Gas Engine),
7. Installed Capacity : 777 MW,
8. Present de-rated capacity: 731 MW,
9. Dependable Capacity: 573 MW,
10. Area of Land : 263.55 Acres,
11. Manpower: 517 (Regular employee) [2].

1.5 Production Report

The APSCL has in total 5 plants. There are two thermal power plants and a combined cycle power plant. One is auto power plant. The fuel used in APSCL is the natural gas supplied by Titas Gas Transmission and Distribution Company Limited (TGTDCL).

Number of generators and their production capacities are given in table 1.1.

Table 1.1: Number of units and their production capacities [3].

Unit	Date of commission	Capacity (MW)		Running hour (Up to February 2012)
		Commissioned	De-rated (Present)	
Unit-1	17.07.1970	64	64	231011.20
Unit-2	08.07.1970	64	64	208955.30
Unit-3	17.12.1986	150	105	190897.65
Unit-4	04.05.1987	150	140	185852.30
Unit-5	21.03.1988	150	140	170610.82
GT-1	15.11.1982	56	40	155522.39
ST	28.03.1984	34	18	91159.05
GT-2	23.03.1986	56	40	183647.05
Gas engine	30.04.2011	53	53	5618.00
Total		777	731	

1.6 Future plan of APSCL

At present, the established generation capacity of the company is 777 MW. A plan has been taken to increase the total established generation capacity to 2102 MW by 2015. According to this plan, presently 4 projects are going on.

These projects are as follow,

225 MW Combined Cycle Power Plant Project: APSCL has decided to establish a 225 MW combined cycle power plant with its own fund. According to this plan an agreement was signed between APSCL and the Consortium of Hyndai Engineering Company Limited, and Daewoo International Corporation, Korea on 5th October, 2011. The brief description of the project is given below.

Generation capacity : 225 MW,
EPC contract price : BDT 253 crores,
Contract Agreement : 5th October, 2011,
Expected date of completion : April, 2014,
Fuel : Natural gas.

450 MW Combined Cycle Power Plant (South) Project: Currently APSCL has planned to establish another 450 MW combined cycle power plant unit with ECA financing. The technical evaluation of the bid document has finished and the financial evaluation is going on. The key points of the projects are as below.

Generation capacity : 450 MW,
EPC contract price : BDT 3333 crores,
Contract Agreement : June, 2012,
Expected date of completion : December, 2014,
Fuel : Natural gas.

450 MW Combined Cycle Power Plant (North) Project: With the financing of ADB and IDB, APSCL has taken another project to establish a 450 MW combined cycle power plant. The brief description of the project is given below.

Generation capacity : 450 MW,
EPC contract price : BDT 3433 crores,
Contract Agreement : June, 2012,
Expected date of completion : October, 2015,
Fuel : Natural gas.

200±10% MW Power Plant Project: To increase the total generation of the company within a very short time a decision has been made to establish a 200 MW modular power plant. A brief description of the project is given below.

Generation capacity : 200 (+10% or – 10%) MW,
EPC contract price : BDT 3433 crores,
Tender invitation date : 26th February, 2012,
Expected date of completion : July, 2013,
Fuel : Natural gas,
Life time : 15 years [4].

1.7 Objective of Internship

The objectives of the internship are summarized below.

1. Understanding industrial environment,
2. Acquiring practical knowledge about instrumentation and control division,
3. Developing practical skills and techniques relevant to our career,
4. Indentifying the problems of APSCL,
5. Recommending how it can be solved.

1.8 Scope and Methodology

This report is based on the internship program where we reviewed the basic operation of the instrumentation and control division of APSCL. The report contains other relevant information about the APSCL which we observed during the internship program.

This report is written on the basis of information collected in two ways. These are as follows,

Primary information: The information is gathered by talking to the plant engineers, technicians and employees. Personal observation and working with the engineers at some cases were other resources of gathering the information.

Secondary information: The company website and various diagrams provided by the engineers whom we worked with.

CHAPTER 2

SIGNAL CONDITIONING AND CONTROL LOOP

2.1 Introduction

Control is one of the most important parts of a power plant. In a power plant everything should be under control, such as, fuel flow, steam flow, air flow and many other things, to avoid unexpected event or accident. So, it should be a proper instrumentation for the purpose of controlling and maintenance. That is why instrumentation is also a very important part in a power plant. By proper instrumentation, power plant efficiency can be improved and power plant can be maintained properly for power generation.

We have observed the different types of equipments of protection and controlling system of APSCL and its operation with the help of Engr. Shafiqul Islam (Senior engineer I and C).

Instrumentation and control are directly related to each other, because instrumentation is needed for the purpose of controlling. In APSCL, there are many different types of instruments or equipments, such as, different types of sensors (temperature sensor, water level sensor, speed sensor, position sensor, pressure sensor, bearing temperature sensor), different types of valves (temperature control valve actuator, pneumatic control valve, solenoid valve, shut-off valve, regulating valve, oil pressure control valve, gas pressure reducing valve), different types of safety valves (boiler safety valve, super heater safety valve), different types of transmitters (air flow transmitter, gas flow transmitter, pressure transmitter, level transmitter, temperature transmitter), gas heater, damper, inlet vent actuator. These instruments are used for control, measurement and protection.

In this chapter, we discuss about above mentioned equipments and their operation, which we have learnt and observed during our internship.

2.2 Signal conditioning

Signal conditioning is mainly a concept which is used for process monitoring and controlling in the APSCL. It is also referred as an auto control element. The concept is that most of the instruments of the plant are controlled by the control room. These generate a continuous analog signal which is not directly recognizable. Therefore, this signal needs to be converted to digital or binary signal. This process is done by manually inputting a threshold value. For example, the threshold value is set to 10 V and the continuous analog signal that is coming from the instrument is fluctuating between 7-14 V. If the continuous analog signal value

fluctuates greater than 10 V, then the binary element will treat it as a high. The binary element is an op-amp or a comparator. When the value of continuous analog signal is more than 10 V, the comparator will give an output signal. Another kind of signal conditioning is one which uses an analog meter with two legs. Where one leg of the meter is fixed and connected to a constant voltage source for example 24 V and the other leg of the meter is carrying the continuous analog signal. When the leg meets with fixed leg, there will be a feedback signal that implies the signal is high or low. This high or low signal goes to the binary instrument and generates a digital signal which shows high temperature or high pressure in the control room. The phenomenon can also be done using temperature switch or pressure switch.

2.2.1 Analog signal

LVDT: LVDT means Linear Variable Differential Transformer. Sensors are the most significant parts of control unit. LVDT is one kind of sensing element that is used in controlling of the valves. In this type of analog signal sensor, a rod is placed between two windings. The windings are like the transformers winding but it is a special transformer. The turns of both windings are same. The rod acts like a medium to transfer voltage to both the windings. The rod generally moves by lifting up or down. When the rod lifts up or down, the turns of one winding generally increase or decrease and therefore, there occurs a voltage difference between two windings of the transformer. By measuring this voltage and comparing it with the fixed threshold voltage, a signal is generated which shows high temperature or high pressure at the control room. By this method, analog signal sensing element works. At APSCL, most of the sensing elements of the valves under unit 3 and 4 are LVDT sensing elements. The LVDT was procured from RDP Electronics Limited, and has the type number ACT2000C. It has the following specifications.

1. Linear range: ± 50 mm,
2. Sensitivity: 27.45 mV/V/mm,
3. Linearity: 0.16%.

2.2.2 Binary signal

In the Control department, there are different kinds of controlling cards which are developed using various types of ICs. For developing logic, different kinds of logic gates, such as, AND gate, OR gate are used. Mostly these controlling cards are developed using flip-flops. More

specifically, these use SR flip-flop. Depending on the SR flip-flop, the logic catalog diagram is studied. In SR flip-flop, R is referred as a priority bit. If it becomes 1, then we cannot get the output from the pins of IC. At APSCL, we have studied the catalog diagram of control cards using SR flip-flop logic. Figure 2.1 shows a catalog diagram which is controlled by SR flip- flop. Logic card input voltage is 24 V DC. In diagram, after using input voltage, if flip-flop output becomes 1, then the motor switch is on and runs the motor.

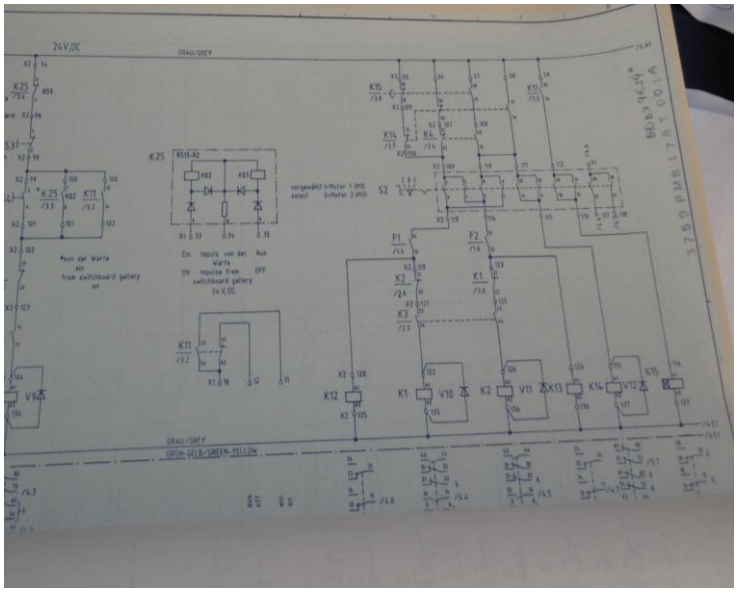

Figure 2.1 : Catalog diagram of control card [5].

Turbine trip logic circuit: Our supervisor showed us turbine trip logic circuit and turbine control circuit in the control room. These logic circuits control the turbine condition. For any abnormal condition turbine will trip. Figure 2.2 shows the turbine protection or turbine trip circuit.

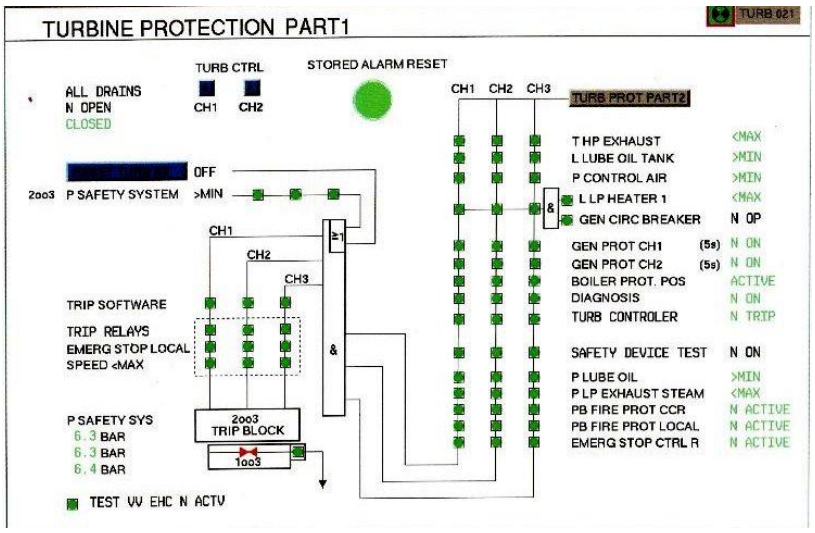

Figure 2.2: Turbine trip logic circuit [5].

Turbine trip is the immediate closing of the turbine steam valves. Turbine trips shut down the turbine by stopping the flow of steam. The main stop valves, control valves, the reheat stop valves and the intercept valves are all used in a turbine trip.

Under normal conditions, turbines rotate at 1800 to 3600 rpm, depending on their design. APSCL turbines rotate at a rated speed of 3300 rpm. Under some emergency conditions, for example, if the generator is suddenly disconnected from the power system, the turbine increases its speed. The first response to an over speed occurs in the turbine control system. The turbine governor senses the increment of speed and immediately begins to close the control valves and the cut off valves to decrease the flow of steam to the turbine. If the turbine speed continues increasing, the turbine protection system will initiate a trip. Over speed trips usually start at 109-111% of rated speed.

2.3 Control loop

A control loop is a system of interrelated elements whose function is to maintain a process variable at a specific value. Operation system of control loop is given below.

1. Sense the condition of the process variable,
2. Send a signal to the control loop which contains the value of the process variable,
3. Responds to changes in the process variable,
4. Manipulate a final control element which keeps the process variable at a desired value.

At APSCL, most control loops in the plant work automatically, without operator intervention. The first control loop discussed here will be a basic automatic control loop. Figure 2.3 shows the elements of control loop which are described below.

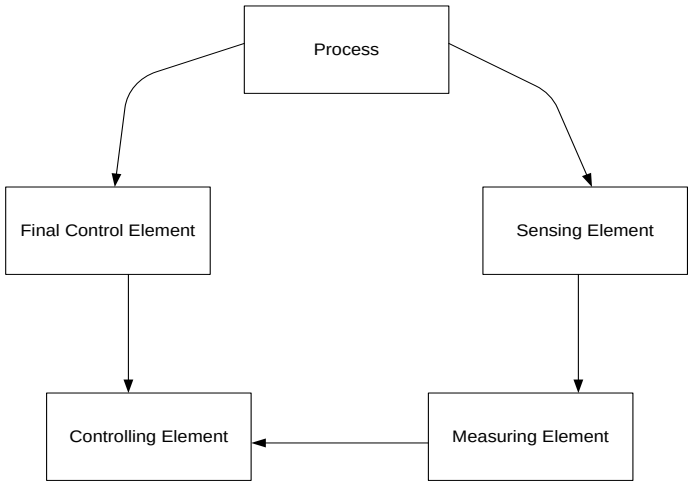

Figure 2.3: Elements of an automatic control loop [6].

2.3.1 Process

A group of organized incidents is called a process. This process is related to some manufacturing sequence or any required system. There are many variables which are involved in a process, and it is advantageous to control all these variables at the same time. There are single-variable process and multi-variable process. In single variable process, only one variable is controlled and in multi-variable process, many variables are controlled.

2.3.2 Sensing element

The sensing element senses the condition of the process variable. Most of the sensing elements used in APSCL correct the changes of the process variable in a way which is proportional to the value of the process variable.

In the following sections we have discussed about flow sensor and temperature sensor.

Flow sensor: The flow sensor detects flow of water by sensing differential pressure. The flow sensing element consists of an orifice plate and a differential pressure. By placing the orifice plate in a pipe, it is possible to create a difference in pressure, and then, sense the differential pressure. When water flows through the orifice, the flow is restricted. As a result, the pressure of the water on the upstream side of the orifice is increased. This pressure is greater than the pressure of the water on the downstream side which converts into a motion. The measuring element converts the motion into a signal that represents the actual flow of water and sends it on the next element in the control loop.

Temperature sensor: There are two types of temperature sensors.

Thermocouples: Thermocouples are measuring devices, which are used in the turbine section of APSCL for measuring the temperature. We observed the sensors of APSCL which was situated in a metal enclosure like stainless steel. The thermocouples measure turbine temperature and send them to the control room. Figure 2.4 shows the thermocouple of APSCL.

Figure 2.4: Thermocouple (unit 3) [5].

Resistance type sensor: The electrical resistance of a conductor changes with temperature, which is the basic principle of resistance type sensors. If a constant voltage is applied to the conductor, then current flows through it. The resistivity of a conductor changes with respect to temperature. This means when the temperature of the conductor rises the resistance increases. In a basic resistance type sensor, there is a thin wire winding and a small sensor head. The winding wire is made by platinum. At APSCL, PT 100 is used as resistance type sensor. The sensors are usually manufactured to have a resistance of 100 Ω at 0° C and the value of temperature coefficient of resistance 0.00385 to 0.00390. A typical operating temperature range is -200° C to 400° C.

At APSCL, we saw a special type of resistance type sensor which is called thermistor. The conductor of the thermistor is special because of a small change in temperature changes the resistance a lot. So, thermistor can be used as a small sensor and it costs less than platinum wire. In this case, the temperature range is limited and the typical range is -20° C to 120° C [6].

2.3.3 Controller

Controller is used to control the drum water level. When the supply pressure of the drum is 1.4 bar, it is in normal condition. Usually drum level is +350 mm to -350 mm. When drum level is +150 mm, controller gives a high signal. When drum level is +300 mm, controller gives high signal. When drum level is -150 mm, controller gives low and when it is -300 mm, controller gives low signal. Input path of water reacts with the controller signal. When the water level lies between -150 mm to +150 mm, then water level is in safe position. When the water level is less than -150 mm, then controller gives a low signal which means water level is decreasing. When the water level is less than -300 mm, then controller gives another low signal which means water level is very low. When the water level is more than +150 mm, then controller gives a high signal which means water level is increasing. When the water level is less than +300 mm, then controller gives another high signal which means water level is very high and then immediately evacuates some water.

2.4 Final control element

2.4.1 Actuator

The final control element is the element which completes a control loop. It links between the process and control signal. A typical final control element consists of valves and dampers.

Fluids flow through the valves. Valves can increase or decrease the openings. Dampers are similar to valves. They can increase or decrease the opening in ducts. Air or gases flow through dampers. Final control elements are moved by actuators. Another function of the actuator is to measure the torque of opening or closing of the valve. If the actuator senses the torque of opening or closing of the valve, then it generates a signal to shutdown the motor which handles the opening or closing of the valves.

At APSCL 3 types of actuators are used.

1. Electrical Actuator,
2. Pneumatic Actuator,
3. Hydraulic Actuator.

A hydraulic actuator is driven by hydraulic fluid under pressure. The fluid passes through a line and pushes against a piston. Hydraulic actuators are typically used where great amount of force is required. Electrical actuators are powered by electricity. These are used in many different applications. Pneumatic actuator is driven by air under pressure. In this actuator, pressurized air pushes the diaphragm and the diaphragm pulls the stem [6].

2.4.2 Thermostat

Thermostat is an important component of final control system. It senses the temperature of a system so that the temperature of a system is maintained near a desired point. The thermostat maintains the correct temperature by switching heating or cooling devices on or off. We saw thermostats are used for measuring temperature inside the boiler. Thermostats are shown in figure 2.5. At APSCL, thermostats indicate and maintain the temperature inside the combustion chamber.

Figure 2.5: Thermostat [5].

2.4.3 Level switch

When feed water goes under 10% of the tank or goes over 90% of feed water tank, then controller gives signal to boiler feed pump to increase its speed or decrease the pump's speed. When feed water goes under 10% of feed water tank, then controller gives low signal and level switch is closed. When feed water goes over 90% of feed water tank, then controller gives high signal and level switch is open. Difference between level control and binary control is that binary control can stand between 0 and 1 but level switch can give reading from 0 to 1.

CHAPTER 3

BOILER

3.1 Introduction

At APSCL, our supervisor Mr. Shafiqul Islam, Senior Engr. (Instrumentation and Control) briefed us about boiler's instrumentation and control and also showed us instrumentation and control of boiler of APSCL. Boilers are used to heat water or other fluid to generate steam or vapor for power generation. The main purpose of boiler of APSCL is to produce steam. There are five boilers in APSCL. The boiler section produces the steam and it is used to run the turbines. Among five boilers of APSCL, one boiler is shown in figure 3.1.

Figure 3.1: Boiler of APSCL [5].

3.2 Boiler working principle

In Ashuganj Power Station Company Limited (APSCL), water tube boilers are used. A bundle of water tubes (tubes containing water) is connected to steam-water drum through two sets of headers. The heat released from furnace flows around these water tubes and water receives the heat. After that, heated water from the tubes is stored into the boiler drum. The steam separates from water in the drum and gets accumulated in the steam space of the drum. From the boiler drum, steam flows into the boiler's super-heater section which adds more heat to steam and steam becomes superheated.

Then superheated steam flows to the high pressure (HP) section of the turbine. In this section, steam flows through the turbine's rotating blades. So, steam pressure moves the rotor which causes the shaft to rotate. In this section, some of steam pressure and thermal energy are

transformed into mechanical energy which drives the generator.

Steam from HP section loses heat and goes to re-heater of the boiler. The re-heated steam from re-heater flows into the intermediate pressure (IP) section of the turbine. Again, in this section, steam flows through the turbine rotating blades. Similar to HP section, steam pressure and thermal energy of IP section are converted into mechanical energy. This section provides additional energy to drive the generator.

Steam from IP section also loses some more heat and goes to the low pressure (LP) section of turbine. In this section, steam pressure and thermal energy are also transformed into mechanical energy and causes rotating blades to turn the shaft. This section also provides additional energy to drive the generator.

A basic boiler diagram is shown in figure 3.2. Water enters the system which is heated by fireside of the boiler and converted into steam. Fireside of the boiler consists of tubes, tube sheets, furnace and furnace heat transfer surface. The inputs of the fireside are fuel and air which are required to burn the fuel and outputs are flue gas and ash.

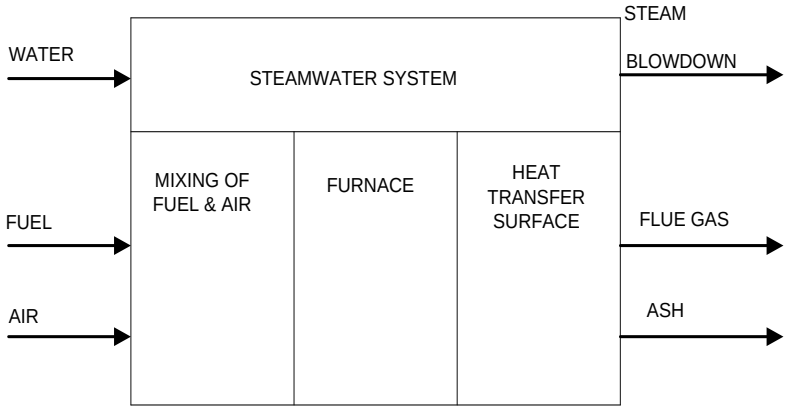

Figure 3.2: Basic diagram of a boiler [7].

3.3 Boiler Components

Our supervisor showed different auxiliary components which are used in a boiler of APSCL. These are as follows,

3.3.1 Furnace

At APSCL, the combustion chamber or furnace releases the heated gas by burning natural gas with air for making steam. This heated gas is called flue gas.

Flue gas: Flue gas is produced inside the burner or furnace of the boiler by burning coal or natural gas with the presence of air.

At APSCL, the flue gas is produced by burning natural gas which comes from the Titas Gas Transmission and Distribution Company Limited (TGTDCL). APSCL uses 15% excess air to produce flue gas because excess oxygen is needed to burn the fuel completely.

At APSCL, each combustion chamber has nine burners. The inside temperature of the chamber is 1200-1500° C. From the feed water tank, the treated water enters into the furnace through economizer through tubes and the flue gas passes over the tubes. In this way, water is heated by flue gas and becomes saturated steam at 260° C which goes to the boiler drum.

3.3.2 Super-heater

The super-heater provides additional heat to the steam to remove any moisture from steam. So, it improves the quality of the steam by removing moisture. There are bundle of tubes inside the super-heater which carries the saturated steam (260° C) and the flue gas passes over these tubes. In this way, the flue gas releases heat and the saturated steam receives the heat and becomes dry and superheated [8].

At APSCL, saturated steam (260° C) is superheated at 520° C to 525° C inside the super-heater and supplied to the HP turbine at 135 bar pressure. Maximum allowable and normal working pressure and temperature of super-heaters of different units are given in table 3.1.

Table 3.1: Maximum and normal working pressure and temperature of different units.

Characteristics	Unit 1, 2	Unit 3, 4, 5
Max allowable steam pressure, (Super heater/Re-heater)	110 bar abs	171/50 bar abs
Normal working pressure, (Super heater/Re-heater)	93 bar abs	138.5/36.6 bar abs
Normal working temperature, (Super heater/Re-heater)	525° C	523° C

3.3.3 Re-heater

Re-heater reheats the steam which comes from high pressure (HP) turbine. Super-heater can increase both temperature and pressure but re-heater can only raise the temperature not pressure. This steam is known as exhaust gas [8].

At APSCL, steam from re-heater at 522° C temperature and 30 bar pressure goes to the intermediate pressure (IP) turbine. From the IP turbine, the steam directly goes into the low

pressure (LP) heater. Maximum allowable and normal working pressure and temperature of re-heaters of different units are given in table 3.1.

3.3.4 Low pressure (LP) heater

Low pressure (LP) heater is a feed water heater which heats the feed water. Steam from IP and LP turbines through extraction lines or tubes heats the feed water. There are two LP heaters in the steam power plant of APSCL. Steam from LP turbine flows through LP heater-1 and steam from IP turbine flows through LP heater-2. Steam of 222° C and 91.2° C from LP and IP turbine respectively is extracted by extraction lines and flowed over the tubes which carry feed water. So, the steam releases heat and feed water receives heat. Then feed water goes to high pressure (HP) heater through feed water tank [8].

Two LP heaters of APSCL are shown in figure 3.3.

Figure 3.3: LP-heater (unit 3) [5].

3.3.5 High pressure (HP) heater

High pressure (HP) heater of boiler of APSCL heats the feed water by the steam which comes from HP and IP turbines through extraction lines or tubes. Feed water is pumped from the feed water tank by boiler feed pump into the HP heater. Steam of 330° C and 220° C from HP and IP turbines is extracted through extraction line and flowed over the tubes which carry feed water. So, steam releases heat that feed water receives [8].

3.3.6 Economizer

The economizer of a boiler is used to recover heat from exhaust flue gas. Economizer transfers this heat to the boiler incoming feed water. The economizer of the boiler of APSCL

is used for this purpose to improve the boiler efficiency and reduce heat loss to the stack. Stack is a chimney or vertical pipe through which flue gases are exhausted to air. So, economizer can reduce fuel and combustion air requirement of the boiler. Economizer process is shown in figure 3.4. When flue gas leaves the boiler through economizer, it makes contact with water tubes through which feed water flows. Thus feed water is heated up by the flue gas because feed water is cooler than the gas. The working principle of economizer is like super-heater and re-heater but only difference between these is in construction.

The failure of an economizer is a very serious problem, because all water of the boiler must pass through the economizer first. If water cannot pass through the economizer, the entire boiler can be damaged.

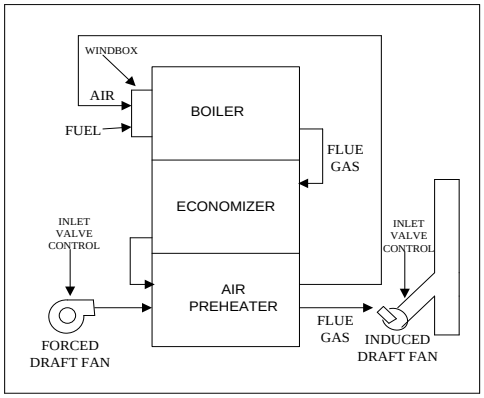

Figure 3.4: Economizer process [7].

3.3.7 Fans and Pumps

There are various types of fans and pumps are used in the boiler of the APSCL for steam production. These pumps and fans are run by the auxiliary supply of the power station. Most of these pumps run at 6.6 KV voltage. The following pumps and fans are used in the boiler of the APSCL for steam generation.

Forced draft fan (FD fan)

Forced draft fan is connected to the furnace. The FD fan pushes air through the boiler for combustion. This fan is used for giving air from nature into the furnace for proper burning of natural gas.

Induced draft fan (ID fan)

Induced draft fan is also connected to the furnace. The ID fan pulls air through the boiler. This fan produces a negative pressure in the furnace for draft control.

Boiler feed pump

Boiler feed pump is used for pumping feed water from feed water tank to high pressure

heater. There are two boiler feed pumps in each boiler of APSCL in which one is standby and the other is working. In unit-5 of steam power plant, the boiler feed pump transfers feed water to the economizer through by-pass line because the high pressure heater is out of work. A boiler feed pump is shown in figure 3.5.

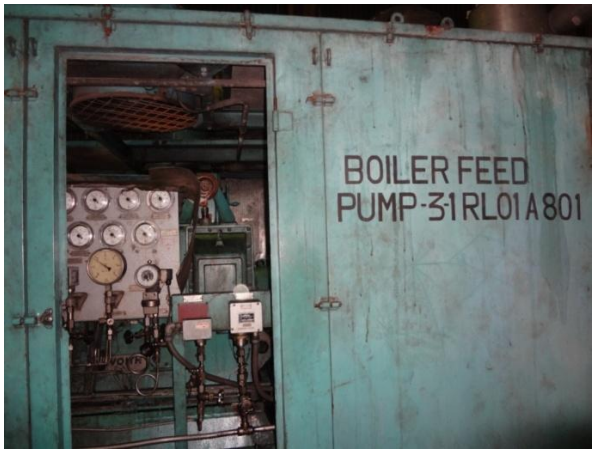

Figure 3.5: Boiler feed pump [5].

Circulating water pump (CW pump)

CW pumps are used for providing cooling water to the boiler. Basically, vertical type and horizontal type CW pumps are used in the boiler depending upon the water intake source. The vertical type is usually used when taking water directly from sea or river, and the horizontal type is commonly used when taking water from the cooling tower. APSCL uses vertical type CW pumps and the resource of the pumps is Meghna river. There are three vertical type CW pumps at APSCL for unit 3, 4 and 5. One CW pump is shown in figure 3.6.

Figure 3.6: CW pump (unit-3) [5].

3.4 Control of boiler

One of the controls of power plant is boiler control which is an important part of a power plant. APSCL uses different types of control for different parts and purposes of the boiler. Most of the controls are auto control which are controlled from the control room. There is also manual control for each auto control. If any auto control fails, then it is controlled manually. Some of the control parts of boiler at APSCL are discussed.

3.4.1 Ratio control

At APSCL, ratio control is used to ratio the quantity of air required for different fuels. The ratio of fuel and air requirement is set initially at 1:15. The set point of the controlled variables changes in direct proportion to change in the uncontrolled variable.

3.4.2 Furnace pressure control

Furnace pressure control is required to maintain a constant pressure in the boiler furnace. At APSCL, furnace pressure is controlled by FD and ID fans. For the pushing air of FD fans into the furnace, flame tries to exert outside which may cause external fire to the boiler. The ID fans of the boiler pull air through the boiler and maintain a negative pressure from the furnace to the outlet of the ID fans. Block diagram of furnace control is shown in figure 3.7.

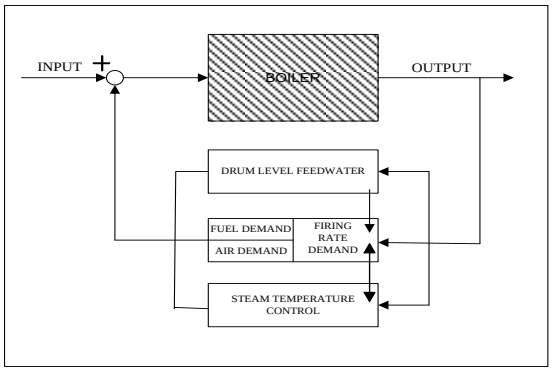

Figure 3.7: Block diagram of boiler control- furnace control [7].

3.4.3 Drum level feed water control

The drum level must be controlled at specific limits which are specified by the boiler controller. If the level exceeds the limits, boiler water carry over into the super-heater or turbine may cause damage. This type of fault increases the maintenance costs or outages of either the turbine or the boiler. If the level is low, overheating of water wall tubes may cause damage and serious accident.

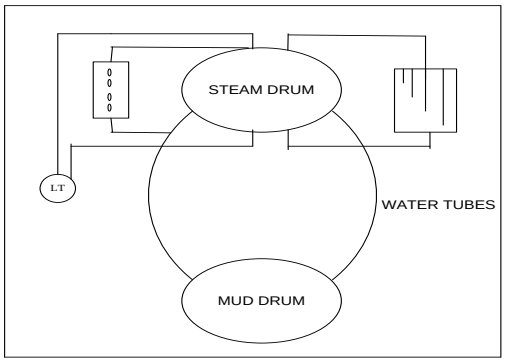

Figure 3.8: Boiler drums/level measurement [7].

The boiler of the APSCL uses differential pressure transmitter which represents the level control measurement and probe type sensor which gives level alarms and low and high shutdown. A boiler drums level measurement system is shown in figure 3.8 which contains a differential transmitter and a sensor.

3.4.4 Single element level control

Single element level control gets input from only one process variable. This type of control is used to control the feed water storage system of a boiler. In single element level control system, the level transmitter sends a signal to the level controller and then the signal is compared to the set point. APSCL uses this type of control for storage tank where water level is the single process variable input. A storage tank of APSCL is shown in figure 3.9.

Figure 3.9: Storage tank of a boiler [5].

3.4.5 Two element level control

In this control system, there are two elements available where steam flow is controlled in addition to drum level. This control system has a secondary variable which has a predictable

relationship with the manipulated variable. This control system is used in the boiler where feed water is controlled at a constant pressure.

At APSCL, this control system is used for feed water control in unit 1 and 2, where feed water is controlled at a constant pressure (93 bar). The steam flow adjusts the feed water control valve based on steam flow signal and the drum level controller signal. As steam flow increases or decreases, the steam flow adjusts the output of the feed water tank and directly sets the feed water final element.

3.4.6 Three element level control

In this control system, there are three elements available where steam flow and feed water flow is controlled in addition to drum level. This control system is used in the boiler where feed water is controlled at variable pressure. APSCL also uses this type of control system for feed water control in unit 3, 4 and 5, where feed water is controlled at variable pressure (at super-heater 135 bar and at re-heater 36 bar). The steam flow adjusts the feed water control valve based on steam flow signal and the drum level controller signal. As the steam flow increases or decreases, the steam flow adjusts the output of the feed water tank and directly sets the feed water controller at set point. Control is improved by adding mass flow compensation to drum level, steam flow, and water flow. In this control system, feed water flow is measured equal to steam flow to maintain the drum level.

3.5 Burner management system

Burner is an important part of a boiler which burns the fuel to provide heat for producing steam. At APSCL, there are nine burners in each boiler. These burners burn the natural gas and produce heat. APSCL uses a control system for the burners so that it can control and save the heat.

Figure 3.10: One burner of a boiler of APSCL [5].

Burning management system is an on/off control system. The system monitors the fuel burning equipments during startup, shutdown and operation of the boiler. When the system is in safe mode, burning will start at any load. If any unsafe condition occurs, the system automatically shuts off fuel flow. One burner of APSCL is shown in figure 3.10.

3.5.1 Purge control

Purging is required before ignition of the first burner to clear any combustibles from the boiler. This is the critical time before the lighting of the first burner. Purge air flow must not be less than 70 percent of the maximum air flow required for a unit. APSCL purges the furnace for four minutes to fully clear the boiler gas passages. During the purge, the air damper is driven to the full open position.

3.5.2 Flame detection

Flame detection is very important for a burner of a boiler. Without flame detection, burner will not get proper heat at proper position.

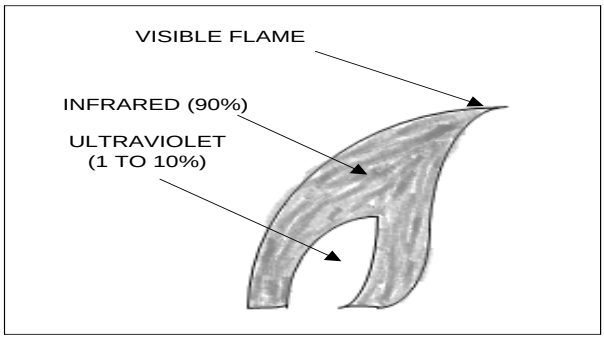

Figure 3.11: Flame detection [7].

At APSCL, visible light, infrared (IR) and ultraviolet (UV) technologies are used for flame detection. Flame configuration is shown in figure 3.11 where infrared (IR) and visible light is 90% of the flame and ultraviolet is between 1to 10 percent of the flame.

3.5.3 Flame tripping validation

APSCL uses flame tripping concept. If there is any loss in burner flame, the burner safety shut off valve is automatically closed. The burner is also closed, if its flame interferes with the air/fuel ratio supplied to any other individual burner flame.

CHAPTER 4

STEAM TURBINE CONTROL AND PROTECTION

4.1 Introduction

Our supervisor Mr. Shafiqul Islam first briefed us about steam turbine and its working principle. Then he explained about the steam turbine control and protection system.

A steam turbine can extract energy from steam flow and convert its pressure and thermal energy into mechanical energy. The steam turbines of APSCL have one moving part, a rotor assembly, which is a shaft with blades attached. When steam flow acts on the blades, these move and provide rotational energy to the rotor. Steam turbine usually has a casing around the blades that contains and controls the working steam. An impulse steam turbine is shown in figure 4.1.

Figure 4.1: Impulse steam turbine of APSCL [5].

4.2 Working principle of steam turbine

Low pressure (LP) steam turbine and intermediate pressure (IP) steam turbine are run by the heat energy from steam. The high pressure (HP) steam turbine is run with the help of low pressure and intermediate pressure steam turbine. In steam turbine section of the APSCL, reaction turbine is used as a low pressure steam turbine and impulse turbine is used as a high pressure steam turbine. The reaction turbine and intermediate pressure turbine help the impulse turbine to run the rotor blades. In impulse turbine, blades are arranged as convergent nozzles. Then generator rotor is run with the help of the HP turbine. At the end of this stage, mechanical energy is produced. This energy is used to run the generator, and thus, the output of the generator gives us electrical energy. Usually, APSCL gets 11 KV from unit 1 and 2 generators and 15.75 KV from unit 3, 4 and 5 generators. Turbine and generator section of a boiler is shown in figure 4.2.

Figure 4.2: Turbine and generator of a boiler [5].

4.3 Steam turbine control system

Steam turbine control systems are composed of a number of components that work together to regulate the flow of steam through turbine. Our supervisor of APSCL discussed and showed about these components of the control system. Some of these components are discussed.

4.3.1 Steam turbine control valves

During the turbine operation, the speed of a steam turbine must be controlled by a desired valve at all times. Turbine speed is determined by the amount of steam flowing through the turbine and turbine control valves are opened by determining the pressure and temperature of the steam. Live steam valve and main stop valve of turbine section of APSCL are shown in figure 4.3.

Figure 4.3: Live steam valve and main stop valve [5].

APSCL mainly uses live steam valve and main stop valve for turbine section. The live steam valve is open at around 520° C temperature and 135 bar pressure of the steam and the main stop valve will operate at any fault of turbine.

4.3.2 Hydraulic actuator and pilot valve

At APSCL, hydraulic actuator is used to adjust the positions of turbine control valve. In hydraulic actuator, there is a piston which is located below a spring and above high-pressure oil. A hydraulic actuator is shown in figure 4.4. The spring exerts a pressure in one direction and the oil exerts a pressure in opposite direction. The spring tries to close the valve and the oil tries to open the valve. The flow of oil into or out of the actuator is regulated by a pilot valve which consists of a cylinder, a supply oil line and a drain line.

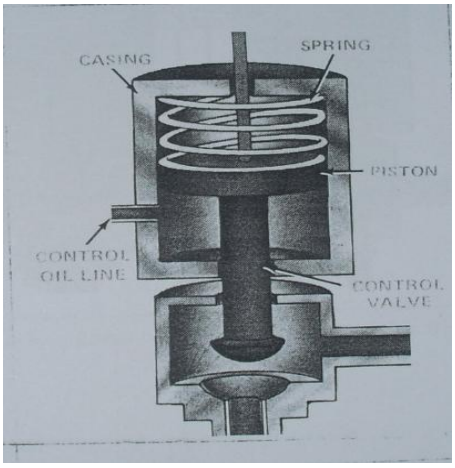

Figure 4.4: Hydraulic actuator [9].

4.3.3 Mechanical governance

At steam turbine section of APSCL, mechanical governance is used to maintain the speed of the turbine at desired value when the generator is disconnected from the power system. Mechanical governor consists of a set of pivoting arms, a bracket, and a spring.

4.3.4 Speed changer

The steam turbine section of APSCL uses speed changer which performs two functions.

1. Adjust the turbine speed when the turbine is off line,
2. Allow the generator to increase its load without changing turbine speed when the turbine is on line.

4.4 Turbine temperature and pressure control

During the turbine operation, the turbine metal will expand or contract when the temperature changes. So, the different temperatures of turbine section are measured and displayed in the control room of APSCL, where the operator can take steps to avoid these problems.

4.4.1 Steam temperature

At the steam turbine section of APSCL, temperature sensors are located at the main steam path, re-heat line, turbine extraction lines and on LP turbine exhaust to control the steam temperature. Thermocouples are used in the steam line to determine the steam temperature in a turbine. The thermocouples generate electrical signals that are proportional to the actual steam temperature at each point.

4.4.2 Bearing temperature

Bearings are usually made of metals that have low melting points. So, bearing can fail or damage if operated at very high temperature. At APSCL, two types of temperature measurement system are used to monitor turbine bearing, one is bearing oil temperature and other one is bearing temperature.

During normal operation, heat is generally removed by oil that is used to lubricate the bearings. Thermocouples are placed in the oil leaving path of each bearing, which provide the accurate temperature of the bearing oil. From oil temperature, operators get the bearing temperature condition.

4.4.3 Pressures control

Turbines are operated at certain pressure and specified pressure is dropped at each stage of steam turbine section. To operate the steam turbines efficiently, the pressure within the turbine must be maintained.

At the steam turbine section of APSCL, steam pressures are typically measured at the main steam line and the crossover line. At APSCL, two types of pressures are monitored in turbine. These are above atmospheric pressure and below atmospheric pressure (vacuum). Steam turbines are operated more efficiently at greater vacuum and operated less efficiently at lower vacuum.

4.5 Steam turbine protection

During emergency conditions, steam turbine protection systems are designed to protect the turbines automatically. Steam turbine protection system is the subsystem of turbine control system. Operators of the control system of APSCL continually monitor the turbine operation and trip the turbine if any emergency occurs. Some of the steam turbine protection systems are discussed below.

4.5.1 Steam turbine trip

Turbine trip shuts down the turbine by closing the turbine steam valves. In a turbine trip, the main stop valves, the control valves, the re-heat stop valves, and the live steam valves are closed. Two cases of steam turbine trip of APSCL are discussed below.

Over speed mechanism

In normal operation, the steam turbines of APSCL rotate at 3300 rpm. Due to some fault, the generator may be disconnected from the power system, and then the turbine can go over speed. For this, the turbine governor reaches in excessive speed and immediately begins to close control valves and live steam valves to decrease the flow of steam to turbine.

Manual trip

The turbine can be tripped manually at any time. Usually, manual trip is done if other trip methods fail during fault occurred or for overpowering the turbine. Manual trip unblocks the drain lines to the hydraulic oil reservoir. So, oil pressure is released from the hydraulic actuator piston. As a result, the turbine valve closes.

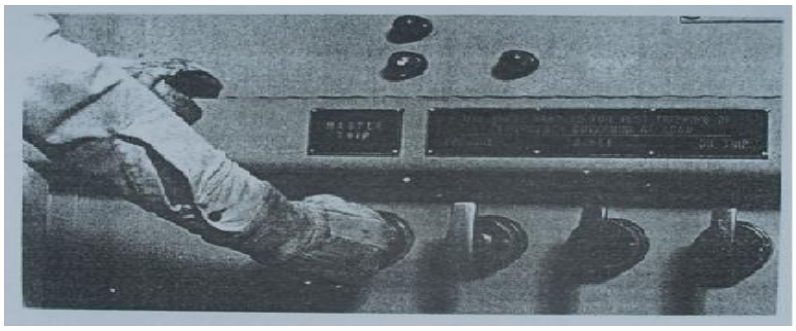

Figure 4.5: Operator activating a manual trip [9].

Figure 4.5 shows an operator initiating a manual trip by pulling a manual trip handle at the front of the turbine. After a turbine trip has occurred, the faults must be corrected before the turbine can be used. The first step in returning the turbine to service is by resetting the trip mechanism. This is typically done by pulling a reset handle like the one shown in figure 4.6.

Figure 4.6: Operator activating a reset mechanism [9].

Pulling the reset handle clears the trip through reset linkage, as shown in figure 4.7.

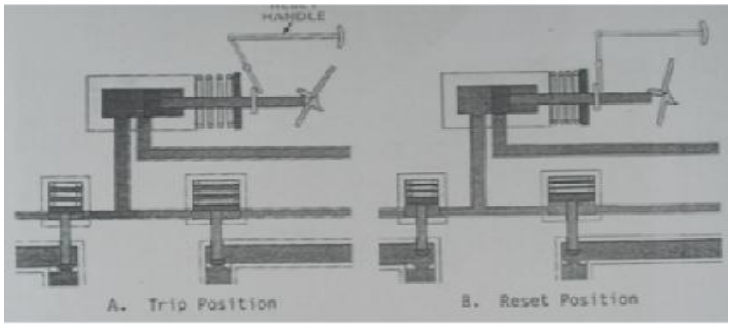

Figure 4.7: Simplified diagram of a basic reset mechanism [9].

Solenoid trip

When fault occurs, the solenoid trip can be operated by an electrical input from any of the several systems. This mechanism is located inside an electrical coil. The electrical coil gets energized when fault occurs and then it moves the plunger. The movement of the plunger drives out the trip finger to trip the turbine. The control room operator can also operate this.

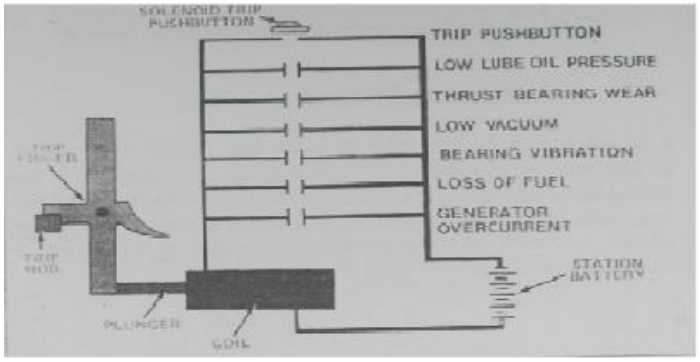

Figure 4.8: Solenoid trip mechanism [9].

Figure 4.8 is a simplified diagram of a typical solenoid trip mechanism. Here, this mechanism includes lube oil, thrust bearing, low vacuum and a high vibration protection system. Generally, there is another power source called station battery. Usually, this arrangement is to ensure emergency power available to the solenoid.

4.5.2 Lubricating oil protection

Steam turbine bearings are designed to operate within an oil pressure range of 20-30 psig (pound-force per square inch gauge). If the oil pressure drops below the preset range, then an insufficient quantity of oil will be delivered to the bearings. As such, there remains insufficient quantity of oil to support the shaft and an insufficient supply of oil to cool the bearings. If the lube oil pressure is not set to normal, serious damage could happen to the

bearings. Lubricating oil protection system starts action when low lubricating oil pressure condition occurs. If the turbine lubricating oil pressure decreases to a rated value, then the contacts become closed by a pressure switch that located in the lubricating oil supply line to the bearings. Closing of the contacts causes two separate actions.

1. Backup pumps are started to restore the pressure to within normal range,
2. Alarm is energized to alert the operator about the low pressure condition.

The alarm is to alert the operator about the situation and allows time to take proper action. If the pressure continues to decrease without being affected by the remedial action, then the second pressure switch becomes closed and then energizes a solenoid trip, which removes the turbine from service.

4.5.3 Bearing protection

Excessive thrust can damage the thrust bearing. Thrust bearing protection system protects the turbine from excessive thrust and high temperature. When the temperature of the bearing becomes very high, the bearing is cooled by lube oil. Lube oil is a part of the thrust bearing protection system. Another purpose of using lube oil is to avoid friction. With this protection system, power loss due to mechanical friction decreases.

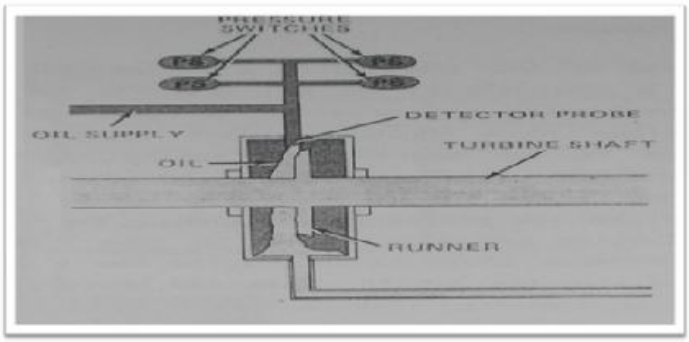

Figure 4.9: A thrust bearing wear detector [9].

Figure 4.9 is a simplified diagram of a thrust bearing detector. The thrust bearing wear detector is usually located on the lowest part of turbine bearing. The main portions of this system are pressure switch, oil supply, bearing wear detector probe, and a runner. The runner is actually part of the shaft. Excessive thrust can be detected by this.

4.5.4 High vibration protection

Extra vibration is harmful for turbine. Generally, maximum allowable vibration limit is 7-10 mils. The turbine must be removed from service when the vibration exceeds specified limits.

Vibration recorders are set to drive an alarm in the control room when excess vibration occured in the turbine. This alarm alerts the control room operator to take proper action during high vibration condition. There are several vibration protection systems that are provided with contacts. During excessive vibration condition, a solenoid trip is activated by these contacts.

CHAPTER 5

FAULT ANALYSIS AND TROUBLESHOOTING

5.1 Introduction

Fault analysis and troubleshooting is a crucial part of a power plant operation. In this chapter, three main faults are discussed. These are circulating water pump trip, high pressure bypass fault, and turbine shaft vibration fault. The reasons of the respective faults and their solutions are mentioned as well as discussed in detail in this chapter.

5.2 Circulating Water (CW) Pump Trip

Problem: The bearing site of the circulating water pump was over heated and the pump tripped.

Time and Place: This fault happened at the water treatment zone on 31st August at 12 pm. Technicians took about 2 hours to fix this. The reserved tank was full, so power generation was not interrupted for this trip.

Fault Reasoning: It is mandatory that lube water must be in the packing site of the circulating water pump. Lube water is used as a cooling system for the circulating water pump bearing section. When the pump runs, the bearing site is heated up. To make it cool, lube water is essential. After having a check, lube water was found absent in the packing site. It happened because the lube water supply line and its fittings were jammed. These lines were being used for a long period of time and the pipe lines were not cleaned before, so the lines and fittings were jammed. For this reason, lube water was not supplied to the bearing site of the circulating water pump and this is why the cooling system was interrupted, the pump was over heated and tripped.

Solution: Technicians changed the lube water supply line and some fittings and then restarted the circulating water pump and then the pump was running again without any problem.

5.3 HP (High Pressure) bypass fault

Problem: Live steam was not supplied fully to the turbine, and generation of power was interrupted.

Time and Place: This fault happened at Unit 5 on 6th September at 12 pm. It took more than 1 hour to fix this problem. Power generation was interrupted for about an hour.

Fault Reasoning: The path by which live steam passes from boiler to turbine is called HP or high pressure bypass line. A valve is also there, which always remains 100% open. HP bypass fault occurred because the valve was open about 75%. As the valve gets closed near to 25%, the rest of steam is passed by a drain called HP drain line which is attached to the HP bypass line. For this reason, live steam was not supplied accurately to the turbine. Although the valve was auto controlled, but at that time, they failed to operate the valve from the control room. Technician team tried to manually operate the valve. There were 3 valves under this valve, technician team checked the other 3 valves and they found that the solenoid controlled valve was not responding. Other 2 valves were working. They brought the log book and checked the valves between boiler to turbine. In the live steam line (RA10), a valve showed false reading. That valve contained a potentiometer. We know that, when the solenoid is de-energized, spring tension holds the valve stand in a closed position. When current is sent through the coil, the coil becomes an electromagnet. As an electromagnet, it attracts the core and holds that up. When the core moves up, the spring tension is overcome by the solenoid action, and the valve is open. When the coil is de-energized, no current passes through this, and there is no longer any magnetic force to attract the core, then the spring becomes able to push the core down closing the valve. This theory was applied to the solenoid valve, but there was no response. This proved that the solenoid was already damaged. At APSCL, the solenoid valve's opening and closing operation can also be controlled by changing the resistivity. So, the resistivity was increased manually by the operator to open the valve and measured the data by applying current through the potentiometer. When potentiometer showed the value of 0.36 mA, valve was opened up to 97.75% but they could not open it up to 100%. This valve was a three element control valve.

Solution: Solenoid valve was in the main line. So, to replace the solenoid valve the main steam line should be turned off first, which was not possible at peak hour. At that time it was peak hour and demand of electricity was high. So, the valve of the HP drain line was turned down by the operator. So in this way, if the drain line remained open, some live steam passed by that way because the solenoid valve was not 100% open. So, when the drain line was shut down, all the live steam directly went to the turbine section without any loss. There was no instruction about the permanent solution of this problem.

5.4 Turbine shaft vibration fault

Problem: Control room received repeating alarm from turbine section with the message that the shaft of the turbine was vibrating more than the allowed amount.

Time and Place: This fault happened at Unit 5 on 2nd September at 4 pm for 15 minutes. It was just an alarm which created threatening environment at the control room but there was no interruption for generating power at that unit.

Fault Reasoning: Balance of the turbine's shaft is maintained by stones and metal. There are places in the shaft to put the metal and stones. For any reason, if the quantities of these balancing materials change, the shaft will vibrate beyond its rated value which is unwanted and dangerous. APSCL turbine rotates at 3300 rpm and its rated shaft vibration is 7-9 mils. Technician team found that the balancing materials were not sufficient in the shaft. So, the shaft vibrated with 9-10 mils. The time was peak hour, so it was not possible to turn off the turbine and balance the shaft weight, a temporary solution was needed there. After some calculation and discussion, the result was that the vibration limit of the shaft was not threatening.

Solution: An alarm was sent to the control room when the shaft vibration crosses the rated limit. Technician team agreed that 9-10 mils are not a threatening condition. So, the technicians changed the rated value to 9-12 mils as a temporary solution so that the false alarm would not create any confusion. After that, the permanent solution was announced that at an off peak hour, the turbine will be shut down to balance the weight of the shaft and the rated shaft vibration limit will be returned to 7-9 mils.

CHAPTER 6

CONCLUSION

The conclusion chapter is to give an overview about the findings and problems during the internship period in APSCL. The instructors at APSCL showed us many types of equipments and explained their working principles. Instrumentation and control division are directly related to each other, because control, measurement and protection are not possible without instrumentation.

We observed the practical applications of theory in APSCL, which we have learnt in our university. Before internship program, we had only some sort of bookish knowledge about all these. We visited the power station and observed how the gas turbine works including its control and protection. We experienced the generation process of electricity. We experienced the physical application of logic gates and flip flop, different relays, signal conditioning, the control parameters and logic cards with different sensors. Engineers of APSCL briefed us about the components, maintenance and supply material of boiler. We observed how the power station was controlled by five control rooms, how the operators operate the control room. We were familiarized with different components of substation, burner and different pumps, like, circulating water pump, feed water pump and different water treatment plants with applications. We learnt how the river water is used in APSCL to operate the steam turbine and in cooling system. We experienced different faults and learned how the faults are analyzed with the solution, what kind of steps were taken by the engineers in emergency.

In this report, we discussed topics which we have experienced during our internship session at APSCL. Here we mainly discussed about instrumentation and control system of APSCL, which contains different types of controlling valves and metering instruments.

6.1 Problems and findings

Although it was a very good working experience, there were some problems and limitations as well. The problems and limitations were:

1. We were not allowed to go to everywhere inside the plant sub-station due to risk of high voltage.
2. Sometimes we could not collect our necessary data or information due to confidentiality reasons.

3. Sometimes it was very hard to understand the matters because it was not possible to watch the internal configurations properly, because of insufficient time or confidentiality concern.

6.2 Recommendations

There are a few recommendations from our point of view. The following are the recommendations about internship program,

1. Internship at a power station for 15 days is not sufficient to know all the matters. It should be more than 30-40 days program.
2. It is suggested that one who is doing internship in a power station should take the power station course before the internship program.

Finally, it can be said that there are some challenges and dimensions which are always faced by the engineers. In a large power station like Ashuganj Power Station Company Limited (APSCL), maintenance of the equipments is a major challenge. Each and every equipment is checked on a regular basis to keep these fully running. Engineers and workers are working hard for some constructional changes of control APSCL with the aim to increase the total power generation. In the long run it will improve the distribution, transmission and contribution to the country. We were lucky enough to work with a group of enthusiastic and dedicated people at APSCL. It has been a unique opportunity and one that we will not forget soon.

REFERENCES

[1] Vision, Mission of APSCL. [Online]. Available: http://www.apscl.com/Profile.asp.

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[8] NUS Training Corporation "Power principle: Power plant basic series, Plant Cycle", A Halliburton company. April 30, 1982.

[9] NUS Training Corporation "Power principle: Power plant practices series, Turbines", A Halliburton company. 1983.

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:	APSCL (Ashugonj power station co. LTd)
Name of the student:	Md. Atikur Rahman
ID:	2008-1-86-010

Date:	24-08-2012
Start time/End time	8.00 am - 4.50 pm
Location:	I&C (Instrumentation and control)
Mentor:	~~Md.~~ Shafiqul Islam

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 day's activities was to know about the history of APSCL (Ashugonj power station company limited) we also visited the whole power station and also know about the future plan of this power station.

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.

In 1970 APSCL started with two 64MW units. Now APSCL has three types of generation system. Gas turbine steam turbine and combined cycle. There are total 9 units. The generation capacities of these stations ① Unit-1: 64 MW, ② Unite-2: 64MW ③ Unit-3: 150 MW ④ Unit-4: 150 MW ⑤ Unit-5: 150 MW ⑥ Gas Turbine-1: 56 MW ⑦ Gas turbine-2: 56 MW ⑧ Gas turbine-3: 34 MW ⑨ Gas Engine: 50 MW.
Total capacity of generation is 774 MW. Avarage 620 MW is supplied to the National Grid.

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

This was just introductory part of our industrial training and we have known about this from our power courses.

24-08-12
Signature of the mentor with date
Name: ?
Designation: ?
Contact Phone #: 01711977093

16/9/12
Signature of academic supervisor with date
Name: FMA
Designation: Lecturer

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:	APSCL (Ashugonj power station co. LTD)
Name of the student:	Md. Atikur Rahman
ID:	2008-1-86-010

Date:	25-08-2012
Start time/End time	8.00 am - 4.00 pm
Location:	I&C (Instrumentation and control)
Mentor:	Eng. Shafiqul Islam

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 know about (I&C) Instrumentation and control division and also known about steam turbine.

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 list of the day's activities according to order of objectives

(i) Discussion of water and steam cycle with the angle of I&C.

(ii) Necessity of river water as cooling water.

(iii) Idea about how to control system work.

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

The objective days activities was related with the power station course.

25-08-12

Signature of the mentor with date
Name:
Designation:
Contact Phone #: 01711977093

16/9/12

Signature of academic supervisor with date
Name: FMA
Designation: Lecturer.

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:	APSCL (Ashuganj power station co. LTD)
Name of the student:	Md. Ankur Rahman
ID:	2008-1-86-010

Date:	26-08-2012
Start time/End time	8.00 am - 4.00 pm
Location:	IQC Division
Mentor:	Eng. Shafiqul Islam

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 to know about how to read P&ID (Pipe and Instrumentation Diagram) and introduce with symbols used in P&ID. We also visited ① condensate pump ⑭ boiler feed pump ⑪ cooling water pump.

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.

P&ID Symbols:

TI → temperature Indicator
Z → Protection
S → switching
R → Recorder
A → Alarm
H → High,
L → Low
F → Flow
P → Pressure
G → position
H → Hand operated control
X → Variable
e → Analog control
D → Differential
Q → Integration
RA11 → Hp bypass
RA10 → Turbine steam line
NA01 → Tank to Drum pipe line

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

The topic discussed was related with power courses.

26-08-12
Signature of the mentor with date
Name: ?
Designation:
Contact Phone #: 01711977093

16/9/12
Signature of academic supervisor with date
Name: FMA
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
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Name of the company:	APSCL (Ashugonj power station CO. LTD)
Name of the student:	Md. Atikur Rahman
ID:	2008-1-86-010

Date:	27-08-2012
Start time/End time	8:00 am - 4:00 pm
Location:	I&C Division.
Mentor:	Eng. Shafiqul Islam.

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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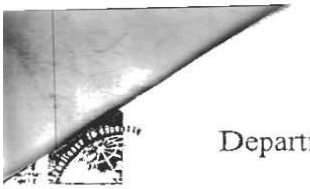

Department of Electrical and Electronic Engineering
East West University

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)

The objective of the day's activities was to know about the signal conditioning

① Analog signal

② Binary signal.

we also observe and check of Instrumentation for firing boiler.

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.

List of the activities:

1. Analog signal
   a) LVDT (Linear variable differantial transformer)
   b) S/D control valve
   c) Tacometer.
2. Binary signal
   a) Flip Flop (SR)
   b) Turbine trip logic circuit using Binary signal.

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

The topic was related to the course studied power station and digital logic design.

27-08-12
Signature of the mentor with date
Name: ?
Designation:
Contact Phone #: 01711977093

16/9/12
Signature of academic supervisor with date
Name: FMA
Designation: Lecturer

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East West University
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Industrial Training
Daily Activity Report

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Name of the company:	APSCL (Ashuganj power station co. LTD)
Name of the student:	Md. Atikur Rahman
ID:	2008-1-86-010

Date:	28-08-2012
Start time/End time	8.00 am - 4.00 pm
Location:	I&C Division
Mentor:	Eng. Shafiqul Islam

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 to know about burner and feed water pump.

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 day's activities were:

1. Burner: ⓐ Natural gas delivery and transfer.
   ⓑ Air resister
   ⓒ spraking rod
   ⓓ Ignition transformer.
2. Hp bypas hydrolic unit
3. Waste drain tank
4. Boiler feed pump – ⓐ Inlock → ⓘ Source line
   ⓘⓘ Delivery line

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

The knowladge we gained was similar to the theoritical knowladge that we know in power station course.

28-08-12

Signature of the mentor with date
Name:
Designation:
Contact Phone #: 01711997093

16/9/12

Signature of academic supervisor with date
Name: FMA
Designation: Lecturer.

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

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Name of the company:	APSCL
Name of the student:	Akhanuzzaman
ID:	2008-2-80-039

Date:	29-08-12
Start time/End time	8.00 am – 4.00 pm
Location:	I&C/ Auto control
Mentor:	Shafiqul Islam.

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
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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)

The objective of the day's activities was the introduction of Logic gates/ Flip Flop used in common purposes and how to read Logic diagram.

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 day's activities were

~~List of~~ ① LP bypass function diagram

→ spray

→ solenoid operated valve

→ OR Gate

→ off delay Timer

→ And gate

① XV – physical signal
② XB → O/P Feed back
③ XC → physical contact

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

The knowledge we gained is similar to the theoritical knowledge that we learnt in our related courses.

29-08-12
Signature of the mentor with date
Name: Shafiqul Islam
Designation: Senior Engineer
Contact Phone #: 01711 - 977093

19/9/12
Signature of academic supervisor with date
Name: FMA
Designation: Lecturer

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

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Name of the company:	APSCL
Name of the student:	Aktaruz-zaman
ID:	2008-2-80-039

Date:	30-08-12
Start time/End time	8.00 am – 4.00 pm
Location:	I&C / Auto control
Mentor:	Shafiqul Islam.

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 activites was to know the control system and elements of control loop

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 day's activities were,

1. For control system, (i) process
   (ii) controller
   (iii) sensing element
   (iv) final control element

2. Visited the final control element of control loop.

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

The knowledge we gained is similar to the theoritical knowledge that we know in our related courses.

30-08-12

Signature of the mentor with date
Name: Shafiqul Islam
Designation: Senior Engineer
Contact Phone #: 01711-977093

19/9/12

Signature of academic supervisor with date
Name: FMA
Designation: Lecturer.

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:	APSeL
Name of the student:	Aktaruzzaman
ID:	2008-2-80-039

Date:	31-08-12
Start time/End time	8:00 am – 4.00 pm
Location:	IPE / Auto control
Mentor:	Shafiqul Islam

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 ~~about~~ analyze the fault of circulating water pump. and whats were the steps removing the fault.

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 day's activities →

① ~~Fault~~
- (i) The temperature of bearing of cw pump was increased
- (ii) circulation of lake water was not sufficient
- (iii) pipe was leakage and feedings were jamed

② Solution:

→ By changing the narrows pipes and refresh the feedings and ensure that the flow of lake water was correct which control the temperature of the bearing of the cw pump.

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

The knowledge we gained is totally an experience about the fault.

31-08-12
Signature of the mentor with date
Name: Shahriad Islam
Designation: Senior Engineer
Contact Phone #: 01711-977093

19/9/12
Signature of academic supervisor with date
Name: FMA
Designation: Lecturer.

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:	APSCL
Name of the student:	Aktaruzzaman
ID:	2008-2-80-039

Date:	01-09-12
Start time/End time	8:00 am – 4:00 pm
Location:	IEC/ Auto control
Mentor:	Shafiqul Islam.

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 to know the different control parameters and introduction to logic cards.

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 day's activities were,
① Thermocouple ② RTD (Resistance temperature detector)
③ Proportional (P) ④ Differential (D) ⑤ Integral (Reset)
⑥ Actuator :- (i) open limit switch
(ii) close " "
(iii) open torque switch
(iv) close " "
(v) Potentiometer
(vi) Thermostate

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

The knowledge we gained is similar to the theoritical knowledge that we know in our related courses.

01-09-12

Signature of the mentor with date
Name: Shafiqul Islam
Designation: Senior Engineer
Contact Phone #: 01711 - 977093

19/9/12

Signature of academic supervisor with date
Name: FMA
Designation: Lecturer.

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

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Name of the company:	APSCL
Name of the student:	Akter Uzzaman
ID:	2008-2-80-039

Date:	02-09-12
Start time/End time	8.00 am - 4.00 pm
Location:	I&C/ Auto control
Mentor:	Shafiqul Islam.

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)

The objective of the day's activities was know about different protection, control and 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.

The day's activities,

1. Inter posing Relay
2. steam circuit
3. motor starting circuit
4. Timer relay
5. 311 control

Set value for
- (i) Feed water
- (ii) Steam water
- (iii) Drum water

6. Leak Test
   - (i) Purge Test (8)
7. Pressure realse valve

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

The knowledge we gained is similar to the theoritical knowledge that we know in our related courses.
↳ course name → EEE

02-09-12

Signature of the mentor with date
Name: Shahiqul Islam
Designation: Senior Engineer
Contact Phone #: 01711-977093

19/9/12

Signature of academic supervisor with date
Name: FMA
Designation: Lecturer

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:	Ashuganj Power Station Company Limited
Name of the student:	Md. Comar Farugue
ID:	2008-2-86-019

Date:	03-09-2012
Start time/End time	8am - 4 pm
Location:	I and C Division.
Mentor:	Shafiqul Islam

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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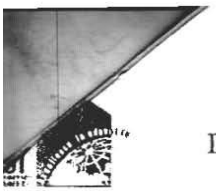

Department of Electrical and Electronic Engineering
East West University

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)

The objective of the day's activities was to know about the components and maintenance of boiler.

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.

a) Interference components:
1. Burning chamber, burner opening - inspection of coolers
2. Bottom
3. water wall.

b) Hot gas path components:
1. Super heater.
2. Ash removal
3. Boiler Reheater
4. Economizer.

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

These practical activity was related with our academic Power station course

03-09-12

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

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:	Ashuganj Power Station Company Limited
Name of the student:	Md. Omar Faruque
ID:	2008-2-26-019

Date:	04-09-2012
Start time/End time	8 am – 4 pm
Location:	I and C Division
Mentor:	Shafiqul Islam

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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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 days activities was turbine control and 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

1) List of the days activities:
Basic component of turbine -
(i) Main stop value (ii) control value (iii) Journal bearing (iv) Stationary blading (v) Moving blading (vi) Steam line to nozzle block (vii) Reheat stop value (viii) Interrupt value, (ix) Hydraulic actuator, (x) Pilot value (xi) Governor (xii) fly weights.

2) Flowing steam to turbine:
i) Steam flow from nozzle to HP turbine.
(ii) Exhaust steam of HP turbine which is reheated and used in I.P turbine
(iii) Using economizer pipe line from IP to L P turbine.

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

These practical activity in related with our theoritical power station courses.

04-09-12
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

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:	Ashuganj Power Station Company Limited
Name of the student:	Md. Omar Faruque
ID:	2008-2-86-019

Date:	05-09-2012
Start time/End time	8am-4pm
Location:	T and C Division
Mentor:	Shafiqul Islam

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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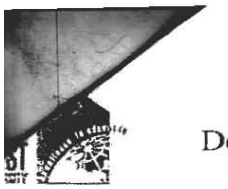

Department of Electrical and Electronic Engineering
East West University

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 days activities was to know about Unit-5 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.

List of days activities:

1. Combustion chamber
2. Gas distribution plant
3. Bord Scanning System
4. Junction box
5. filter overhead tank
6. Feed water tank
7. Flash vessel
8. Down corner
9. Pre heater
10. Stack
11. boiler Drum
12. Flue gas analyzer
13. Cooling water expansion tank
14. compressor
15. Lub oil cooler
16. Storage tank

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

These practical activity is related with our power station course.

05-09-12

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

10.09.2012

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
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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:	APSCL
Name of the student:	Md. Omar Faruque
ID:	2008-2-86-019

Date:	06-03-2012
Start time/End time	9am - 4pm
Location:	I & C Division
Mentor:	Shafiqul Islam

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 was to visit control room and analysis a fault.

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.

List of activities:

1. MARSHALLING RACK (Cable Junction)
2. Drive cont panel
3. 24 DC I&C power supply panel
4. Analog and Binary Signal cubical panel.

Fault: The value of HP Bypass was not under auto control.
Possible occurance of fault: (i) oil pressure decreased (ii) filter was blocked (iii) the value was open 24/7.
(iv) Manual maintenance. Solution: manually decrease variable resistance to maintain the closing value to zero potential.

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

This topic was related with power and control system course.

06-09-12
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

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:	APSCL
Name of the student:	Md. Omar Farugue
ID:	2008-2-81-019

Date:	07-09-2012
Start time/End time	8 am- 4 Pm
Location:	I & C Division
Mentor:	Shafiqul Eslam

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 was to visit and familirize with different components of substation.

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.

List of activities:

1. Current transformer
2. Single phase transformer
3. Circuit breakers
4. Lightining Arrester
5. Sky line wire
6. Isolators.
7. Potential transformer
8. Auxilary transformer
9. bus bar
10. wave trap
11. counting transformer.

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

The knowledge we gained is similar to the theoritical knowledge that we learn in power station and switch gear course.

07-09-12

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