A brief overview on electrical power generation in Shahjalal Fertilizer Company Limited and Overhauling in the power generating unit.

This thesis has been submitted to the Department of Electrical and Electronic Engineering in partial fulfillment of the requirement for the degree of Bachelor of Science in Electrical and Electronic Engineering.

SUBMITTED BY:

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SUPERVISED BY:

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Lecturer
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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

Letter of Transmittal

September, 2019

To

The Supervisor

Department of EEE

Daffodil International University

Dattapara,Ashulia,Savar,

Dhaka.

Subject: Submission of Intern Report.

Dear Sir,

Please find enclosed the intern report entitled **"A brief overview on electrical power generation in Shahjalal Fertilizer Company Limited and Overhauling in the power generating unit".**

The study has been carried out in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

In carrying out the study, I have followed supervisor's advice and collected.

Required information from several text books, reference books, web sites and other sources. I think you will find it useful and informative; I would be glad to furnish you explanations or clarifications if required.

Sincerely yours,

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Shamsul Arefin

ID:152-33-195

Declaration

I do hereby solemnly declare that the work presented in this report entitled **"A brief overview on electrical power generation in Shahjalal Fertilizer Company Limited and Overhauling in the power generating unit"** has been carried out by me and has not been previously submitted to any other university, college or organization for an academic qualification, certificate or diploma/degree.

I hereby warrant that the work that has been presented here does not breach any existing copyright. I further undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligations.

Authors

Shamsul Arefin
ID: 152-33-195

DAFFODIL INTERNATIONAL UNIVERSITY

Certificate

This to certify that the report entitled **"A brief overview on electrical power generation in Shahjalal Fertilizer Company Limited and Overhauling in the power generating unit"** is the valid record of the work done by Shamsul Arefin for Partial fulfillment of the requirement of the degree of B.Sc. in Electrical and Electronic Engineering (EEE) from Daffodil International University.

This work has been carried out under my guidance and is a bonfire record of valid works carried out successfully.

Countersignature

Apan Dastider

Lecturer
Department of EEE
Daffodil International University
Dattapara, Ashulia,
Savar, Dhaka

APPROVAL

This Thesis titled **"A brief overview on electrical power generation in Shahjalal Fertilizer Company Limited and Overhauling in the power generating unit"** submitted by Shamsul Arefin to the Department of Electrical & Electronic Engineering, Daffodil International University has been found as satisfactory & accepted for the partial fulfillment of the requirement for the degree of Bachelor of Science in Electrical & Electronic Engineering.

Board of Examiners:

Acknowledgement

First of all, we would like to express our gratitude to omnipotent and almighty Allah, whose invisible guidance helped us to complete this report. Although, time was very limited for getting the sufficient knowledge about all the elements related our dissertation, but the sort experience that we gathered as an, in Daffodil International University asset for all the time to come in our life. We would like to take the opportunity to express our deep sense of gratitude of our supervisor Apan Dastider for his invaluable suggestions and guidance during the study period that has greatly inspired in preparing this dissertation successfully.

We are deeply grateful to all concerned persons who provide valuable guidance, suggestions and advices in collecting information, analyzing and preparing the report. We are particularly indebted to them whose efforts and cordial cooperation made the dissertation possible.

Finally, we want to express deep gratitude to our all university friends who have helped us various ways through out the time required to prepare this dissertation.

……..

Signature
Shamsul Arefin
Student ID: 152-33-195

Program: B.Sc. in EEE
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Executive Summary

The production activities of several important Industrial sectors in Bangladesh depend on an inadequate supply of natural gas. Natural gas is the main raw material for urea manufacture and basic components for production of urea, ammonia and carbon dioxide.

First of all natural gas is cracked by steam in the primary and secondary reformer to produce carbon dioxide, carbon monoxide and hydrogen. Moreover air is also added to the secondary reformer as a source of nitrogen. Carbon monoxide is converted to Carbon dioxide in the shift converters and carbon dioxide is separated from the gas steam in the carbon dioxide removal plant and send into urea plant under high pressure. Remaining components of the gas steam i.e. nitrogen and hydrogen react together under pressure and temperature to from ammonia. This ammonia and carbon dioxide then react together in pool reactor under controlled pressure and temperature to produce urea. Later on this liquid urea is supplied to granulator where spray of liquid urea being bonded with the small amount of binder. The granular urea is bagged with 50 kg content in polythene inserted polythene bags and delivered to the distribution barge and truck and rail wagons from the factory premises.

List of contents

Chapter:01.

1.1:Intruduction:

Sylhet is a land of natural beauties. Sylhet is considred the holy place of Hazrat ShahJalal (Rh), Hazrat Shah Poran (Rh) and 360 awliyas. Fenchujong is a gloriousarea of sylhet. Near the bank of Kusheriya river there is built Shahjalal Fertilizer Company Limited (SFCL). That is 30 km south from sylhet zilla sodor. Shahjalal Fertilizer Company Limited SFCL is an government owned organization under industrial ministry and controlled by Bangladesh Chemical Industries Corporation. (BCIC).

The foundation of this project was established by honorable Prime Minister Sheikh Hasina, On 24th March 2012. Shahjalal Fertilizer Company Limited (SFCL) is the 6th largest and power saving Urea Fertilizer producing factory in Bangladesh. The institute is built with modern DCS,PLC,ITCC, ESD And SCADA. The main production of the factory is granular urea, that Has daily capacity of 1,760 Metric Tons and yearly 5,80,800 Matric Tons. The other production Is liquid ammonia having 1,000 Matric Tons daily capacity and 3,30,000 yearly capacity. The main raw material of the production is, 1.Natural gas from (Jalalabad T&D Gas Station)2.Air 3.Water. One of the main production granular urea is supplied regularly Selected areas.

These lected areas are two kinds of, They are-

(a) Commanding area: Sylhet, Moulovi bazar, Hobigonj & Sunamgonj District.

(b) Buffer-godoun: Shantahar,Bogora; Corkai,Dinajpur; Parbotipur,Dinajpur; Shiruil,Rajshahi; Shiromoni,Khulna; Shibgonj,Thakurgaon;In addition,Urea Fertilizer despathch to buffer godown of other Fertilizer Factory of Bangladesh Chemical Industries Corporation (BCIC). Another main production liquid ammonia is supplied to various glass and soap factories.

Shahjalal Fertilizer Company Limited (SFCL) has a total area of 417.76 acres including 66.73 acres of factory area and 351.03 acres of residential and other areas. The total cost to built this factory was 5,409 cores BDT from Bangladesh government, and 560 Milllion USD from China government. It took 44 months to built this factory. 565 officers, staffs and workers can work in this factory. More over, Housing colony, Bacholors hostle, Clubs, Medical centre, Educational Institution, Mosque, Temple, Bank, Post office, Park etc are also other facilities for the job holders.

1.2:Objective:

The Department of Electrical & Electronic Engineering (EEE), Daffodil International University, Dhaka Bangladesh has introduced a course entitled **"Industrial Training in Electrical industries"** for the fulfillment of undergraduate degree. The aid and objectives of this program are as follows.

A. To gain general knowledge in fertilizer manufacture.
B. To gain work experience in electrical industry.
C. To identify specific problem in electrical industry.
D. To gain knowledge and skills in handling equipment such as Boiler, Turbine, Generator, Deaerator, Switchgear etc for the quality Industrial training of the SFCL.
E. To work on specific problems in electrical industry.
F. **Overhauling:** The most major part was, I have witnessed overhauling of Shahjalal Fertilizer Company Limited (SFCL) during my three months internship. It was the first overhauling of Shahjalal Fertilizer Company Limited (SFCL). So that I was lucky to see clearing many important machine and repairing parts and equipment's. Not only that, I also joined in this event and some worked with them.

NB:

I chose to intern among thesis, project and internship. I had twelve weeks of internship at Shahjalal Fertilizer Company Limited (SFCL) in Fenchugonj, Sylhet. It was a government Institute under industrial ministry. There were Maintenance and Technical Service (MTS) and Electrical Instrument Power (EIP) departments those were related to my subject Electrical and Electrical Engineering (EEE). I did my internship forty five (45) days in this two departments and other forty five (45) days in other six departments equally.

At the end they took me a test of hundred (100) marks, on my total period. They issued me a certificate for very good performance of that test.

There are total eight (8) departments In Shahjalal Fertilizer Company Limited (SFCL).

They are-

1. Administration.
2. Finance & Accounting.
3. Trade & Commercial.
4. Technical.
5. Operation.
6. Maintenance and Technical Service (MTS)
7. Electrical Instrument Power (EIP)
8. Health Safety Environment & Training.

Now, I will briefly describe about all eight (8) departments of Shahjalal Fertilizer Company Limited (SFCL).

Chapter:02.

2.Briefly discribe about all SFCL department:

1.Administration:

There are ten section under this department. They are:-

1.Managing Director Office: Managing Director holds the superior responsibility as the head of the institute.

2.General Manager Administration Section: General Manager has the responsibility of doing all administration related tasks.

3.Security Section: This section handle the security issues of the total area.

4.Medical Facility Section: They provide medical support to the job holders and their family members.

5.Logistic Section: Operate cases, appoint advocate and all other logistic events are Maintained Here.

6.Labor and Staff Admin (LSA) Section: Facilities of the staffs, allowance, promotion etc are monitored by the section.

7.Labor Welfare Section: Various welfare activates of the staffs such as, canteen facilities, the funeral support, celebrating festivals etc are provider by this section.

8.Transportation Section: All transport related activities of the officer, employee and staff are done here.

9.General Administration Section: This Section coordinates recruitment, transfer, promotion, increment, provident fund, pension, vacation etc including deceplanary actions with other Bangladesh Chemical Industries Corporation (BCIC) related factory.

10.State Section: The work of this branch is to residential arrangement for the workers and employees and supervise the land.

Human Resource:

Set up: Number of Jobs:

Officer:	262	229
Employee:	367	151
Worker:	236	293
Total =	865 person	673 person

2.Finance & Accounting:

There are nine section under this department. They are:-

1.Salary Section: This section handle to pay the salary of workers, employees and officers.

2.Bill Section: All the payments such as TADA, party bill, advance bill, income tax, vat collection ect and all related tasks are done by this section.

3.Sells Section: Selling the fertilizer to the dealers.

4.Audit Section: Reserving all the data, papers, documents and answering to the auditors are done by this section.

5.Store Section: To buy necessary equipment's and store them for get into the lasers.

6.Cost & Budget Section: To assume the production cost, salary, TADA, maintenance cost etc in advance .

7.Insurance Section: To make insurance for all the equipment of the SFCL and demand compensation in case of accidents.

8.Finance Section: Monthly and yearly budget, running budget, inter project, update laser are maintain this section.

9.Cash & Bank Section: Cash exchange and banking are handle in this section.

3.Trade & Commercial:

There are five section under this department. They are:-

1.Local Purchase Section: To purchase equipment's for the factory which are available in local market, following the purchase policy of the government.

2.MPIC Section: Purchase planning, receive, budget from the authority and inventory control.

3.Import Section: To import necessary equipment's from abroad following the import policy of the government.

4.Stor Section: Reserving equipment's according to the code of the equipment's in the store.

5.Sells Section: to sell the production, granular urea and liquid ammonia, following government policy.

4.Technical:

There are four section under this department. They are:-

1.Laboratory Section: To verity quality of fertilizer, water, and gas oil for the factory.

2.Documentation And Data Processing Section: Reserving the books and documents of the Shahjalal Fertilizer Company Limited (SFCL).

3.Process & Project Engineering Section: Data collecting, analysis, modification and monitoring of the processes.

4.Information & Communication Technology (ICT) Section: Monitoring EGP, E-Filing etc.

5.Operation:

There are four section under this department. They are:-

1.Ammonia Section: Ammonia plant produces hydrogen and carbon dioxide reaction natural gas and steam in attendance of nickel catalyst, then nitrogen is found with reaction of air in secondary reformer. After then carbon dioxide is to remove from nitrogen, hydrogen and carbon dioxide. After then hydrogen, nitrogen are to advanced to ammonia converter reaction with in attendance iron catalyst finally we get ammonia from the converter.

2.Urea Section: Liquid ammonia supplied from ammonia plant and gases carbon dioxide produce urea in the reactor by reaction.

3.Utility Section: The main job of utility section is to supply available water for the need of the production.

4.Bagging Section: The main job of bagging section is after producing granular urea, then hand it over to commercial section for packaging and selling.

6.Maintenance and Technical Service (MTS)

There are five section under this department. They are:-

1.Solid handling Section: Mechanical and electrical part of bagging are done here.

2.Central Maintenance Workshop (CMW) Section: Welding, drilling, fixing big crane and making machineries and parts in short time.

3.Plant Maintenance Section: Fixing pipe lines, Gasket, Bearing and other mini machineries of the factory.

4.Mechinary Maintenance Section: Fixing the heavy machinery's of the SFCL Factory such as Turbine, Boiler, FDF Fan, various kinds of pump and motor are done here.

5.Civil Section: Building-Construction, water line, gas line, etc are served and take necessary action for fixing purpose.

7.Electrical Instrument Power (EIP)

There are three main section under this department. They are:-

1.Electrical Maintenance Section: Electrical Maintenance Section has two separate sector. They are:-

A. Main Sub-Station: Collects electricity from the main power plant and delivers to the sub-station.

B. Sub-Station: Supplying power to load, motor, panel-board etc from collected electricity from main sub-station.

2. Instrument Maintenance Section: Controlled valve, Motor Operating Valve (MOV), etc are used and maintenance for processor parameter controlled.

Maintenance and calibration of various transmitter for monitoring (processes parameter, temperature, pressure, flow-level) etc

The main purpose of Instrument Maintenance is to monitor central control system of the processes control and monitoring of the total plant.

3. Power Plant Section: Power Plant Section has three separate sector. They are:-

A. Boiler: Medium pressure steam is produced using boiler. This steam helps to spin the turbine blades and to start up ammonia & urea plant.

B. Turbine: The Turbine blades are span using steam from boiler.

C. Generator: Turbines helps to produce electricity using generator.

8.Health, Safety, Environment & Training:

There are four section under this department. They are:-

1.Health Section: Concerning about health care of the staffs and arrange for necessary treatments.

2.Fire & Safety Section: Fire & Safety has two separate sector. They are:-

A. Fire: Immediate action for any fire circulation.

B. Safety: Direction and guide line for safety issue to the staffs and arrange necessary equipment's.

3.Environment Section: Taking necessary steps so that, any ecological in balance can not take place by the air, water and gas used for the factory.

4.Training Section: To train the staffs and industrial team from university are handle in this section.

Overhauling Period:

The most major part was, I have witnessed overhauling of Shahjalal Fertilizer Company Limited (SFCL) during my three months internship. It was the first overhauling of Shahjalal Fertilizer Company Limited (SFCL).

So that i was lucky to see clearing many important machine and repairing parts and equipment's. Not only that, I also joined in this event and some worked with them.

Internee Period: 02th May 2019 To 01th August 2019. (Thirty days).

Overhauling period: 16th June 2019 To 20th July 2019. (Thirty five days).

Chapter:03.

3.Different Equipment's in the power plant in (SFCL):

3.1: Boiler:

1.Boiler details of SFCL:

Name: Beijing, boiler.

Type: Water Turbine Boiler.

Amount: Two (2) Boilers. There are two drums in the boiler. They are:-

A. Upper Drum. B. Lower Drum.

Capacity: Seventy Five (75) Tons/hour.

Steam pressure: Fifty (50) Kg. (Medium Pressure).

Temperature: Four Hundred (400) Degree Celsius.

Percentages of Ratio: Gas: Air = 1:13

Shape: U Shape

Made In : Beijing, China.

Parts Of Boiler: A. Furness Chamber. B. Super Heater. C. Economizer.

D. Motor Operating Valve (MOV). E. Force Draft Fan (FDF). F. Burner. G. Stake.

Description of different parts of boiler:

A. Furness Chamber: Its the reaction chamber of oxygen and mitten. Where adequate gas and air

mixed. Percentages of Ratio: Gas: Air = 1:13

B. Super Heater: To boilers use to super heaters to remove the moisture under temperature of

(350-400) Degree Celsius.

C. Economizer: Economizer exchange heat, mainly in the boiler to exchange heat of water.

D. Motor Operating Valve. (MOV): Open or close different connections of water and steam.

Some kind of valve in Shahjalal Fertilizer Company Limited (SFCL):

Gate Valve, Angle Valve, Solenoid Valve, Check Valve, Butterfly Valve, Ball Valve, etc.

E. Force Draft Fan (FDF) : Force Draft Fan (FDF) supplies enough oxygen for firing in the boiler.

F. Burner: Burner fires the boiler.

G. Stake: Stake brings out flew gas from boiler in fixed 160 Degree Celsius temperature.

Fig3.1: Boiler of SFCL.

Properties of boiler in SFCL:

Collecting water by Boiler Fed Water (BFW) from demi section, increasing feed water temperature through deaerator and heater, water is supplied to boiler using Boiler Fed Water (BFW) pump. Then with the help of Force Draft Fan (FDF), firing burner combining natural gas and air ratio of 1:13 steam is produce taking four hours from primary state.

Produced steam is used to rotate turbine, start up ammonia and urea plant and also warm up different pipe lines.

Fig3.2: Boiler of SFCL.

More information about Boilers:

Principle of Boiler:

The heater is the most significant piece of a focal warming framework. It resembles a major flame that has a persistent supply of gas joining into it from a pipe that goes out to a gas primary in the road. When you need to warm your home, you switch on the evaporator with an electric switch. A valve opens, gas enters a fixed burning chamber in the heater through loads of little streams, and an electric start framework sets them land. The gas planes play onto a warmth trade associated with a pipe conveying cold water. The warmth trade takes the warmth vitality from the gas flies and warms the water to something like 60°C (140°F)

The water pipe is really one little segment of a huge, nonstop circuit of pipe that movements directly around your home. It goes through each heated water radiator thus and after that profits to the evaporator once more. As the water moves through the radiators, it emits a portion of its warmth and warms your rooms thusly. When it returns to the heater once more, it's chilled off a lot. That is the reason the heater needs to continue terminating: to keep the water at a sufficiently high temperature to warm your home. An electric siphon inside the evaporator (or close to it) keeps the water streaming around the circuit of pipework and radiators.

Types of Boiler:

Boiler Types and Classifications. There are two general types of boilers: "fire-tube" and "water-tube". Boilers are classified as "high-pressure" or "low-pressure" and "steam boiler" or "hot water boiler." Boilers that operate higher than 15 psig are called "high-pressure" boilers.

Fire-tube Boilers

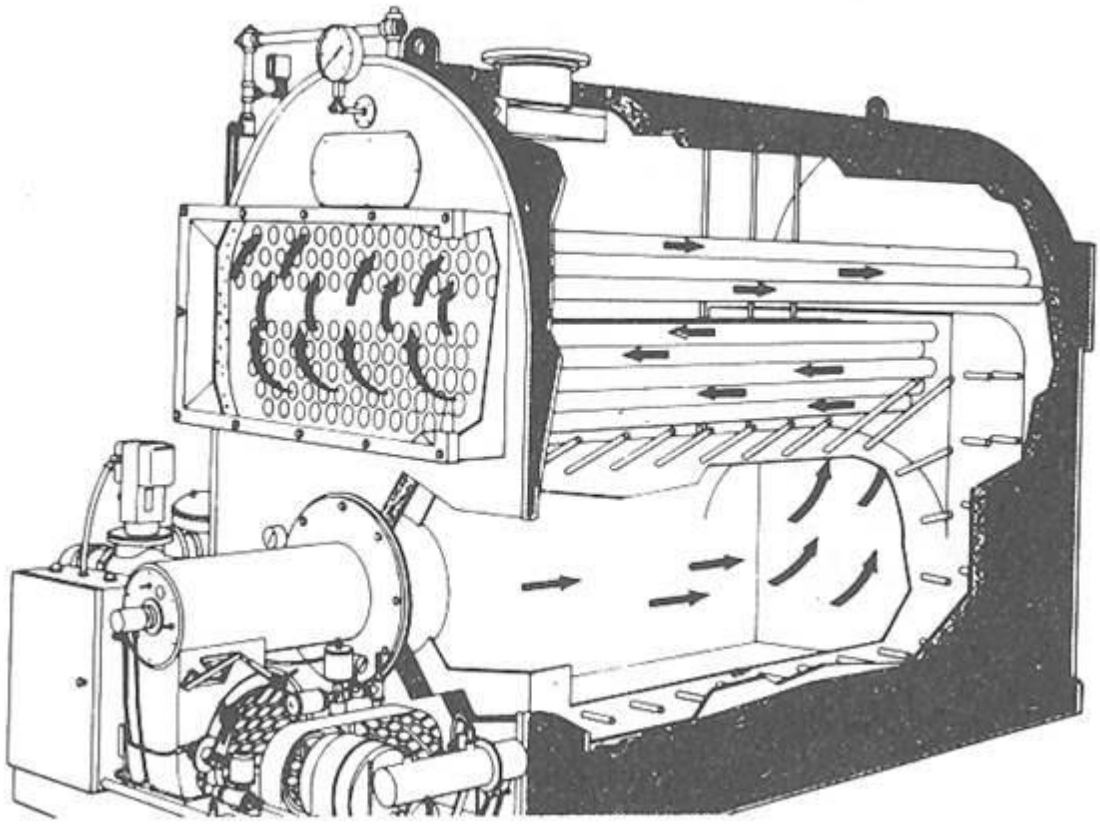
In flame tube boilers, ignition gases go through within the cylinders with water encompassing the outside of the cylinders. The upsides of a flame tube heater are its straightforward development and less inflexible water treatment necessities.

The impediments are the unreasonable weight-per-pound of steam created, over the top time required to raise steam weight in view of the moderately huge volume of water, and failure to react rapidly to load changes, once more, because of the huge water volume.

The most well-known flame tube boilers utilized in office warming applications are regularly alluded to as "scotch" or "scotch marine" boilers, as this heater type was generally utilized for marine administration in view of its minimal size (fire-box indispensable with kettle area).

The name "fire-tube" is distinct. The flame, or hot pipe gases from the burner, is diverted through cylinders ("'Figure 2"') that are encompassed by the liquid to be warmed. The body of the evaporator is the weight vessel and contains the liquid. Much of the time, this liquid is water

that will be flowed for warming purposes or changed over to steam for procedure use.



Every set of tubes that the flue gas travels through, before it makes a turn, is considered a "pass." So, a three-pass boiler will have three sets of tubes with the stack outlet located on the rear of the boiler. A four-pass boiler will have four sets and the stack outlet at the front.

Fire-tube boilers are:

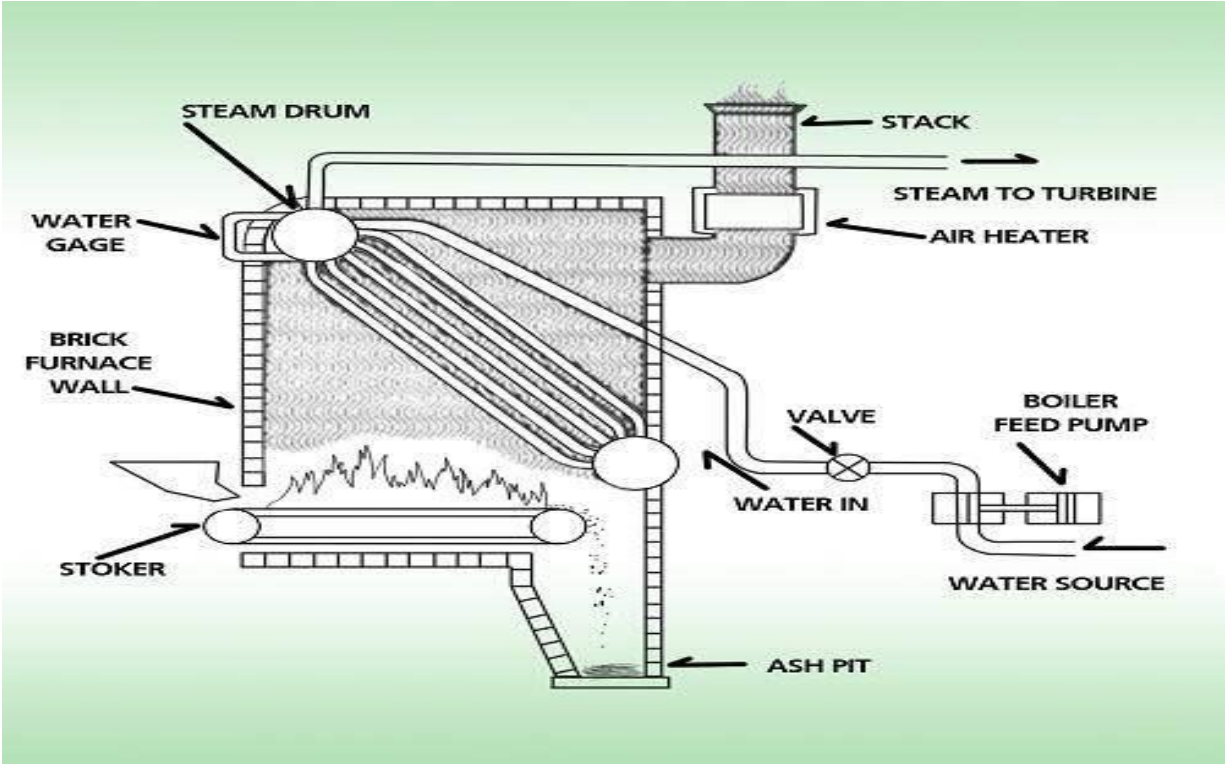
- Relatively inexpensive
- Easy to clean
- Compact in size
- Available in sizes from 600,000 btu/hr to 50,000,000 btu/hr
- Easy to replace tubes
- Well suited for space heating and industrial process applications

Disadvantages of fire-tube boilers include:

- Not suitable for high pressure applications 250 psig and above.
- Limitation for high capacity steam generation.

Water-tube Boilers

In a water-tube boiler ('"Figure 3"'), the water is inside the tubes and combustion gases pass around the outside of the tubes. The advantages of a water-tube boiler are a lower unit weight-per-pound of steam generated, less time required to raise steam pressure, a greater flexibility for responding to load changes, and a greater ability to operate at high rates of steam generation.



'"Figure: Water-tube Boiler"'

A water-tube design is the exact opposite of a fire-tube. Here, the water flows through the tubes and is encased in a furnace in which the burner fires. These tubes are connected to a steam drum and a mud drum. The water is heated and steam is produced in the upper drum.

Large steam users are better suited for the water-tube design. The industrial water-tube boiler typically produces steam or hot water primarily for industrial process applications, and is used less frequently for heating applications. The best gauge of which design to consider can be found in the duty in which the boiler is to perform.
Water-tube boilers:

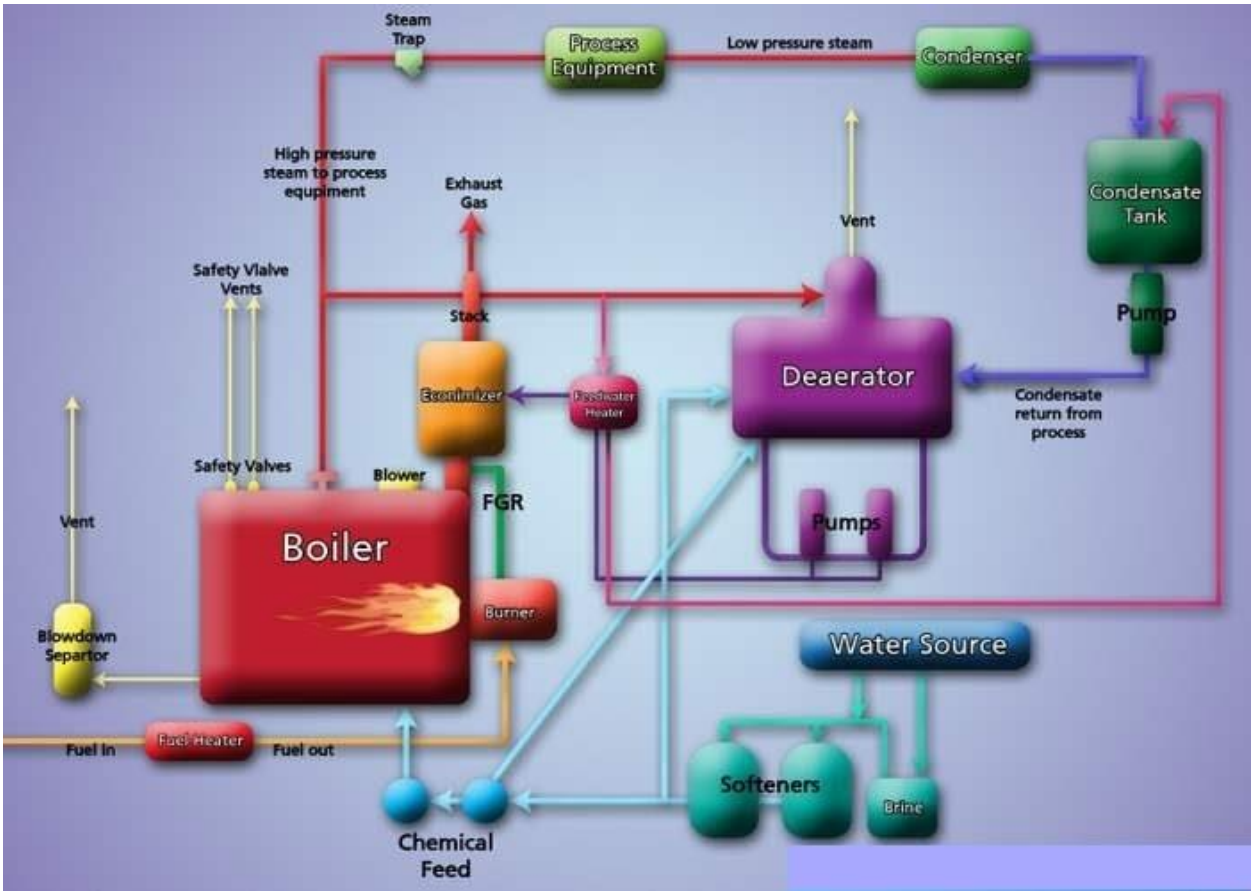
- Are available in sizes far greater than a fire-tube design , up to several million pounds-per-hour of steam
- Are able to handle higher pressures up to 5,000 psig
- Recover faster than their fire-tube cousin
- Have the ability to reach very high temperatures

Disadvantages of the water-tube design include:

- High initial capital cost
- Cleaning is more difficult due to the design
- No commonality between tubes
- Physical size may be an issue

Boiler System Major Components

Boiler systems are comprised of the major components described below and shown in



Downcomer:

A high weight water tube evaporator (likewise spelled water-cylinder and water tube) is a kind of heater where water circles in cylinders warmed remotely by the flame. ... Cool water at the base of the steam drum comes back to the feed water drum through enormous bore 'down comer tubes', where it pre-warms the feed water supply.

Difference between Water tube boiler and Gas tube boiler:

Water Tube Boiler:

- Water circulates in tubes and heated externally by hot gases. Fuel is burned inside the furnace. i.e (hot gases- outside the tubes and water- inside the tubes).
- Operating pressure = up to 100 bar
- Efficiency = up to 90%
- Steam generation rate is high.
- Operating cost is high.
- Bursting risk is high.
- Water treatment is necessary.
- Best example from our daily life is Pressure cooker.
- Famous water tube boilers are : Babcock & Wilcox boiler, Foster wheeler D-type boiler, Foster wheeler ESD type boiler etc.

Fire Tube/Smoke Tube Boiler:

- Hot gases (products of combustion) pass through tubes, running through a sealed container of water i, e (hot gases- inside the tubes and water- outside the tubes).
- Also called as smoke tube boiler.
- Operating pressure - limited to 16 bar.
- Steam generation rate is lower.
- Generally, internally fired.
- Operating cost is low.
- Bursting risk is less.
- Efficiency = up to 75%
- Famous fire tube boilers are : Cochran boiler, Lancashire boiler, Scotch boiler etc.

Difference between Water tube boiler and Gas tube boiler:

S.No	Fire tube boiler	Water tube boiler
1	In Fire-tube boilers hot flue gases pass through tubes and water surrounds them.	In Water-tube boilers water passes through tubes and hot flue gasses surround them.
2	These are operated at low pressures up to 20 bar.	The working pressure is high enough, up to 250 bar in super critical boilers.
3	The rate of steam generation and quality of steam are very low, therefore, not suitable for power generation.	The rate of steam generation and quality of steam are better and suitable for power generation.
4	Load fluctuations cannot be handled.	Load fluctuations can be easily handled.
5	It requires more floor area for a given output.	It requires less floor area for a given output
6	These are bulky and difficult to transport.	These are light in weight, hence transportation is not a problem.
7	Overall efficiency is up to 75%.	Overall efficiency with an economizer is up to 90%.
8	Water doesn't circulate in a definite direction.	Direction of water circulated is well defined.
9	The drum size is large and damage caused by bursting is large.	If any water tube is damaged, it can be easily replaced or repaired.
10	It requires more floor area for a given output.	It requires less floor area for a given output

3.2: Turbine:

2.Turbine details of SFCL:

Name: Steam Turbine.

Type: Steam turbine.

Amount: Two (2) Turbines.

Capacity (Per Turbine): 12 MW.

Frequency: 50 Hz.

Main steam pressure: 4.7 M Pa (a)

Main steam temperature: 397 Degree Celsius.

Cooling water temperature: 33 Degree Celsius.

Revolution Per Minute: 3000 r/min

Pressure of supplemental steam: 0.4 M Pa (a).

Temperature of supplemental steam: 165 Degree Celsius.

Exhaust pressure: 11.01 K Pa (a)

Made in: Nanjing Turbine and Electrical Machinery Group Company Limited in China.

Fig 3.3: Steam Turbine Of SFCL.

Properties of turbine in SFCL:

At first the blades of the turbines are rotated by the steam from the boiler, then this turbine runs the generator. In SFCL Turbine, here the rotor of turbine is connected by coupling with rotor of generator. Which produces the main electricity later. This is mainly a primary mover to generate electricity.

Fig3.4: Steam Turbine Of SFCL.

Fig3.5: The rotor of turbine is connected by coupling with rotor of generator.

More information about Turbines:

Turbine: A turbine is a machine that changes rotational vitality from a liquid that is gotten by a rotor framework into usable work or vitality. ... Green power applications incorporate breeze turbines and water turbines utilized in applications for wind power and tidal power.

Principle of the Turbine:

Turbine is the mechanical gear which changes over the weight vitality into motor energy. later on, its dynamic vitality of turbine is utilized to produce electric power through generators. Basically work done by the turbine is determined by the distinction of outlet and bay enchant of the stream medium.

Types Of Turbine:

A. Water turbine

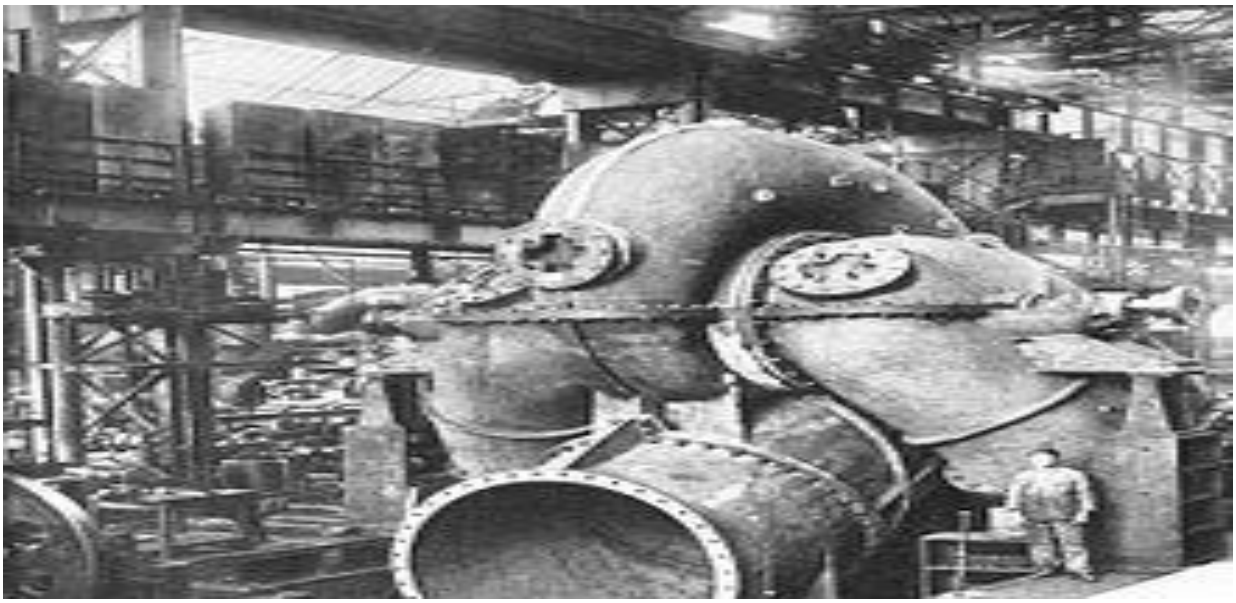
A water turbine is a rotational machine that changes over motor vitality and potential vitality of water into mechanical work. Water turbines were created in the nineteenth century and were generally utilized for mechanical power preceding electrical networks.

Presently they are for the most part utilized for electric power age. Water turbines are generally found in dams to produce electric power from water motor vitality.

Theory of operation

Streaming water is coordinated on to the edges of a turbine sprinter, making a power on the edges. Since the sprinter is turning, the power demonstrations through a separation (power acting through a separation is the meaning of work).

Along these lines, vitality is moved from the water stream to the turbine. Water turbines are isolated into two gatherings: response turbines and drive turbines. The exact state of water turbine sharp edges is an element of the supply weight of water, and the sort of impeller chose. sort of impeller chose.



Reaction turbines

Response turbines are followed up on by water, which changes weight as it travels through the turbine also, surrenders its vitality. They should be encased to contain the water weight (or suction), or they must be completely submerged in the water stream.

Newton's third law portrays the exchange of vitality for response turbines.

Most water turbines being used are response turbines and are utilized in low (<30 m or 100 ft) and medium (30–300 m or 100–1,000 ft) head applications. In response turbine weight drop happens in both fixed and moving cutting edges. It is to a great extent utilized in dam and huge power plants

Impulse turbines

Motivation turbines change the speed of a water fly. The fly pushes on the turbine's vended sharp edges which alters the course of the stream. The subsequent change in force (drive) causes a power on the turbine cutting edges. Since the turbine is turning, the power demonstrations through a separation (work)

what's more, the redirected water stream is left with decreased vitality. A motivation turbine is one in which the weight of the liquid streaming over the rotor sharp edges is steady and all the work yield is expected to the change in dynamic vitality of the liquid. Before hitting the turbine cutting edges, the water's weight (potential vitality) is changed over to active vitality by a spout and concentrated on the turbine. No weight change happens at the turbine cutting edges, also, the turbine doesn't require a lodging for task. Newton's subsequent law depicts the exchange of vitality for drive turbines. Drive turbines are regularly utilized in high (>300m/1000 ft) head applications.

B. Steam turbine

A steam turbine is a gadget that concentrates warm vitality from pressurized steam and uses it to do mechanical work on a pivoting yield shaft. Its cutting edge sign was created by Sir Charles Parsons in 1884. The steam turbine is a type of warmth motor that infers quite a bit of its improvement in thermodynamic productivity from the utilization of numerous phases in the extension of the steam, which results in a closer way to deal with the perfect reversible development process.

Since the turbine produces rotational movement, it is especially fit to be utilized to drive an electrical generator about 85% of all power age in the United States in the year 2014 was by utilization of steam turbines.

Operation and maintenance

A modern steam turbine generator installation

In view of the high weights utilized in the steam circuits and the materials utilized, steam turbines furthermore, their housings have high warm idleness. When heating up a steam turbine for use, the primary steam stop valves (after the heater) have a detour line to permit super heated steam to gradually sidestep the valve and continue to warmth up the lines in the framework alongside the steam turbine. Additionally, a turning rigging is locked in when there is no steam to gradually pivot the turbine to guarantee even warming to counteract uneven extension. After first pivoting the turbine by the turning gear, permitting

time for the rotor to accept a straight plane (no bowing), at that point the turning rigging is separated and steam is admitted to the turbine, first to the toward the back sharp edges then to the ahead edges gradually turning the turbine at 10–15 RPM (0.17–0.25 Hz) to gradually warm the turbine. The warm-up technique for huge steam turbines may surpass ten hours. During normal operation, rotor imbalance can lead to vibration, which, because of the high rotation velocities, could lead to a blade breaking away from the rotor and through the casing.

To decrease this hazard, extensive endeavors are spent to adjust the turbine. Likewise, turbines are kept running with top notch steam: either super heated (dry) steam, or immersed steam with a high dryness portion.

This forestalls the fast impingement and disintegration of the cutting edges which happens whenconsolidated water is impacted onto the edges (dampness extend). Likewise, fluid water entering the sharp edges may harm the push heading for the turbine shaft.

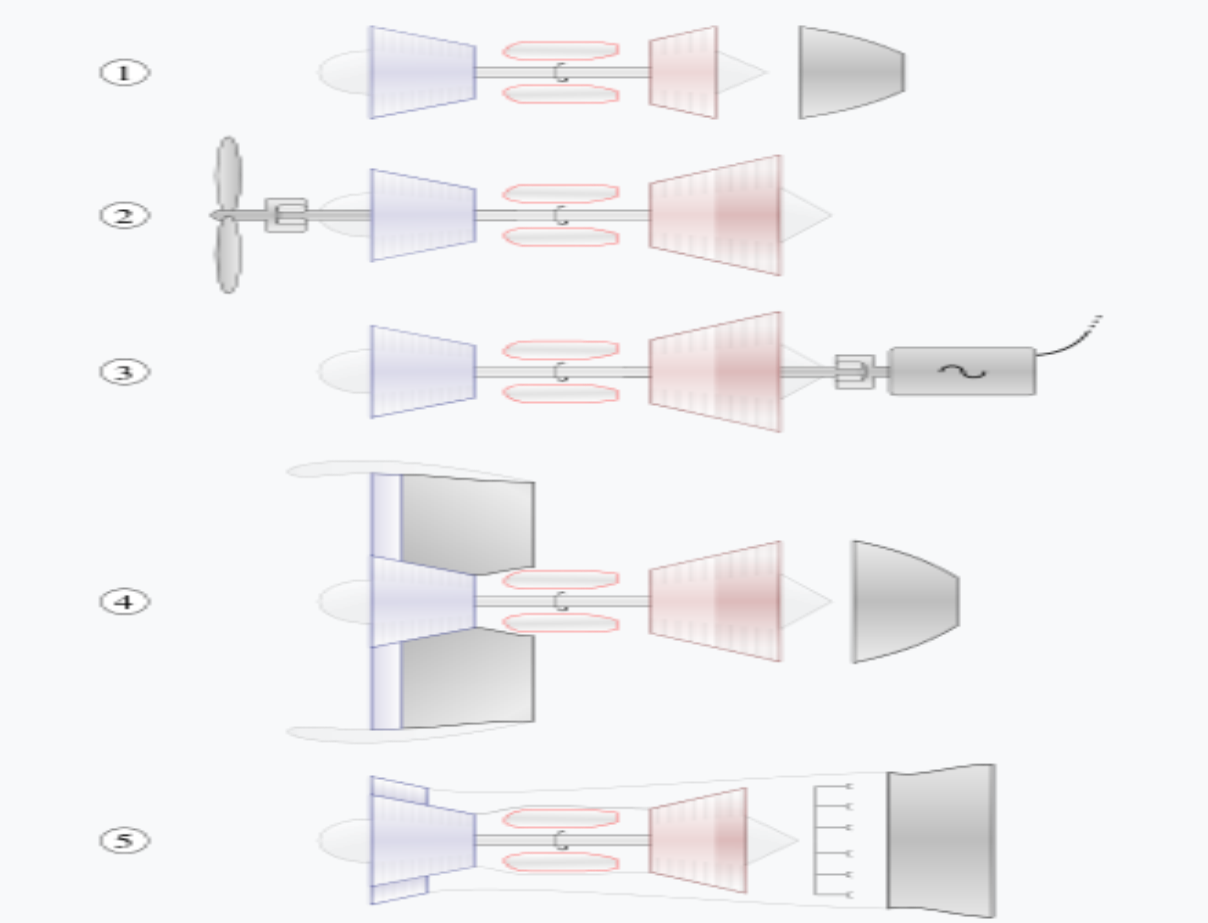
To anticipate this, alongside controls also, confounds in the boilers to guarantee great steam, condensate channels are introduced in the steam funneling prompting the turbine.

Support prerequisites of present day steam turbines are basic and bring about low expenses (ordinarily around $0.005 per kWh);[25] their operational life regularly surpasses 50 years.

C. Gas turbine

A gas turbine, also called a combustion turbine, is a type of continuous combustion, internal combustion engine. The main elements common to all gas turbine engines are:

1. An upstream rotating gas compressor;
2. A combustor;
3. A downstream turbine on the same shaft as the compressor.



4.

A fourth part is frequently used to expand effectiveness (on turboprops and turbofans), to change over control into mechanical or electric structure (on turbo shafts and electric generators), or to accomplish more noteworthy push to-weight proportion (on afterburning motors).

The fundamental task of the gas turbine is a Braydon cycle with air as the working liquid. Barometrical wind currents through the blower that carries it to higher weight. Vitality is at that point included by showering fuel into the air and touching off it so the ignition creates a high-temperature flow. This high-temperature high-pressure gas enters a turbine, where it expands down to the exhaust pressure, producing a shaft work output in the process.

The turbine shaft work is used to drive the compressor; the energy that is not used for compressing the working fluid comes out in the exhaust gases that can be used to do external work, such as directly producing thrust in a turbojet engine, or rotating a second, independent

turbine (known as a power turbine) which can be connected to a fan, propeller, or electrical generator.

The reason for the gas turbine decides the structure so the most alluring split of vitality between the push and the pole work is accomplished. The fourth step of the Braydon cycle (cooling of the working liquid) is overlooked, as gas turbines are open frameworks that don't utilize a similar air once more. Gas turbines are utilized to control flying machine, trains, ships, electrical generators, siphons, gas blowers, and tanks.

D. Wind turbine

This article is about wind-powered electrical generators. For wind-powered machinery used to grind grain or pump water, see Windmill and Wind pump.

Thornton bank Wind Farm, using 5 MW turbines Repower 5M in the North Sea off the coast of Belgium. A wind turbine, or alternatively referred to as a wind energy converter, is a device that converts the wind's kinetic energy into electrical energy.

Wind turbines are fabricated in a wide scope of vertical and level pivot. The littlest turbines are utilized for applications, for example, battery charging for helper control for pontoons or on the other hand trains or to power traffic cautioning signs. Bigger turbines can be utilized for making commitments to a household power supply while selling unused power back to the utility provider through the electrical framework. Varieties of enormous turbines, known as wind ranches, are turning into an inexorably significant wellspring of discontinuous sustainable power source and are utilized by numerous nations as a component of a system to decrease their dependence on petroleum products. One appraisal guaranteed that, starting at 2009, wind had the "most minimal relative ozone harming substance discharges, the least water utilization requests and... the most ideal social effects" contrasted with photovoltaic, hydro, geothermal, coal and gas.

3.3: Generator:

3.Generator details of SFCL:

Name: Steam Turbine Generator.

Amount: Two (2).

Rated Capacity: 15 MVA

Rated Power: 12MW

Rated Voltage: 6.3 KV

Rated Current: 1375A

Power Factor: 0.8

Revolution Per Minute: 3000 r/min

Rated Frequency: 50 Hz

Phase: Three (3)

Poles: Two (2)

Rotor Current: 242A

Rotor Voltage: 185.5

Efficiency: 97%

Insulation Class: F/B

Connection: Y

Weight: 37.3 Ton

Fig3.6: Generator of SFCL.

AC Brushless Exciter:

Rated Capacity: 70 KW

Rated Voltage: 235 V

Rated Current: 297 A

Rated Frequency: 150 Hz

Revolution Per Minute: 3000 r/min

Power Factor: 0.90

Connection: Star-Shape.

Weight: 1193 Kg.

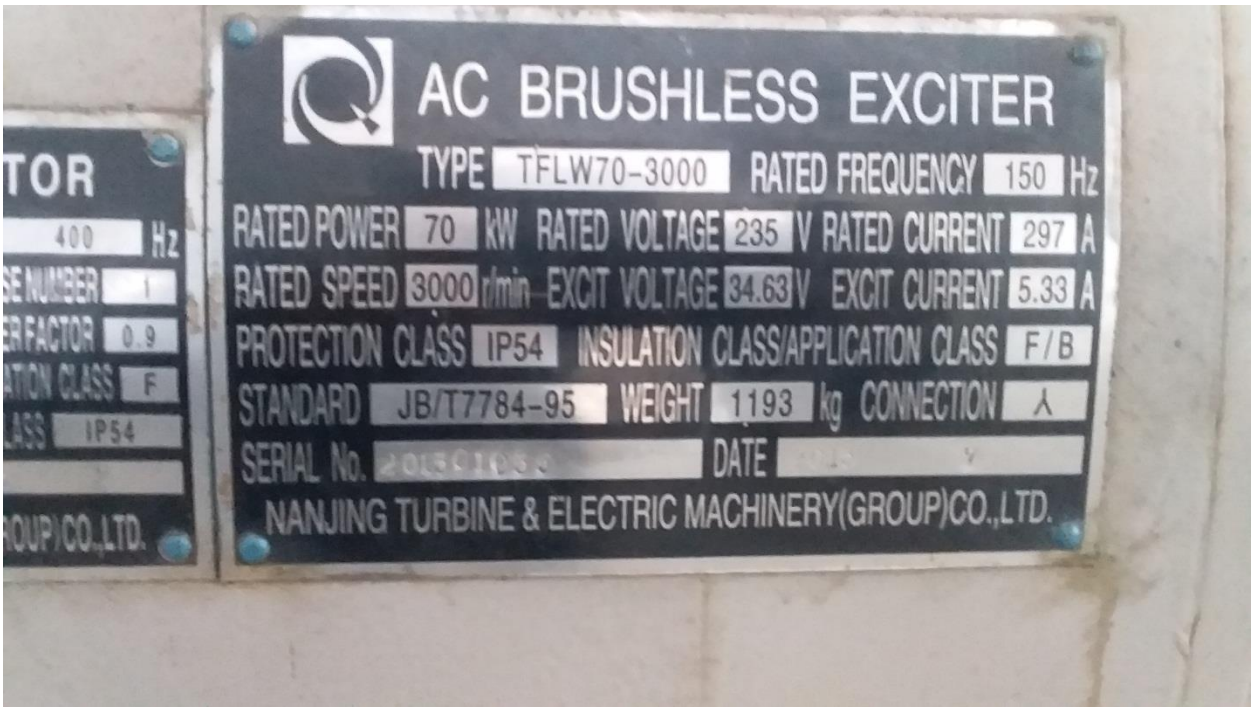


Fig3.7: AC Brushless Exciter of SFCL.

Details of PM Generator:

Capability: 2.85 KVA

Rated Voltage: 190 V

Rated Speed: 3000 r/min

Rated Frequency: 400 Hz

Phase No: 01

Power Factor: 0.9

Insulation Class: F

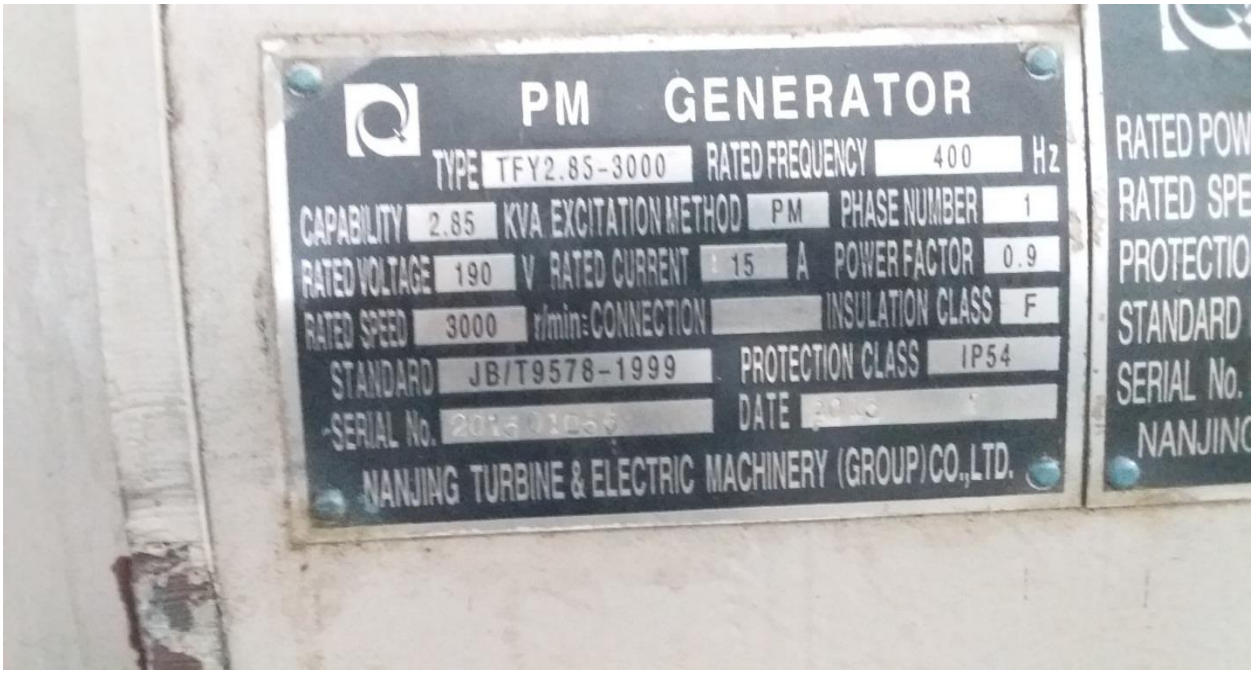


Fig 3.8 Details of PM Generator in SFCL.

Properties of Generator in SFCL:

At first Direct Current (DC) is supplied to Permanent Magnet generator. Then a Magnetic field is created around main Steam Turbine Generator by Permanent Magnet generator.

Fig3.9: Permanent Magnet (PM) Generator.

As Because Steam Turbine Generator is too huge in size and such huge magnet is not available, So that, small tiny magnets and PM generator are used to run the Steam Turbine Generator of SFCL. From primary state after four hours later three phase electricity is produced from this Steam Turbine Generator.

Fig3.10: Generator of SFCL.

More information about Generators:

Principle of the Generator:

A generator generally implies a machine that makes electrical vitality. It has generator head with wires, turning inside an attractive field. The subsequent electromagnetic enlistment makes power move through the wires. Half and half electric vehicles convey a generator amazing enough to cause them to go.

Principle of generator

Both of these generators produce electrical power dependent on the guideline of Faraday's law of electromagnetic acceptance. This law expresses that when a conductor moves in an attractive field it cuts attractive lines of power, which prompts an electromagnetic power (EMF) in the conductor.

Generator is a machine that changes over mechanical vitality into electrical vitality. It works dependent on guideline of faraday law of electromagnetic enlistment. ... So the significant components of a generator are: Magnetic field. Movement of conductor in attractive field.

Types Of Generator:

It works dependent on rule of the electromagnetic acceptance. These are of two sorts one is acceptance generator and other one is synchronous generator. Synchronous generators A=π huge size fundamentally utilized in power plants. These might pivot field type or turning armature type.

Generator is a machine that changes over mechanical vitality into electrical vitality. It works dependent on guideline of faraday law of electromagnetic enlistment. The faradays law expresses that at whatever point a conductor is set in a fluctuating attractive field, EMF is instigated and this actuated EMF is equivalent to the rate of progress of transition linkages. This EMF can be created when there is either relative space or relative time variety between the conductor and attractive field. So the significant components of a generator are:

- Magnetic field
- Motion of conductor in magnetic field

Working of Generators:

Generators are essentially curls of electric channels, typically copper wire, that are firmly wound onto a metal center and are mounted to pivot inside a show of enormous magnets. An electric channel travels through an attractive field, the attraction will interface with the electrons in the transmitter to prompt a progression of electrical flow inside it.

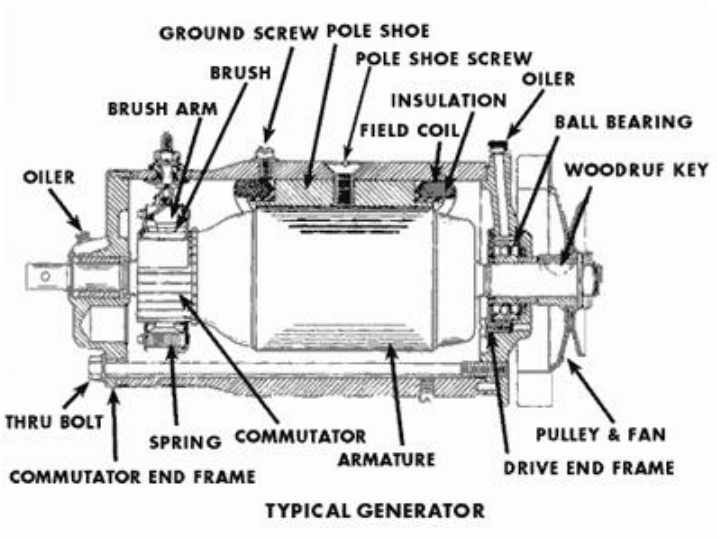


Image Source – top alternative sources

The conveyor curl and its center are known as the armature, interfacing the armature to the pole of a mechanical power source, for instance an engine, the copper conduit can turn at outstandingly expanded speed over the attractive field.

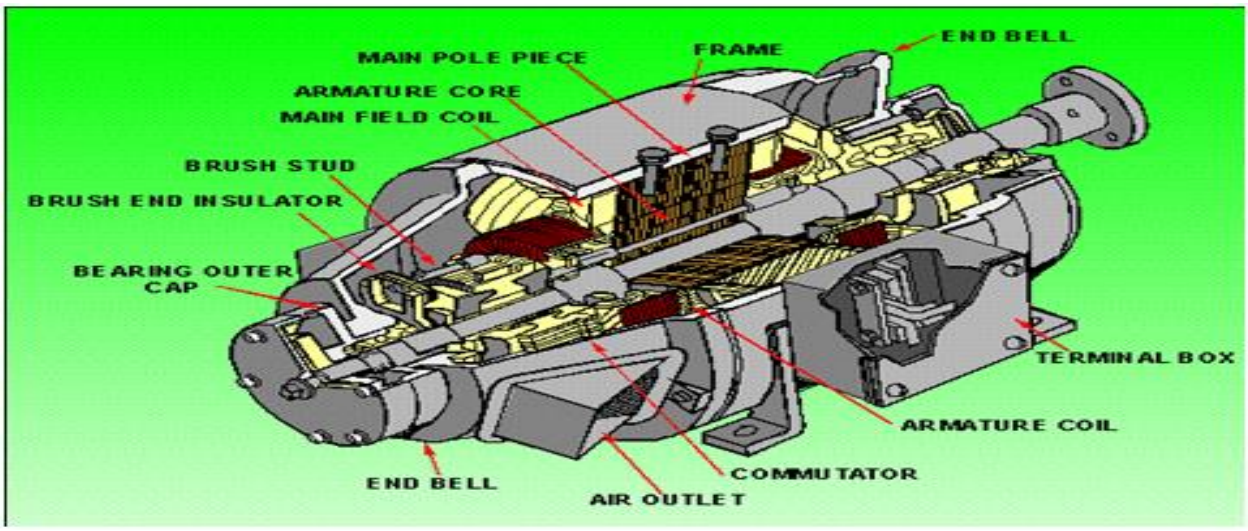


Image Source – tpub

The moment that the generator armature first begins to turn, at that point there is a feeble attractive field in the iron shaft shoes. As the armature turns, it begins to raise voltage. A portion of this voltage is making on the field windings through the generator controller.
This dazzled voltage develops more grounded winding current, raises the quality of the attractive field. The extended field creates more voltage in the armature. This, thus, make increasingly current in the field windings, with a resultant higher armature voltage. As of now the indications of the shoes relied upon the course of stream of current in the field winding. The contrary signs will offer current to stream in misguided course.

Types of Generators:

The generators are classified into types.

- AC generators
- DC generators

AC Generators:

These are likewise called as alternators. It is the most significant methods for creating electrical power in a large number of the spots since now days every one of the customers are utilizing AC. It works dependent on standard of the electromagnetic enlistment. These are of two kinds one is enlistment generator and other one is synchronous generator.

The enlistment generator requires no different DC excitation, controller controls, recurrence control or representative. This idea happens when conductor curls turn in an attractive field activating a current and a voltage. The generators should keep running at a reliable speed to pass on a steady AC voltage, even no heap is available.

Synchronous generators are enormous size generators chiefly utilized in power plants. These might pivot field type or turning armature type. In pivoting armature type, armature is at rotor and field is at stator. Rotor armature current is taken through slip rings and brushes. These are restricted because of high wind misfortunes. These are utilized for low power yield applications. Turning field kind of alternator is generally utilized due to high power age ability and nonappearance of slip rings and brushes.

It very well may be either 3 stage or two stage generators. A two-stage alternator produces two totally separate voltages. Every voltage might be considered as a solitary stage voltage. Each is produced voltage totally autonomous of the other. The three-stage alternator has three single-stage windings divided with the end goal that the voltage initiated in any one stage is uprooted by 120º from the other two. These can be associated either delta or wye associations. In Delta Connection each curl end is associated together to shape a shut circle. A Delta Connection seems like the Greek Letter Delta (Δ). In Wye Connection one finish of each loop associated together and the opposite finish of each curl left open for outside associations. A Wye Connection shows up as the letter Y.

These generators are bundled with a motor or turbine to be utilized as an engine generator set and utilized in applications like maritime, oil and gas extraction, mining apparatus, wind power plants and so forth.

Advantages of AC Generator:

- These Generators are generally maintenance free, because of absence of brushes.
- Easily step up and step down through transformers.
- Transmission link size might be thinner because of step up feature
- Size of the generator relatively smaller than DC machine
- Losses are relatively less than DC machine
- These Generator breakers are relatively smaller than DC breakers

DC Generators:

DC generator is typically found in off-grid applications. These generators give a seamless power supply directly into electric storage devices and DC power grids without novel equipment. The stored power is carries to loads through dc-ac converters. The DC generators could be controlled back to an unmoving speed as batteries tend to be stimulating to recover considerably more fuel.

Classification of DC Generators:

D.C Generators are classified according to the way their magnetic field is developed in the stator of the machine.

- permanent-magnet DC generators
- Separately-excite DC generators and
- Self-excited DC generators.

Lasting magnet DC generators don't require outer field excitation since it has perpetual magnets to create the transition. These are utilized for low power applications like dynamos. Independently energize DC generators requires outside field excitation to deliver the attractive motion. We can likewise differ the excitation to get variable yield control. These are utilized in electro plating and electro refining applications. Because of leftover attraction present in the posts of the stator self-energized DC generators can ready to deliver their very own attractive field ones it is begun. These are straightforward in structure and no need the outer circuit to differ the field excitation. Again these self-energized DC generators are ordered into shunt, arrangement, and compound generators.

These are used in applications like battery charging, welding, ordinary lightening applications etc.

Advantages of DC Generator:

- Mainly DC machines have the wide variety of operating characteristics which can be obtained by selection of the method of excitation of the field windings.
- The output voltage can be smoothed by regularly arranging the coils around the armature .This leads to less fluctuations which is desirable for some steady state applications.
- No shielding need for radiation so cable cost will be less as compared to AC.

Now you have clearly understand about the working and types of generators if any furthermore queries on this topic or on the electrical and electronic projects leave the comments below.

Types of Industrial Generators:

- Power Requirements. Generators are available that provide one phase or three phase power, 120 volts or 480 volts. ...
- Diesel Generators. ...
- Natural Gas Generators. ...
- Petroleum. ...
- Portable Industrial Generators. ...
- Marine Generators. ...
- Heavy Fuel Oil Generators. ...
- Generator Sizing.

Six Common Types of Generators

1. Gasoline

   Of the considerable number of choices on the rundown, gas generators are among the most widely recognized, basically in light of the fact that gas is promptly accessible and these generators are on the low-finish of the cost scale. Notwithstanding, gas is typically inaccessible during force blackouts, since it expects power to siphon. Gas generators are accessible in little sizes, perfect for versatile models, however the fuel is exceptionally combustible.

   Fuel keeps going short of what one year when put away, and gas costs are similarly higher than diesel, propane, and flammable gas. Fuel generators produce generally high discharges, don't ordinarily keep going as long as some different models, and don't will in general begin well in colder temperatures.

2. Diesel Fuel

   Diesel is the least combustible of all the fuel sources, and is nearly as promptly accessible as gas. These motors have long life expectancies, and perform all the more effectively while enduring longer under overwhelming, thorough use, insofar as they are appropriately kept up. Diesel generators are moderate to work, however these units normally cost more than gas generators. A few states, areas, and districts permit ranch activities to buy diesel at a decreased duty rate, or without assessment exacts by any stretch of the imagination. Also, diesel generators begin moderately effectively in cool conditions.

   In any case, diesel fuel is just great as long as two years away, and putting away huge amounts can be costly. Like gas, it's regularly difficult to siphon diesel during force blackouts. Since diesel motor emanations are very high, a few zones limit the quantity of hours these motors can be worked every day because of ecological concerns.

   Dampness in the fuel ruins it (except if it is emulsified diesel, talked about beneath), so it isn't appropriate to wet conditions, for example, those close lakes and waterways or outside in the components. Diesel generators require customary upkeep by a certified technician, and are heavier motors, along these lines less convenient.

3. Bio Diesel

   Bio diesel fuel is produced using a blend of diesel and another organic source, for example, vegetable oil or creature fat. The advantages and disadvantages of bio diesel are

like those of normal diesel fuel, just with increasingly natural advantages. Bio diesel utilizes less of the non-sustainable power wellspring of non-renewable energy sources, and ignites with lower outflows and less waste. This makes it an earth amicable alternative contrasted with standard diesel. All diesel powers are less combustible than different fluids and gasses on this rundown, however these motors are likewise boisterous.

Like diesel, bio diesel keeps going two years or less away, and is some of the time inaccessible during a power blackout since it can't be siphoned. It is likewise harder to discover in certain areas. Since the blend of diesel to oil must be kept at a proportion of 80:20, it is viewed as increasingly hard to work with.

4. Emulsified Diesel

Emulsified diesel is a blend of diesel fuel and water mixed with a blending operator. It shares the upsides and downsides of diesel and biodiesel powers. As with bio diesel, emulsified diesel produces less discharges than conventional diesel and expends less non-renewable energy sources. It also has a time span of usability of two years or less, and keeping up the correct proportion of water to diesel is testing, particularly in boisterous workplaces.

5. Propane Gas (Vapor And Liquid)

Propane flaunts a more extended time span of usability than gas or diesel powers, and consumes far more clean. It is effectively put away in any amount, and is promptly accessible notwithstanding during force blackouts.

Propane creates generally low outflows, and isn't liable to "wet stacking" regular in diesel generators. Propane generators are commonly reasonable, and keep going quite a while. Propane additionally begins effectively in cool temperatures, and offers calm activity.

On the con side, propane is held under strain, and is exceptionally combustible, even unstable. The fuel frameworks are progressively mind boggling, hence subject to disappointments that are increasingly visit. Establishment expenses are higher, in light of the fact that a certified expert must introduce the gas lines.

Propane generators are increasingly costly to purchase and work, consuming around multiple times the measure of fuel as equivalent diesel motors. Furthermore, propane units commonly don't have long futures contrasted with some other generator types.

6. Natural Gas

Gaseous petrol is promptly accessible in pretty much every area, and the new shale stores opened up by fracking systems mean a for all intents and purposes boundless supply. Since gaseous petrol lines are rushed to the site of activity, these generators never come up short on fuel or should be refilled. This likewise implies the generators are not compact.

Petroleum gas generators consume neatly with next to no waste, and the gas is promptly accessible even without a power supply. These units are likewise reasonable in contrast with different decisions. Petroleum gas additionally begins well in virus conditions, and runs moderately discreetly.

The burdens of gaseous petrol generators incorporate higher establishment costs, because of running the gas lines. These generators don't ordinarily keep going as long as diesel generators, and if the gas lines are broken this could prompt a risky break. Like propane, there is no issue with "wet stacking" when working a flammable gas generator.

7. Surprise! Hydrogen

Since the 1800s, individuals have taken a shot at building up a generator that could create control from hydrogen. Hydrogen is enormously inexhaustible (especially from water sources), is non-lethal, spotless, shoddy, and delivers more vitality per pound than some other fuel source.

During the 1940s, tests started to make a hydrogen fueled vehicle, and endeavors proceed with today. Despite the fact that not as promptly accessible as some different sorts of generators, hydrogen generators are convenient and helpful for some, conditions, including labs. At the point when furnished with legitimate wellbeing highlights, hydrogen generators are likewise protected and convenient.

The essential thought when picking a generator is the kind of condition where the hardware is squeezed into administration. Offset budgetary necessities with wellbeing factors, the requirement for convey ability, the temperature of working conditions, and that it is so natural to refuel when supplies are low.

3.4: Deaerator:

More information about Deaeratorss:

A deaerator is a gadget that evacuates oxygen and other broke down gases from water, for example, feed water for steam-producing boilers. Broken up oxygen in feed water will cause genuine erosion harm in a kettle by connecting to the dividers of metal funneling and other gear and shaping oxides (rust). Broken up carbon dioxide consolidates with water to frame carbonic corrosive that brings on additional erosion. Most deaerators are intended to expel oxygen down to levels of 7 ppb by weight (0.005 cm^3/L) or less, just as basically taking out carbon dioxide.

Deaerator Working Principle:

Deaeration depends on the rule that the solvency of a gas in water diminishes as the water temperature increments and methodologies immersion temperature. In the deaerator, water is warmed up to near immersion temperature with a base weight drop and least vent. Deaeration is finished by splashing the feed water to give a huge surface zone, and may include stream over various layers of plate. This cleaning (or stripping) steam is sustained to the base of the deaeration area of the deaerator. At the point when steam contacts the feed water, it warms it up to immersion temperature and broke up gases are discharged from the feed water and vented from the deaerator through the vent. The treated water tumbles to the capacity tank underneath the deaerator.

Deaerator plant

Types of Deaerators:

There are many different horizontal and vertical deaerators available from a number of manufacturers, and the actual construction details will vary from one manufacturer to another. Figures 1 and 2 are representative schematic diagrams that depict each of the two major types of deaerators.

There are two basic types of deaerators, the spray & tray-type and the spray-type:

- The *spray & tray-type* (also called the *cascade-type*) includes a vertical or horizontal domed deaeration section mounted on top of a horizontal cylindrical vessel which serves as the deaerated boiler feed water storage tank.
- The *spray-type* consists only of a horizontal (or vertical) cylindrical vessel which serves as both the deaeration section and the storage tank for boiler feed water.

Spray & Tray-type Deaerator

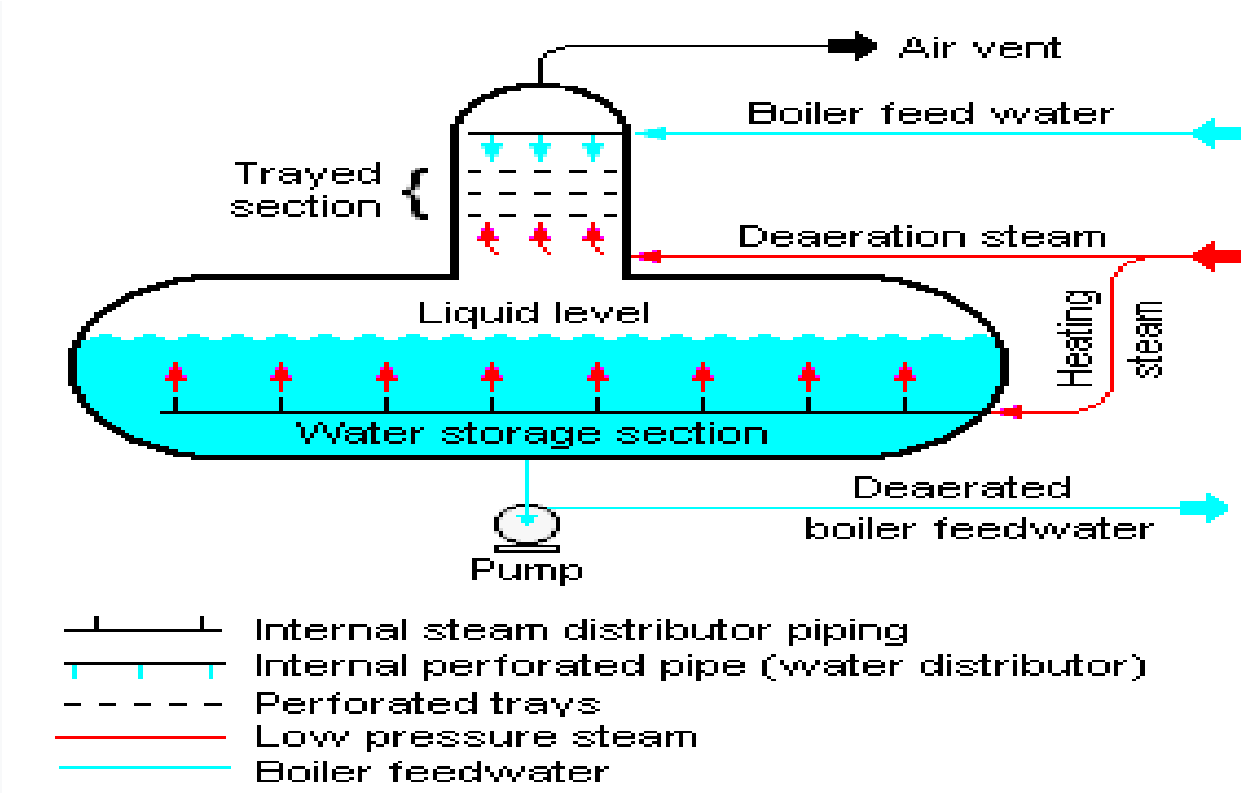


Figure 1: A schematic diagram of a typical tray-type deaerator.

The typical spray & tray-type deaerator in Figure 1 has a vertical domed desecration section mounted above a horizontal boiler feed water storage vessel. Boiler feed water enters the vertical desecration section through spray valves above the perforated trays and then flows downward through the perforations. Low-pressure desecration steam enters below the perforated trays and flows upward through the perforations. Combined action of spray valves & trays guarantees very high performance (as confirmed by HEI stud) because of longer contact time between steam and water. Some designs use various types of packed bed, rather than perforated trays, to provide good contact and mixing between the steam and the boiler feed water.

The steam strips the dissolved gas from the boiler feed water and exits via the vent valve at the top of the domed section. Should this vent valve not be opened sufficiently the deaerator will not work properly, causing high oxygen content in the feed water going to the boilers. Should the boiler not have an oxygen-content analyzer, a high level in the boiler chlorides may indicate the vent valve not being far enough open. Some designs may include a vent condenser to trap and recover any water entrained in the vented gas. The vent line usually includes a valve and just enough steam is allowed to escape with the vented gases to provide a small visible telltale plume of steam.

The deaerated water flows down into the horizontal storage vessel from where it is pumped to the steam generating boiler system. Low-pressure heating steam, which enters the horizontal vessel through a sparer pipe in the bottom of the vessel, is provided to keep the stored boiler feed water warm. External insulation of the vessel is typically provided to minimize heat loss.

Spray-type deaerator

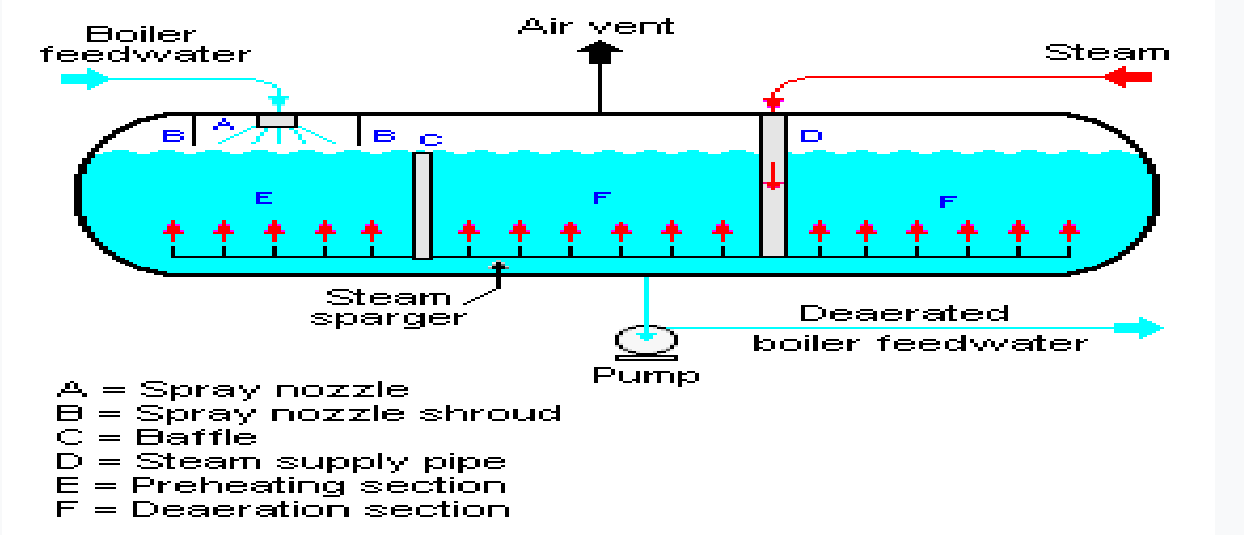


Figure 2: A schematic diagram of a typical spray-type deaerator.

As shown in Figure 2, the typical spray-type deaerator is a horizontal vessel which has a preheating section (E) and a deaeration section (F). The two sections are separated by a baffle (C). Low-pressure steam enters the vessel through a sparer in the bottom of the vessel.

The boiler feed water is sprayed into section (E) where it is preheated by the rising steam from the sparer. The purpose of the feed water spray nozzle (A) and the preheat section is to heat the boiler feed water to its saturation temperature to facilitate stripping out the dissolved gases in the following deaeration section.

The preheated feed water then flows into the deaeration section (F), where it is deaerated by the steam rising from the sparer system. The gases stripped out of the water exit via the vent at the top of the vessel. Again, some designs may include a vent condenser to trap and recover any water entrained in the vented gas. Also again, the vent line usually includes a valve and just enough steam is allowed to escape with the vented gases to provide a small and visible telltale plume of steam.

The deaerated boiler feed water is pumped from the bottom of the vessel to the steam generating boiler system.

Deaeration steam

The deaerators in the steam generating systems of most thermal power plants use low pressure steam obtained from an extraction point in their steam turbine system. However, the steam generators in many large industrial facilities such as petroleum refineries may use whatever low-pressure steam is available.

Oxygen scavengers

Oxygen rummaging synthetic substances are frequently added to the deaerated kettle feed water to evacuate any last hints of oxygen that were not expelled by the deaerator. The kind of substance included relies upon whether the area utilizes an unpredictable or non-unstable water treatment program. Most lower weight frameworks (<650psi) utilize a non-unpredictable program. Most higher weight frameworks (>650psi) and all frameworks where certain very alloyed materials are available, are currently utilizing unstable projects as the old phosphate-based projects are eliminated. Unstable projects are further separated into oxidizing or diminishing projects [(AVT(O) or AVT(R)] depending regardless of whether the waterside condition requires an oxidizing or decreasing condition to lessen the frequency of stream quickened consumption (FAC) which is a very discussed subject inside the industry today. FAC-related disappointments have caused various mishaps in which critical misfortune of property and life has happened. The most regularly utilized oxygen scrounger for lower weight frameworks is sodium sulfite (Na2SO3).It is exceptionally compelling and quickly responds with hints of oxygen to frame sodium sulfate (Na2SO4) which is non-scaling. Another generally utilized oxygen forager is hydrazine (N2H4), utilized for areas utilizing unstable projects.

Chapter:04.

4.Conclusion:

Bangladesh is an agricultural country, has got a high demand of fertilizer especially urea to get good product of crops. The agriculture, now a days is not an occupation only, it is emerging a highly demanding and rapidly growing industry. Around (70-75)% people are directly or indirectly related to this industry. That is why everyone eyes to get bumper production of crops which is possible by the supply of healthy seeds and good quality fertilizer on time.

Again since our country is highly populated country, the lack of cultivating land has led to grow three or four types of crops at different period in the same land. The land requries to be fed with fertilizer necessary to supply nutrients. Thus the fertilizer plays a vital role in national economy and it should be supplied to the farmers on time. To do so a no. Of fertilizer industries are producing urea and the deficient to the local demands is covered by importing fertilizer from various countries.

Shahjalal Fertilizer Company Limited (SFCL) is the latest fertilizer industry with most production and less cost and environmental effect. It has open as project between BVIV and China National Company Plant Import & Export Corporation (COMPLANT) in January 12, 2012. The Project will implement in June 2016. Now is has manage to produce urea 1760 MT/day successfully.

From this training i have got many experiences about an industry. Before this training i had only theoretical knowledge about Electrical Concepts. I have gained practical experiences through this training. This practical knowledge will help me to work an industry skillfully. When i was taking my training i observed some problems in there. The production rate is not constantly 100% in every day. For the project reason the COMPLANT is not handover this industry to BCIC completely. So all the equipment is not handling well. Like other industry they also have some problem with in environmental pollution, but is has minimized the rate of pollution aspects of other industry.

SFCL has the latest waste water management system in the country. So it also minimized the water pollution when its discharge the water in to Kushiyara river. But this also polluted the river water. Sound pollution is another major problems in this industry.

SFCL is a powerful power plant company, here are two powerful steam turbine generators. Where each generators capacity is twelve MW. Factory and area electricity does not require our outside assistance.

This industry should take some steps to reduce this pollution. Some reactor vessel and equipment should be changed to reduced pollution and increase production. Using of silencer would reduce the sound pollution. If these steps are implement properly the production if this industry will increase and pollution will decrease. Then this project will be a blessing for our country and play a great role as an industry in the national economy.

I hope this industry will play a key role to fulfill the requirement of fertilizer for the people of Bangladesh.

Finally:

I have learned all the basic ideas about this subjects in this three months.

Mainly, I focused on Boiler, Turbine and Generator in this time period.

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