INTERNSHIP REPORT

Duration: 30th December,2019 – 10th January,2020

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Acknowledgement

Firstly, we would like to express our gratitude **to Mr. GR Ravi (Chief Manager-HR & Admin, SGL)** for accepting our request and for providing us opportunity to do our industrial training at Sabarmati gas limited.

We would like to thank our college and the training & placement cell for allowing us to have our industrial training at SGL.

We would specially like to thank **Mr. Nitin Jaiswal, Mr. Anupam Basu and Mr. Sunny Padaria (Deputy HR)** for guidance throughout this training with their encouraging support.

We sincerely thank our mentor for this internship period **Mr. Aalap Parekh(Deputy Manager, O&M)**, their constant guidance and generous support made this internship an excellent learning experience for us.

We would like to thank **Ms. Aarti Tank, Mr. Uday Kagathara , Mr. Rushabh Vekaria** for giving us guidance and constant support.

We would also like to fill our gratitude toward all officials & staff of Sabarmati gas limited, Gandhinagar, for their help and supportive gesture throughout this internship.

General Information About Company

Sabarmati Gas Ltd.
(A Joint Venture of GSPC and BPCL)

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OFFICE ADDRESS: -

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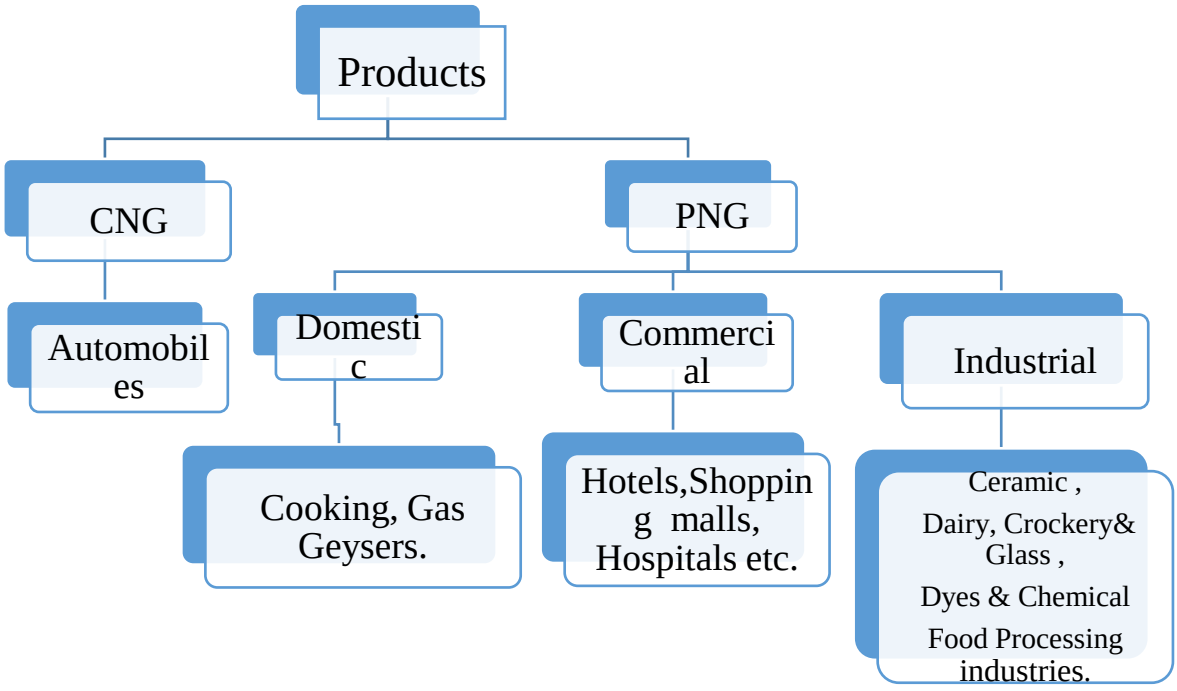
Promoted by: - Joint Venture of Gujarat state Petroleum Corporation(GSPC) & Bharat Petroleum Corporation Limited (BPCL)

- Sabarmati Gas Limited (SGL) was incorporated on 6th, June,2006, a joint venture company of Bharat Petroleum Corporation Limited (BPCL) and Gujarat State Petroleum Corporation (GSPC), has been conceived to retail natural gas by implementing gas distribution networks in Northern Gujarat.

- The objective of Sabarmati Gas Limited is to construct, operate and maintain natural gas distribution system to supply piped natural gas to various sectors i.e. Industrial, Domestic, Commercial and Transportation. Industrial demand comprises demand from small and medium scale industries. The Company operates in fairly large network in all the five districts of Gandhinagar, Mehsana and Himmatnagar, Patan & Aravalli of North Gujarat.

- SGL predominately serves 4 segments in its whole spectrum of retailing of Natural Gas. These four segments are Domestic, Industrial and Commercial/Non Commercial customers through PNG and automobiles through its CNG outlets.

➢ Products and Services covering :



CGD Industry in India

- **History**

  - The CGD business in India dates back to 1857 when Calcutta Gas Company and Bombay Gas Company commenced operations in Calcutta (now Kolkata) and Bombay (now Mumbai) respectively, with coal gas as the primary input. Subsequently however, the industry remained by and large dormant, until Oil and Natural Gas Corporation Limited (ONGC) and Assam Gas Company Limited entered the business in the mid- to late-1980s.

  - The commercial success of these companies in the ensuing period along with improving gas supplies has drawn a number of new entrants to the CGD business in the recent past. Even while the industry has been gathering momentum, GoI has set up a regulator, the Petroleum and Natural Gas Regulatory Board (PNGRB), which has, among other mandates in the hydrocarbon sector, the mandate of regulating the CGD business. PNGRB has recently finalized a set of guidelines for the CGD sector. List of companies from CGD sectors is as below:

State	Company Name
Gujarat	Adani Energy, Gujarat Gas, Sabarmati Gas, HPCL, Vadodara Gas, Charotar Gas, Torrent gas, IRM Energy
Delhi / NCR	Indraprastha Gas, Delhi
Maharashtra	Mahanagar Gas and Maharashtra Natural Gas
Andhra Pradesh/Telangana	Bhagyanagar Gas Ltd. and Hyderabad Godavari Gas Pvt. Ltd.
Rajasthan	Rajasthan State Gas Limited, Torrent Gas

U.P.	Green Gas, Central UP Gas, Siti Energy, GAIL Gas, Sanwaria Gas, Indraprastha Gas, Adani Gas, Indian oil-adani gas
Tripura	Tripura Natural Gas Co. Ltd (TNGCL) Agartala
Haryana	Haryana City Gas Ltd., GAIL Gas Ltd. and Adani Gas Ltd
West Bengal	GEECL
Karnataka	GAIL Gas Ltd.
Chandigarh	IOC-Adani
Daman	IOC-Adani

Departments in CGD Company in General

CGD company has a function to provide piped natural gas & compressed natural gas to the end consumers (Domestic, Industrial, Commercial & vehicles) In a particular geographical area (GA) by pipeline network laid, maintained and operated by the company.

CGD company comprises various departments with different functional area, but should work in synergy for smooth function of the Company.

- **General Departments**

I) Finance Department

The function of this department include:

- Preparing Budget and forecasting
- Planning & organizing company finance
- Management of Company cash flow
- Financial Reporting and analysis.
- Management of Investment of company
- Tax management
- Financial management of Company Resources

II) Human Resources Department

The Function of this Department includes: -

- Recruitment and selection of new employees
- Ensure compliance of company operation with laws
- Manage relations with other companies
- Maintaining good working conditions
- Management of employ relations
- Training & development of employees

III) Marketing & Sales Department: -

This department divided in to several sub-divisions.

A. CNG Marketing
B. PNG Marketing
    - Domestic PNG Marketing
    - Industrial PNG Marketing
    - Commercial PNG Marketing

Their functions are: -

- Direct and Indirect potential customer interaction
- Develop promotional program to attract new customers
- Promote the company through different media platforms.
- Development of feasibility plan for potential industry customer
- Design and organize promotional event & campaign to reach the consumers
- Design company brochure and promotional material
- create the identity of the company in the market
- Market survey of Geographical area
- Represent company in seminar, conference or meeting.

IV) Health & Safety Department

This departments plays major role in maintaining health & safety of the personals & equipment of the company & its associates.

Their functions are: -

- Develop and execute zero accident policy
- Ensure company follow best practice to improve HSE performance rather than just compliance of the company to legal, statutory rules and regulations of the government
- Develop Comprehensive and compulsory action plan to execute the policy.
- Provide and channelize resource for implementation of HSE policy.
- Development, operation & monitoring of Emergency response system(ERS), Disaster management system(DMS) and other safety
- Plan safety and awareness program for personals working for the company & contractor at site.
- Coordinate and guide other departments to follow the safety procedure & norms at site during operations.
- Conducting internal audit of the safety system at site.
- Promote HSE in work culture of company by recognition and reward to the contributors for improving HSE performance of company.
- Timely review of HSE Policy

• Technical Departments:

I) Operation & Maintenance Department

This department in the CGD Company is responsible for smooth & safe operations of the company equipment's, this department has divisions like

❖ PNG Operation & Maintenance Department:-

The main function of this departments are:-

- Ensure continuous supply of gas at required pressure to the end PNG customers
- Scheduled checking of high pressure gas pipeline to find and remove leakage or defect if any
- Timely checking & maintenance of safety device and metering skid at customer facility for their smooth & accurate operations.
- Regular maintenance of service regulator, district regulation system for smooth operations of the equipments.
- Ensure damage to pipelines or leakage is attended as soon as possible while following best safety procedures.
- Replace or repair damaged equipment or part of gas pipeline

❖ CNG Operation & Maintenance Department:-

The main function of this departments are

- Ensure safe operational practice at CNG Station
- Reduce the breakdown time of station
- Scheduled maintenance of compressor (Both Hour based and time based) for its smooth operation
- Maintain the good working condition at station
- Scheduled checking of cascade for leakage or other fault
- Ensure proper working of all Gauges in the equipment
- Ensure timely cleaning of filtering device to remove dust
- Replace or repair damaged part of the equipment like dispenser at the station
- Check availability of safety equipment's at station within their service life

II) Project & Planning Department: -

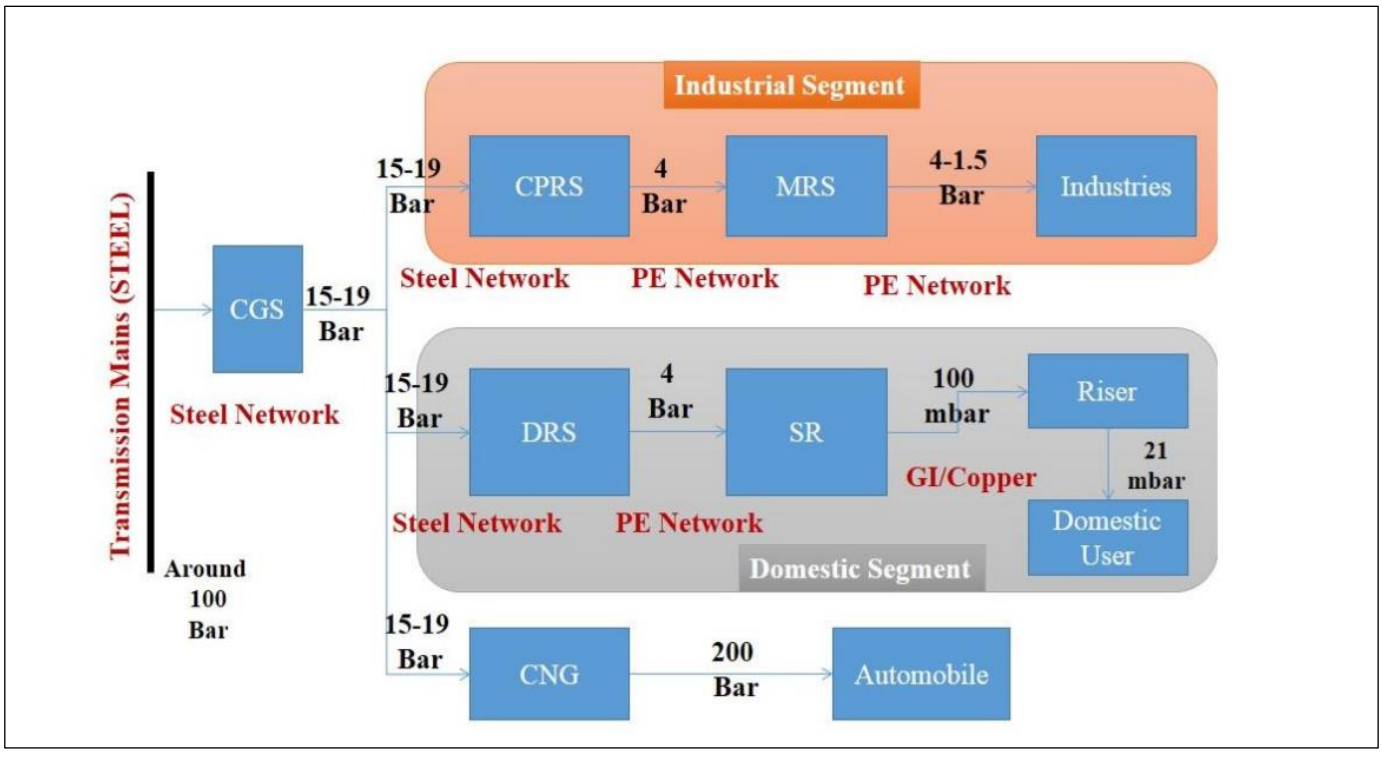
The function of this department includes: -

- ❖ Design Prefeasibility report of potential work area or Project
- ❖ Decide project capacity on basis of consumer base & expected demand
- ❖ Selection of a proper site
- ❖ Designing, Execution and commissioning of Project
- ❖ Cost Calculation
- ❖ Equipment Requirement and clearance from respective authority
- ❖ Staff Requirement

Components of CGD Network

A typical PNG network consists if following components:

I. CGS
II. DRS
III. Valve Chamber
IV. SR
V. CNG Station



(Diagram: CGD value chain**)**

- **CGS:**

CGS is the tap-off point of high pressure natural gas transmission pipeline, where pressure is reduced to 25-30 barg from 45-50 barg. The main components of City Gas Station and their functions are as follow:

• Filtration skid:

Dust particle and liquid coming along with the gas stream are separated by high efficient filters in KOD. Gas pressure is maintained same from the CGS inlet to the filtration skid. After the filtration two streams are divided two streams or pipeline. Line which is in function is known as active line while another one is called passive line or stand-by stream.

• Pressure Reduction Skid:

A pressure reduction skid is used to reduce the pressure of the gas stream from 40-45 bars to 25-30 bars. Creep relief valve and Slam Shut off valve is being installed in this skid for the safety purpose.

• Metering Skid:

Metering skid is installed for the gas flow measurement. Orifice meter is used in this metering skid; because of the large pressure drop requirement. The various parameters such as temperature in the various sections of the line pressure at the inlet & outlet joints, flow inlet & outlet are monitor by the SCADA systems in the control room.

• Odourization Unit:

An Odourization unit is installed for addition of ethyl Mercaptan in the gas stream. The dozing unit of the ethyl Mercaptan should be of 9 mg/m3. This unit consists of pneumatic panel, level indicator and a filter. This unit is directly connected to the main line after the metering skid.

District Regulating System:

- DRS are the device used to reduce the pressure from 19 bars to 4 bars. It is the interface between the steel grid network and medium pressure PE network. It is located at various demand centers for domestic /commercial users.
- Gas at high pressure enters into the filter, where borosilicate cartage is provided to remove the impurities and solid particles.
- There is pressure gauge attached to it which measures the differential pressure. If differential pressure reaches 0.5, immediate cleaning of filter is required. And if differential pressure reaches 1 barg then filter stop working.
- Above filter safety relief valve is provided to vent off inlet gas if pressure increase more than 42 kg/cm2 as maximum pressure handling capacity of steel pipe is 49 kg/cm2.
- DRS outlet pipeline can resist pressure up to 7 kg/cm2.
- Chances of trip in DRS are mainly due to back pressure induced when the flow is stopped in the downstream line.

➢ There is provision of pressure reduction valves as main function of DRS is to reduce the pressure. Following table shows the pressure reduction capacity valves for active stream and stand-by stream:

Active Stream	
VALVE	REDUCED PRESSURE (in Bar)
PRV- ACTIVE	4
PRV-MONITOR	4.5
CRV	5
SSV	5.2

Stand-by Stream	
VALVE	REDUCED PRESSURE(in Bar)
PRV- ACTIVE	3.7
PRV-MONITOR	4.5
CRV	5
SSV	5.5

- **Service Regulator**

➢ It is used to reduce the pressure from 4 bars to 110 milibar and to maintain the flow. Flow can be of 200 SCMH (Standard Cubic Meter per Hour), 150 SCMH, 100 SCMH or 50 SCMH based on the requirements.

➢ 50 SCMH capable to fulfill the demand of approx. 150 domestic connections theoretically.

Design criteria	
Inlet Pressure	1.5 to 5.0 bar-g
Outlet Pressure	110 mbar-g
UPSO	40 – 60 mbar
OPSO	145-175 mbar

Operation & Maintenance (Metering)

- **Metering**

➢ Metering is one of the important part in O&M department at SGL.
➢ Meters are installed as per different premises.
1. Domestic Premise
2. Commercial Premise
3. Industry Premise

- **Types of meters used in CGD**

1. Diaphragm Meter (use in Domestic/commercial)
2. Rotary Positive Displacement Meter (RPD) (use in Industry)
3. Turbine Meter (use in Industry)
4. EVC Meter (use in Industry)

- **Meters used in CGD**

Type	Qmax
G6	10
G10	16
G16	25
G25	40
G40	65
G65	160
G160	250
G250	400
G400	650
G650	1000
G1000	1600

- **Valves**

1. Ball Valve
2. Gate Valve
3. Pressure Regulating (PRV) Valve
4. Slam shut off Valve
5. Check (NRV) Valve

- **MRS**

- Meter Regulating station is installed for the gas flow measurement.
- Rotary meter is used for measuring volume of incoming gas.
- MRS used to Reduce the gas pressure from 4 bar to 4-1.5 bar as per industry required.

- **Components of MRS**

1. Typical photo of MRS
2. Filter, Temperature and pressure gauge
3. Rotary meter, Turbine meter and EVC(Electronic volume corrector)

- **Valves for controlling flow**

1. **Slam Shut off Valve**

   - Slam Shut-off valve is installed immediately after the filter & prior to the Regulator. It normally remains open, in case the outlet pressure of the regulator exceeds the permissible limit, the slam shut-off valve senses it through the impulse line & immediately shut off the flow to downstream.

2. **Creep relief valve**

   - Pressure relief valves are a dependable means of protecting a regulator or downstream systems, storage vessels and other systems against overpressure conditions by relieving the excess gas pressure. Designed to provide protection against excessive pressure in systems and vessels, suitable for use as creep relief and as part of stream discrimination in systems and vessels.

3. **Non-returnable valve**

   - These valves are very useful in preventing back flow of water to the pump. These valves have minimum head loss and can be very competitive in terms of long service life. Non slam and quick closing characteristics have made this product a very useful product.

➢ Calibration

(Diagram: CGD value chain**)**

(Diagram: CGD value chain**)**

GIS – Geographical Information System

- A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.
- GIS is used as tool in both problem solving and decision making processes, as well as for visualization of data in a spatial environment (Map).
- GIS has 5 key factor i.e Hardware, Software, Data, People and analysis to prepare different reports.
- SGL adopted open source based GIS system in Year 2016 by engaging STP(Science Technology Park) Pune. Open Source based GIS system opened the way for unlimited access and reduced hefty licensing fee.
- SGL has 6 Desktop users who maintain the GIS daily operation such as As-laid porting, Data QA/QC, field verification of assets. SGL has 40 Nos of Web GIS users who can access the GIS at browser or mobile phones at any time anywhere.
- GIS Maps is also facilitated to other statuary auditors/ Companies on request.
- Gas Objects/features that are being captured in GIS is shown in screenshot.
- SGL is in process to host the GIS System in house. Till now SGL GIS system was hosted in STP, Pune (Implementation Partner to SGL).
- GIS and Synergee (network planning software) integration for planning/extending current Gas Pipeline network and determining capacity utilization of different section of pipeline to achieve maximum utilization of existing Pipeline.
- Identification of isolation valve in upstream and downstream in case of planned or unplanned outages/leakages to isolate the section of pipeline to reduce gas loss.

Advantages of GIS In CGD:

- GIS helps in asset management by locating pipeline assets such as main and service lines by tracking their coordinates and calculating their relative distances
- Leak management and analysis is swifter as GIS provides faster response time in case of a leak or an accident, by sharing the information of the incident to the response team
- GIS stores consumer data and various thematic maps can be prepared to identify future potential consumers and plan the pipeline network accordingly
- Study of demand and supply of consumers through survey and mapping can help in the expansion planning of the pipeline network and prediction of the future growth can be accessed
- To produce calculations such as pressure, inlet quantity of the gas etc., as well as to generate maps and BoM showing various design parameters at all nodes and lines
- Network size critically designed to ensure supply pressure at consumer & intermediate points without over/ under sizing any element
- Flexibility to change the design to suit the site conditions
- Ability to manually adjust the automatically calculated locations
- For operations and maintenance, it is important to identify weak sections of the pipeline and to replace the segment to prevent a leak or an accident. Pipes made of steel or iron are subject to rust due to environmental factors which needs to undergo cathodic protection.
- Optimal DPRS location, service area & routing for substantial cost saving
- Plan route to ensure maximum reach with minimum length.
- Reduce the network design time.

5 component of GIS

A working GIS integrates five key components: hardware, software, data, people, and methods.

- Hardware. Hardware is the computer on which a GIS operates. ...
- Software. GIS software provides the functions and tools needed to store, analyze, and display geographic information. ...
- Data
- People
- Methods

Software of GIS :

- ArcGIS (Esri) ArcGIS 9.x. ...
- 2 Geo media (Hexagon Geospatial) Geo media has been the main rival to ArcGIS for years, even decades. ...
- 3 MapInfo Professional (Pitney Bowes) ...
- 4 Global Mapper (Blue Marble) ...
- 5 Manifold GIS (Manifold) ...
- 6 Small world (General Electric) ...
- 7 Bentley Map. ...
- 8 Map Viewer and Surfer (Golden Software)

Our projector during internship under GIS Department

- In GIS, we located the industries and commercial location were not located and connectivity was not displayed in the GIS.
- We visited each and every location along with the technician help we located the connectivity and we took the coordinates of the Valve chamber and MRS/Meter.
- And then we plotted the connection of the industry valve chamber with the header line.
- We visited Kudasan, Kadi and Chhatral sites.
- In kudasan, we visited total 8 commercial sites to know their pipeline connectivity with valve chamber and metering unit.
- Where we find out some commercial connection which were directly connected from the domestic with the help of regulator and risers.
- In kadi and chhatral, we visited total 25 commercial and industrial sites to know their connectivity and measures the coordinate of valve chamber and MRS/meter to plot it in the GIS map.

Some objectives of GIS solution

Information management: GIS enables the gas industry in managing pipe network information, device information, user information, economic information and environment information

Integrity management: Gas distribution companies constantly face several risks in the form of leakages, corrosion, excavation damages and unplanned outages. Against this backdrop, it is essential for CGD companies to tackle integrity requirement. For this, GIS technology helps utilities understand the existing network elements such as mains, service valves, regulators, and cathodic sections and meters. It proves information about the material used for piping, diameter, operating pressure and leaks in pipes and maintains history.

Leak management: GIS technology provides leak survey tools that allows a gas utility to administer leakage in the distribution system. Leaks are plotted on digital GIS maps, and leak repair schedules can be automatically generated and sent to repair crews located nearest to a leak.

Risk management: GIS identifies exposed pipes in a particular location. If CGD companies expect the demand for gas to increase in this location, they can make prior plans to replace the vulnerable pipes and reduce the risk damage.

Corrosion management: Underground gas distribution pipes are prone to corrosion due to their proximity to the earth. This requires steel pipelines to be cathodically protected. In this case, GIS technology proves companies are visual display of those pipe segments that are covered by cathodic protection and those that are not.

Conclusion

- This report gives a brief information about city gas distribution network. It cover all information about pipeline connectivity to all domestic, commercial and industrial sites including the location of valve chamber and meter/MRS and main header lines.

- Moreover, hands-on experience with the help of ours guides also gave us opportunities to hone our practical skills.

- Apart from the technical learning, the most important thing that we learnt is to work in the corporate environment and to fulfill our goals in a time based work environment where there is a fixed time schedule to complete each task given to us.