Marketing Training Report

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September 1, 2019

Contents

Chapter 1

Sanand Bottling Plant

1.1 Important Terms and Abbreviations

- OISD= Oil Industry and Safety Directorate
- PESO= Petroleum and Explosives Safety Organization
- TT= Tanker Trucks
- Cavitation = Cavitation is a phenomenon in which rapid changes of pressure in a liquid lead to the formation of small vapor-filled cavities, in places where the pressure is relatively low.When subjected to higher pressure, these cavities, called "bubbles" or "voids", collapse and can generate an intense shock wave. These shock waves can damage pumps/motors.
- CFM= Cubic Feet per Minute
- SO= State Office
- HO= Head Office
- DOA= Delegation of Authority
- BCW= Blue Collar Workers
- VCB= Vacuum Circuit Breaker
- ACB= Air Circuit Breaker
- EB= Electricity Board
- T/F= Transformer
- CT= Current Transformer
- PT= Potential Transformer
- CB= Circuit Breaker
- SFU= Switch Fuse Unit (See Fig 1.4a)
- EP= Earthing Pit
- TLV= Threshold Limit Value
- LEL= Lower Explosive Limit
- UEL= Upper Explosive Limit
- BA= Breathing Apparatus
- STEL= Short Term Exposure Level

1.2 Sanand Bottling Plant - Day 1 (13.08.2019)

1.2.1 Introduction to Sanand LPG Bottling Plant - Salient Points

Faculty: Shri. Joydev Ojha, DGM(P), Sanand BP

- Due to low land prices and government push, this particular bottling plant has much more space than what is required under the OISD guidelines.
- In addition to that, there is a 66 acre buffer area which is not required anymore according to the latest OISD guidelines so, the plant "occupier" or location in charge Shri. Joydev Ojha, DGM(P) has decided to utilize it to benefit the corporation in the following ways:-
  - A 8MW solar plant was established in the buffer area which generates about Rs.3 lacs of electricity per day, part of which is used up by the factory and part is distributed to other IOCL facilities via the grid. It is important to note that according to the some regulations in the Gujrat solar power consumption policy, IOCL at max can only generate 50% of their net electricity demand if they wish to stay on grid and share their power with other IOCL facilities using the same. This facility covers 66 acre of the buffer area.
  - A 2 acre lube storage facility (CFA). It is important to note here that lube being a high flashpoint product is an "excluded product". Therefore, storing it in buffer areas donot raise any safety concerns.
  - 4 acres are being delegated to the pipelines division to facilitate the Kandla-Gorakhpur pipeline.
- Product is sourced into the bottling plant using approximately 100 LPG TTs of 18-20 MTs from the following sources -
  - Kandla port
  - Pipawa port
  - Varoda refinery
  - Reliance refinery, Jamanagar
  - Essar refinery, Jamnagar etc.
- There are 8 TLDs which takes about 3-4 hours to completely decant all the trucks and this happens in about 4 batches a day.
- Storage of LPG is done as follows:-

  - 3 Horton Spheres 1400 MT,1200 X 2 MT
  - 1 Stationary Vessel ie. Bullet 150 X 4 MT

  Therefore, net storage capacity = $1400+12X1200+150X4=4400MT$
- Decantation is done via pressure difference using a vapour compressor in the following steps:-
  - First vapour of TT is pressurized by taking vapour from vessel. This forces liquid LPG to move from TT to vessel.
  - Then, liquid valve is closed and then vapour is sucked from the tanker using vapour suction.

  This method is preferred over simply using pumps to pump the LPG from TT to vessel because if the pump pulls vapor by mistake, that will lead to cavitation.
- There are 3 carousels - 1400 cylinders/hour X 2 and 1600 cylinders per hour.
- The 3 carousels are fed by 3 pumps - 110 , 90, 36 X 2 CFM each with a max capacity of 6000 cylinders per month therefore, the net capacity would be approximately 18000 per month, but generally only about 15000 are required to be produced as per guidance from SO.
- The following requirement from SO side is generated by a computer model which takes the following factors into account -
  - Bulk receiving cost
  - Capacity of plant
  - Demand from market
  - Transportation cost from plant to market
- There are 2 types of valves in cylinders ie. Self Closing Valve (SC) 1.1band Liquid Off Take Valves (LOT) 1.1a.
- Delivery within 24 hours to distributor.
- There are baffle plates in LPG TTs to arrest momentum of the fluid thereby causing less hindrance to the driver.

1.2.2 Roles and Responsibilities - Salient Points

Faculty: Shri. Joydev Ojha, DGM(P), Sanand BP
- Occupier has he role responsibility and has the power of attorney
- The occupier then delegates the responsibility /authority to other officers below him via DOA guidelines.
- Finally the grass root users of official authority are Grade 'A' Officers who get the work done by the BCW in company payroll and contractors.

1.2.3 LPG Plant Layout - Salient Points

Faculty: Shri. B.H. Bharti, SM(P), Sanand BP
- There are four sizes of BPs based on net production per annum-
  1. less than 6000 —- Micro
  2. between 6000 to 22000 —- Mini
  3. between 22000 to 68000 —- Major
  4. greater than 68000 —- Mega

  Based on information given above the average production per month of Sanand BP is 15000 therefore appx. production per annum 15000 X 12 = 180000 which is greater than 68000. Therefore, Sanand BP is a Mega Plant.2
- Vapour seals are used in water drains so that LPG vapour (which is heavier than air) cannot travel outside the plant licensed area where it can catch spark and ignite thereby causing grave fatalities and carry the ignition to plant and cause an even bigger calamity.
- Types of storage at any LPG facility can be as follows:-
  - Above ground storage- Bullets, Horton Spheres, Mounded Storage
  - Under ground storage
  - Cavern storage
  - Refrigerated storage tank @ $-42°C$ and atm pressure
- Minimum of 3 vessels are to be kept at a plant.
- Storage vessel should be filled upto 84-85% to keep room for LPG expansion with change of temperature, failing this, risk of explosions due to expansions are considerably increased which renders such operating procedure ineffective and useless.
- Mimimum compressor air pressure for carousel is 5.5 kg/cc and for the latest fully automatic carousel it is 6 kg/cc
- The following are the various types of LPG cylinders in the portfolio of IndianOil-Indane - (all are weight of LPG only)
  - 5 kg (domestic/commercial)
  - 14.2 kg (subsidized/non-subsidized domestic)
  - 19 kg (commercial for hotels etc./nanocut for fabrication etc.)
  - 47.5 kg (commercial for furnace, biscuit burners etc with SC or LOT valves/ domestic)
  - 425 kg (only commercial)
- The color coding for Indane cylinders is red for domestic and blue for commercial.
- Nanocut cylinders contain LPG along with an additive which gives rise to a sharp flame, which helps in cutting metal easily and accurately.
- The following are the truck capacities of the LPG cylinder trucks -306, 450, 504, 540 cylinders.
- SAP code for induction of new trucks - O4V1
- The bulk tankers incoming have the following capacities - 18 MT and 21 MT
- The following are defects for which cylinders are returned to IOCL from market and the corporation has to suitably compensate the distributor via credit according to policy **(Market Return Policy)**-
  - Oversize/undersize valve

- Bung leak
- Underweight/overweight
- Broken pin
- Pin stuck up
- Water filled cylinder
- Body leak
- Other OMC (Oil Marketing Company) Cylinder
- Burnt cylinder
- SRD (Stay Ring Defect) / FRD (Foot Ring Defect)

1.3 Sanand Bottling Plant - Day 2 (14.08.2019)

1.3.1 Electrical Systems - Salient Points

Faculty: Shri. Prakash Chand Meena, OO(P), Sanand BP

With respect to Fig 1.3, the following points should be noted:-

- VCB1 monitors the following - voltage, power factor, frequency, current and has ratings as defined in Table 1.1
- The VCB has the following components for operation - CTs, PTs and CBs.
- Inside any panel, the electrical power goes through the following equipment-s in order:- SFU (415 V), Fuse, Contactor(125 A rating), Thermal Relay (only for over current). See Fig 1.4a.
- There are total 17 racks each with 2 sides and 6 units (as rows) on each side. So all in all there is accommodation for 17 X 2 X 6 = 228 equipment such as conveyer motor etc.
- All the control signals for the VCB and ACBs need 110 V DC supply as does the emergency lights. This is supplied by a DC distribution system as shown in Fig. 1.5a.
- In the panels the following protection measures are present **Switch** to **Fuse**(Now replaced by **SFU** - Switch Fuse Unit See Fig 1.4a) to **Contactor** to **Thermal Relay** to **Equipment**. The practical example of this can be seen in Fig 1.4b.
- In tranformers, as we can see from Table 1.2, 1.3 there is a guaranteed rise of temperature of winding and oil upto 55°C, therefore the high temperature alarm goes off at 60°C and trips the transformers at 90°C for oil OR winding overheating.
- Other that this, there is no inline protection for transformers such as differential protection (protection by Mertz-Price Circulating Current principle).
- However, for protection of transformers from Incipient faults, there are Buccholz Relays attached to each transformer.
- For reactive power compensation there are capacitor banks which are switched on and off via thyristors with the help of a automatic VAR compensator which keeps the power factor above 0.96 by switching on as many capacitors as required. The following are the capacities of the compensators available (Total Capacity= 340 kVAR):-
  - 25 kVAR X 13 = 325 kVAR
  - 10 kVAR X 1 = 010 kVAR
  - 5 kVAR X 1 = 005 kVAR
- There are 3 types of earthing present in a bottling plant (or any industrial facility for that matter) - Neutral Earthing (for DG and TF), Lightning Earthing (for Buildings and other structures), Body Earthing (for every electrical equipment in the plant and 2 point earthing if operating voltage is more than 250 Volts). The earthing schemes as per OISD regulations are roughly described in Fig 1.6

1.3.2 LPG Plant Safety - Salient Points

Faculty: Shri. Umesh Malviya, OO(LPG-Safety), Sanand BP

- Safety is the freedom from injury, death and damage.
- All accidents are preventable.
- Incident = Something wrong happened but no one was harmed or no damage was done whatsover.
- Near Miss = Some minor injury occurred or injury was just avoided.
- Accident = Someone died and some major property damage has occurred.
- Reasons for accidents are 88% human error, 10% unsafe condition and 2% a combination of both.
- The fire triangle consists of 3 things required for a fire - product, air (oxygen) and spark. Therefore, just by removing any one of the three, fire can be stopped. However, that is not always the case for compounds like **Ethylene Oxide** which itself consists of oxygen, therefore the only was to stop the fire is to cut the fuel out of the equation.
- TLV for any chemical is a measure of how toxic it is to human beings. If the chemical concentration is more than the TLV then the max amount of time for which a person can operate in that environment without incurring serious damage is 8 hours. The TLV for LPG is 1000 ppm.
- All equipments present inside the licensed area have to be PESO approved.
- If the mixture of fuel and air is below LEL (1.9% for LPG) then it will not burn due to lack of fuel and is considered "too lean to burn", and if the mixture is above UEL then it will not burn due to lack of oxygen and is considered "too rich to burn". Therefore, the danger lies when the concentration is between LEL and UEL.
- Using a fire extinguisher (PASS) - **P**ull the pin, **A**im at the base of fire, **S**queeze the trigger and **S**weep.

- There are 2 types of fire protection - Active and Passive Fire protection. Active fire protection is a group of systems that require some amount of action in order to work efficiently in the event of a fire eg. fire extinguishers, automatic sprinkler systems, alarms etc. Passive fire protection is a group of systems that compartmentalize a building through the use of fire-resistance rated walls and floors, keeping the fire from spreading quickly and providing time to escape for people in the building eg. fire doors, photoluminescent egress path markers etc.
- There are 3 types of safety audits - Internal Safety Audit (Every 1 year), External audit by OISD (Every 5 years) and Suprise Audits.
- The expansion ratio of LPG is 1:250.
- The hazchem code for LPG is 2WE. See Fig 1.7 to know how to read hazchem signs. 2WE means that in case of an incident, fog of water must be sprayed, full protective clothing must be worn with Breathing Apparatus (BA), spill must be contained.
- Self Contained BA shows contained air pressure in bar. To convert it into minutes remaining, the shortcut formula is to remove the ending 0 and then add it to half of itself. For eg 300 bar means 30+15=45 mins, similarly 200 bar means 20+10=30mins.
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1.4 Sanand Bottling Plant - Day 3 (16.08.2019)

1.4.1 Supply & Distribution - Salient Points

Faculty: Shri. Himanshu Jatav, OO(P), Sanand BP

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1.4.2 Bulk - Salient Points

Faculty: Shri. Shirish Rao, SM(P), Sanand BP

- Bulk domestic product= 89000 MT
- Bulk international product= 94000 MT
- Supply for domestic from Kandla
- Supply for only non domestic from Dumar
- Supply for domestic from Essar Oil Limited (EOL), Jamnagar and Reliance, Jamnagar
- +-200g allowed in Gross Weight-Tear Weight
- TLD tests performed - Visual inspection, Pneumatic Test, Hydrostatic Test, Electrical Continuity.

1.5 Sanand Bottling Plant - Day 4 (17.08.2019)

1.5.1 Stores - Salient Points

Faculty: Shri. Nitin Parwani, AM(P), Sanand BP
Store contains the following:-
- Project - Contains project materials when such projects are being performed - Compressor, DG, Lights etc.
- LPG Consumables - SC valve, Pressure Regulator, O-Ring, TES, Soap Solution, Safety Caps
- HSD - for DG sets
- Lube - lube oil, I5W40
- Revenue Maintenance - Conveyer material, bearing, solenoid valve.

1.5.2 Shed Visit

The filling shed operation can be summarised by the following points:-
- Washing unit
- Drying unit
- Pre-O Ring Machine
- Carousel
- Check scale
- Weight correction unit
- Valve leak detector
- Post-O Ring Machine
- Water Bath
- Sealing Machine
- Purging Machine - Taking pressure to -0.365 kg/cm2, in order to aide filling of LPG.

The correct order of things can be seen in Fig 1.2.

1.5.3 Closing Session - Salient Points

Faculty: Shri. Joydev Ojha, DGM(P), Sanand BP

- CVT= Continuous Valve Testing which checks for both valve leak and o ring leak.
- CVT verifier is to check if CVT is working or not
- When a cylinder is beyond repair, the following steps are taken to discard it -
  1. Evacuation
  2. Depressurize

3. Valve removal
4. Degassing
5. Sent for scraping

1.6 FAQs

What is the standard pressure in a LPG T/T? answer
What is the minimum pressure in a LPG cylinder? 15 kg/cc
What factors go into the calculation of production requirement of a bottling plant? answer
Why are LOT cylinders required? Because Liquid Off Take (LOT) Cylinders have valves with pipes which go down to the lower part of the cylinder therefore, allowing it to draw liquid from the cylinder which may then be used to evaporate at a higher rate along with other LOT cylinders, thereby creating enough vapour for large burners, furnaces etc. Therefore, it is generally used for commercial/industrial purposes.
What is the additive added to LPG in Nanocut cylinder and what parameter of the LPG does it change? answer
What is MSDS of a product? answer

1.7 Tables

S. No.	SPECIFICATION	VALUE
1	TYPE	VK 10J20
2	SERIAL NUMBER	2639
3	YEAR	1995
4	STANDARD	IS:13118 / IEC-56
5	RATED FREQUENCY	50 Hz
6	RATED VOLTAGE	12 kV
7	RATED CURRENT	630
8	Ins.LEVEL Imp.	75 kVp;P.F.28 kV
9	RATED BREAKING CURRENT	20 kA
10	RATED MAKING CURRENT	50 A (Peak)
11	SUPPLY VOLTAGE CLOSING	110 V DC
12	SUPPLY VOLTAGE TRIPPING	110 V DC
13	RATED SHORT TIME CURRENT	20 kA (3 secs)
14	WEIGHT OF BREAKER	70 kg

Table 1.1: VCB1 technical specifications made in technical collaboration with Toshiba Japan

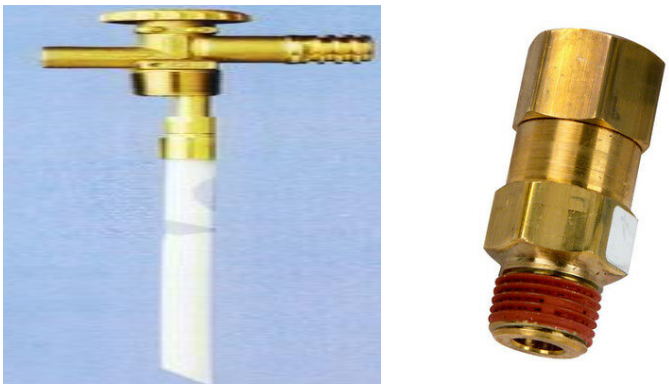
S. No.	Specification	Value
1	Specification	IS 2028
2	Phase	3
3	Frequency	50Hz
4	Ambient Temperature	45 Degree C
5	Max Temperature Allowed	55 Degree C
6	Primary Winding	433 Volts +2.5%+5% DELTA
7	Secondary Winding	433 Volts STAR
8	Primary Vpeak or Amplitude	266.67 Volts
9	Secondary Vpeak or Amplitude	266.67 Volts
10	Impedance Volts	4.62%
11	Oil	330 l
12	Vector Group Ref.	Dyn11
13	Cooling	ON/AN
14	KVol	200
15	Insulation Class	A
16	Type	DW
17	Weight	1110 kg
18	Serial Number	ABY-1-9

Table 1.2: Data card for the Isolation Transformer for the lighting equipment as mentioned in Fig 1.3

S. No.	Specifications	Value
1	Standard	IS 2026-1977
2	kVA Rating	1000 kVA
3	HV Voltage Rating (No Load)	11000 Volts
4	LV Voltage Rating (No Load)	433 Volts
5	HV Current Rating	52.5 A
6	LV Current Rating	1333 A
7	No. of phases at HV and LV	3
8	Type of Cooling	ONAN
9	Impedance Volts	4.13%
10	Vector Group Reference	Dyn 11
11	Core and Windings Weight	1520 kg
12	Oil Weight	740 kg
13	Total Weight	3260 kg
14	Oil Quantity	770 litres
15	Year of Manufacture	1995
16	Max Temp Rise of Oil and Wdg	55 degrees C
17	Insulation Level	LI 75 AC 28/LI AC-3

Table 1.3: Datacard for the main step down transformer connected to the Electricity Board in Fig 1.3

1.8 Figures



(a) LOT Valve (b) SC Valve

Figure 1.1: Types of valves attached to LPG cylinders

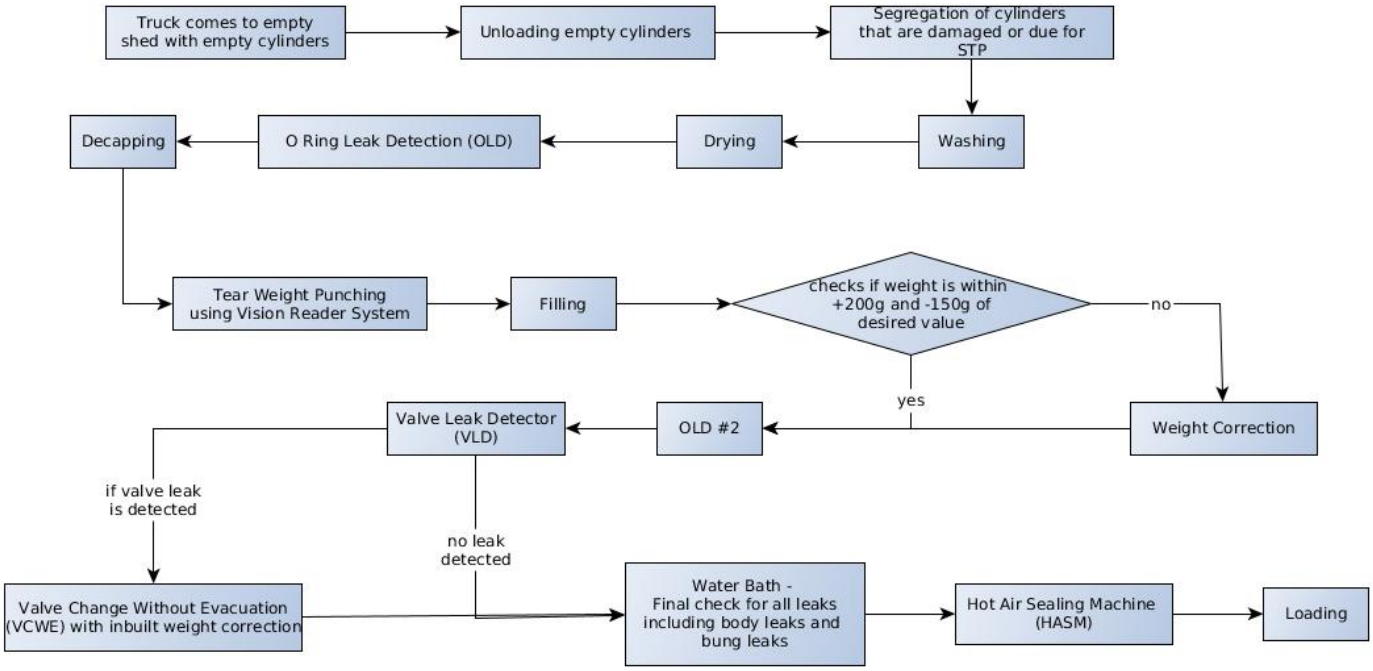


Figure 1.2: LPG filling process flow

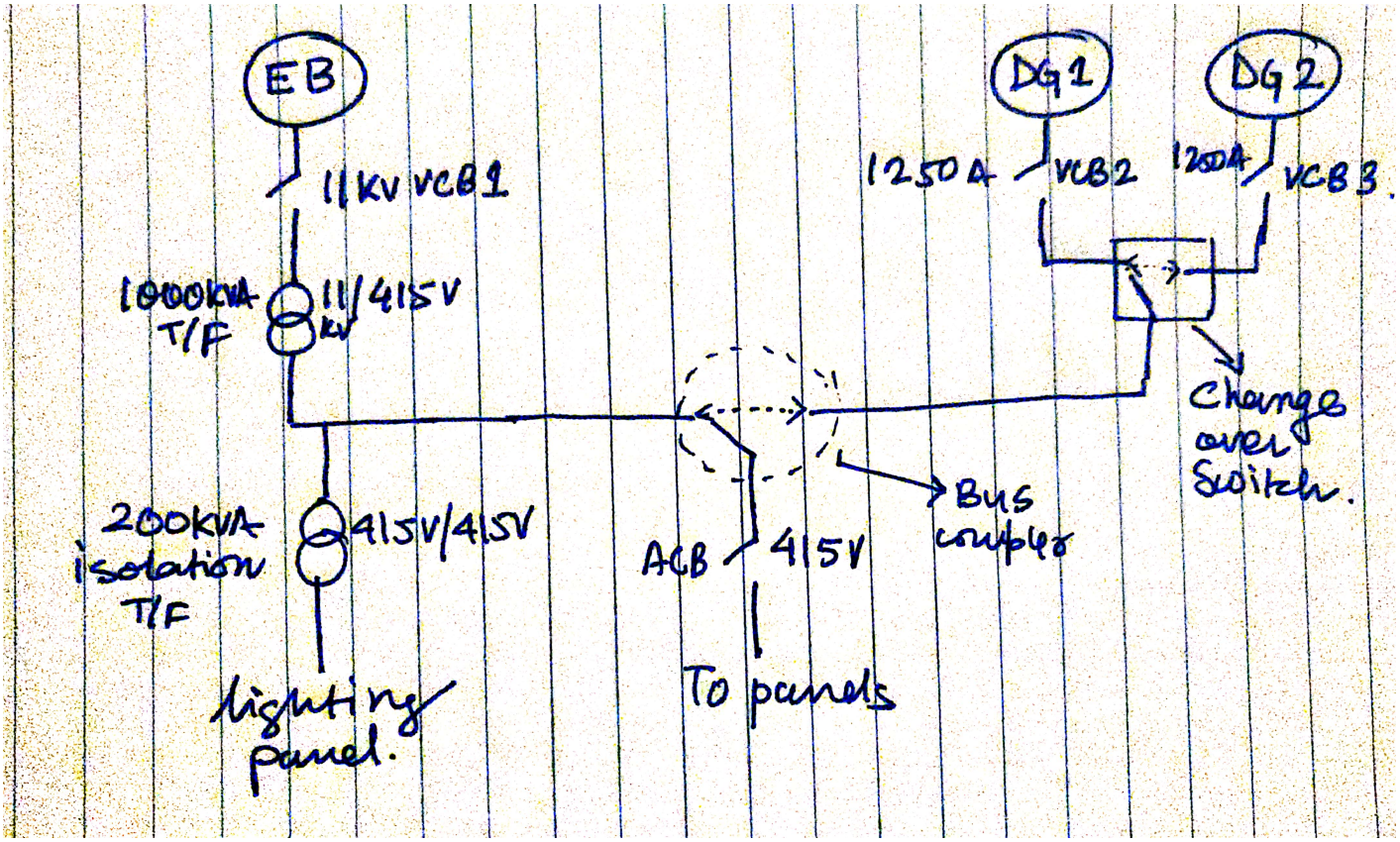
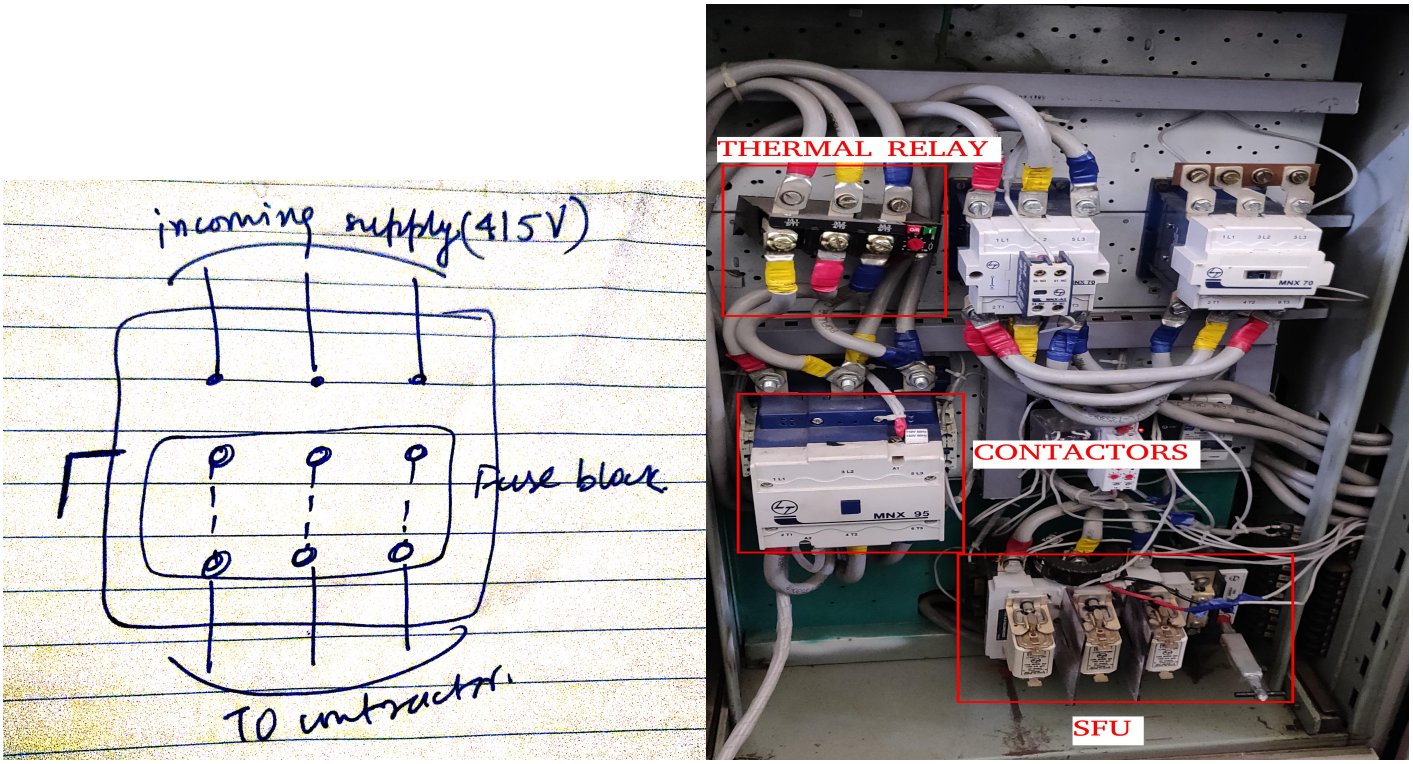


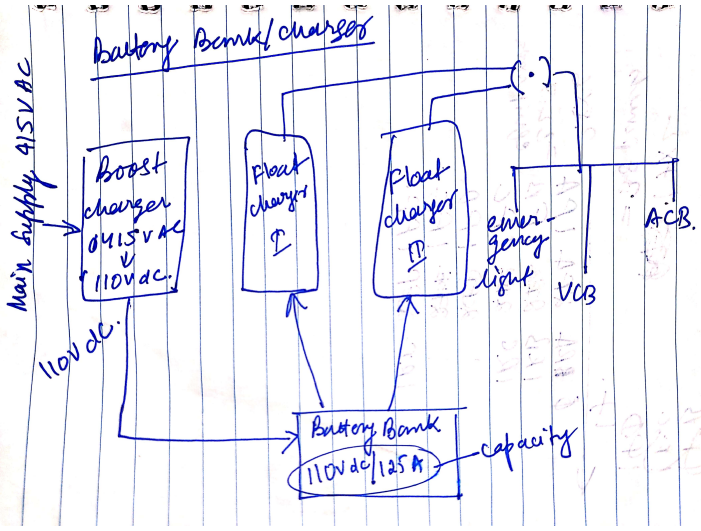
Figure 1.3: Basic single line diagram of a bottling plant electrical distribution system



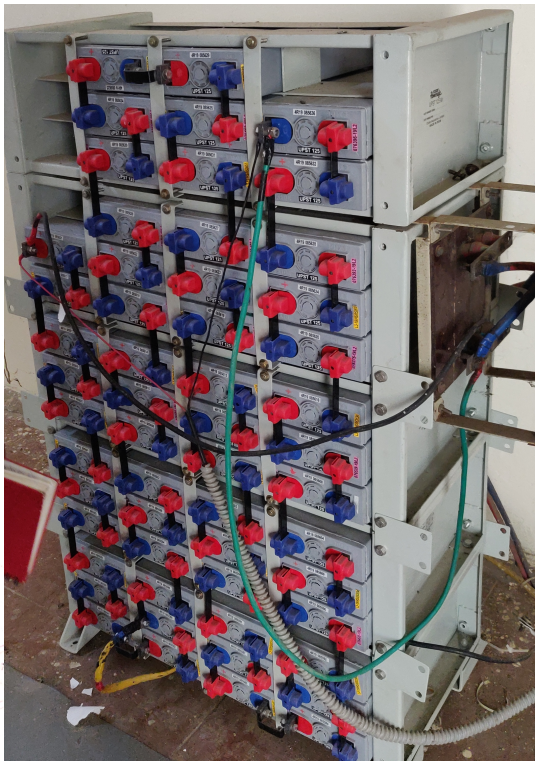
(a) Schematic diagram of a Switch Fuse Unit

(b) Inside view of a panel showing its safety features

Figure 1.4: Theoretical and real panel equipment protection apparatus

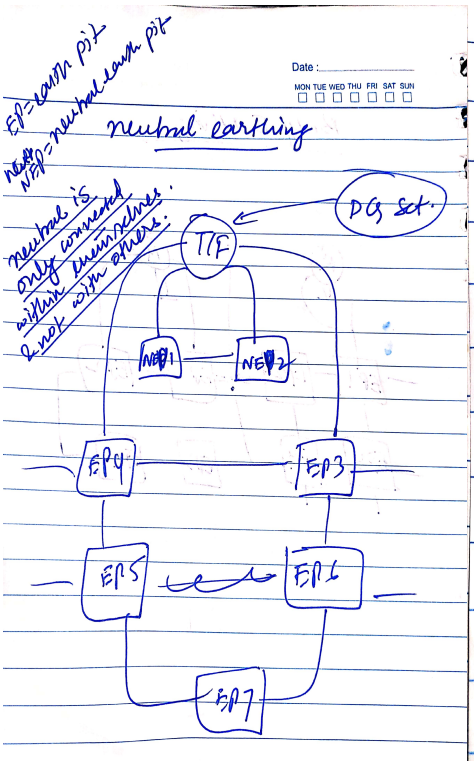


(a) Schematic diagram of the dc power delivery system

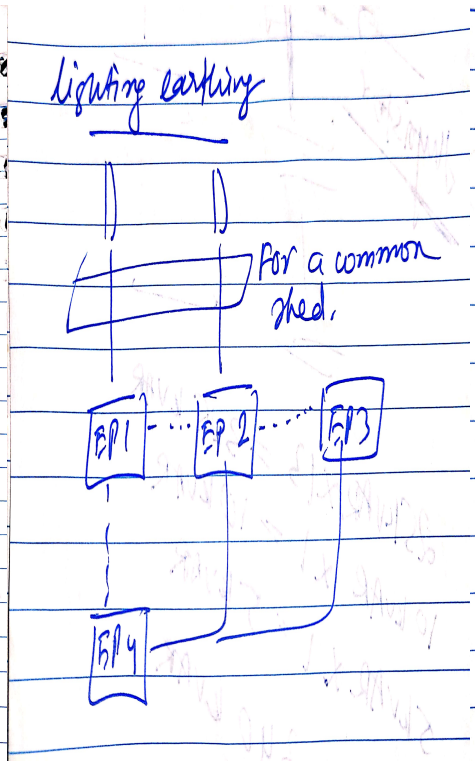


(b) Schematic diagram of the dc power delivery system

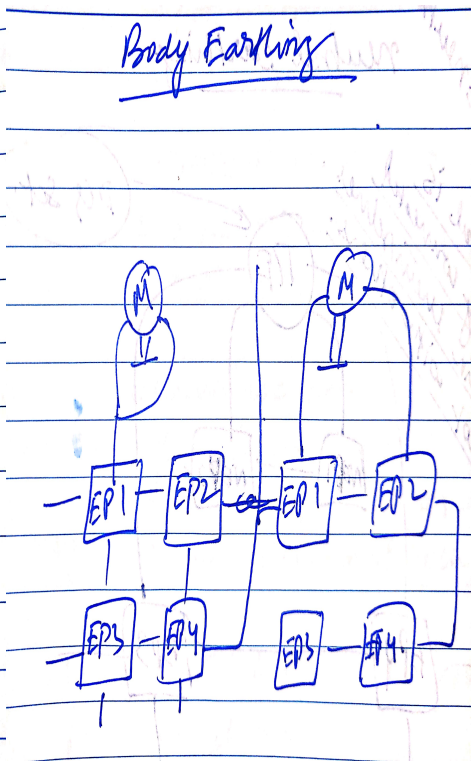
Figure 1.5: DC power delivery system



(a) Neutral Earthing



(b) Lightning Earthing



(c) Body Earthing

Figure 1.6: Different types of earthing schemes

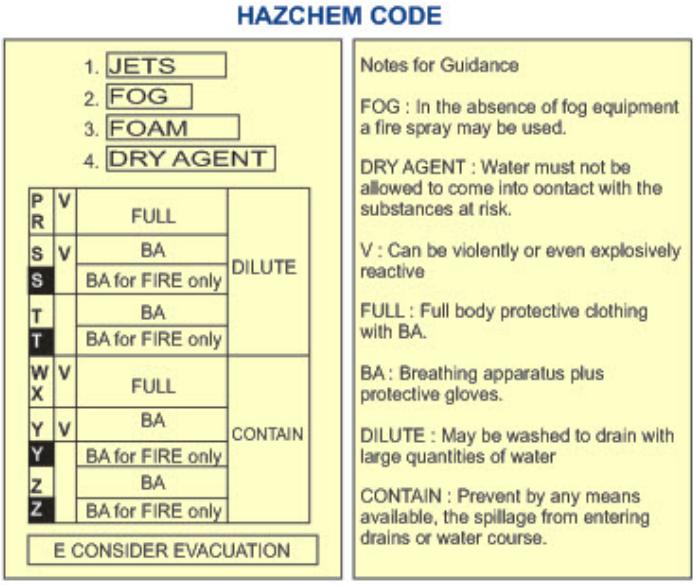


Figure 1.7: Hazchem decoded (BA=Breathing Apparatus)

Chapter 2

Bareja Terminal

2.1 Important Terms and Abbreviations

- ROSOV = Remotely Operated Shut Off Valve
- DBBV = Double Block and Bleed Valve
- COCO = Company Owned and Company Operated
- PD Meter = Positive Displacement Meter
- DCV = Digital Control Valve
- BCU = Batch Control Unit

2.2 Operations

Operations at Bareja Terminal consists of the following things:-

- Receipt
- Storage
- Dispatch
- Quality

Each of these are described in further detail below.

2.2.1 Receipt

Bareja terminal receives product via 2 pipelines:-

- KSPL (Koyali- Sanganer Pipe Line) = Multiproduct pipeline tapped at Ahmedabad
- KAPL (Koyali- Ahmedabad Pipe Line) = Dedicated ATF pipeline which supplies the whole of Gujarat and parts of Rajasthan.

Then interface cutting (See Fig 2.1)is done by the pipelines division at the exchange pit and supplied to the terminal via pipelines.

2.2.2 Storage

- Tank farm at bareja terminal can be represented by Fig 2.2.
- The storage capacities of the aforementioned tanks can be realized by Table 2.1.
- Tanks are classified in 3 ways -
  - Underground and Aboveground tanks
  - Floating roof tanks and cone roof tanks
  - Horizontal and Vertical tanks
- Floating roof tanks are used to store class A products such as MS, which are very volatile thereby prone to vapor loss. The floating roof of the tank floats just over the product thereby not giving any space for vapor to form.
- A floating roof tank has the following attachments to its roof with their specific purpose -
  - Articulated Vent - to remove water stored on roof by rain or foam pouring drills etc.
  - Primary seal - Metal (aluminum) clamps sealing the product in.
  - Secondary seal - Secondary line of defense from product leakage and provides weather protection to the primary seal.
  - Stands - So the floating roof doesn't touch the bottom of the tank when tank is emptied for cleaning or maintenance purposes (6ft length).
  - Auto-bleeder valve - Leg length a bit longer than the stand and open cap on other side. This opens the valve when the floating roof lowers beyond a point thereby stopping vacuum locking.
  - For safety there are foam pourers and foam dams to direct foam towards the secondary seal which is most prone to product leakage and fire.
  - There are automatically triggered (by the rate of increase of temperature) foam pourers which pour foam directly over the primary seal in case of an emergency.
- The bottom of any tank has a central sump to collect any water that has infiltrated the system and a water draw off line to drain that water.
- The sand pad that forms the base of the tank should - have no cracks, have no vegetation since roots crack the base even further.
- A tank can be either of the 3 modes - Receipt, Dispatch and Dormant. (See Fig 2.3)
- There are alarms for overfilling and underfilling of tanks, the details about which can be easily understood from Fig 2.4.

- There are various valves attached to the inlet and the outlet of the tanks which can be seen in Fig 2.5. It is important to note here that the ROSOV can only be shutoff remotely but has to be turned on manually whereas the DBBV can be shutoff and turned on remotely and in case of loss of power, the ROSOV closes automatically. This is done, so that when someone manually opens the ROSOV, then that person can check the surroundings for any hazards before doing so.

2.2.3 Dispatch

- There are 2 types of customers - Retail Outlets, Bulk Consumers
- It is to be noted that product given to COCO ROs and AFS are treated as stock transfer rather than sale.
- Dispatch is done via tank trucks which can be - dealer owned, transporter owned and consortium owned.
- The demand sensing or indenting is done via sms or web indenting.
- ATF has dedicated tankers which is coated internally with epicoating to prevent chemical reaction with the tanker metal thereby contaminating it.
- The following is the priority list of the customers while dipatching loads to it -
  1. Consumer sales
  2. Priority dealers
  3. COCO
  4. Non Priority dealers
- The complete flow of the TT coming in empty and leaving the automated terminal can be seen in Fig 2.8.
- The filling of the TT can be further maginified to a process flow as seen in Fig 2.7.
- The instruments used to automatically fill the TTs along with their order of operation is shown in Fig 2.6. The PD meter (sensor) supplies information to the BCU which then sends the open or close signal to the DCV (actuator). The DCV can either be open or close, anything in between is achieved by repeatedly turning the valve ON and OFF.

2.2.4 Quality

The various stages at which quality checks are done can be seen in Fig 2.9.

2.3 Safety and Maintenance

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2.4 FAQs

What is the requirement of LL and LLL alarm?

2.5 Tables

Storage Tank	Quantity	Level Filled (kL)	Tank Diameter (m)
MS	3	8300	24
HSD	4	11000	32
ATF	2	6300	28
SKO	2	3300	18
Ethanol	2	70	
Water	3	2600/5200	

Table 2.1: Tank Capacities & Storing Limit

2.6 Figures

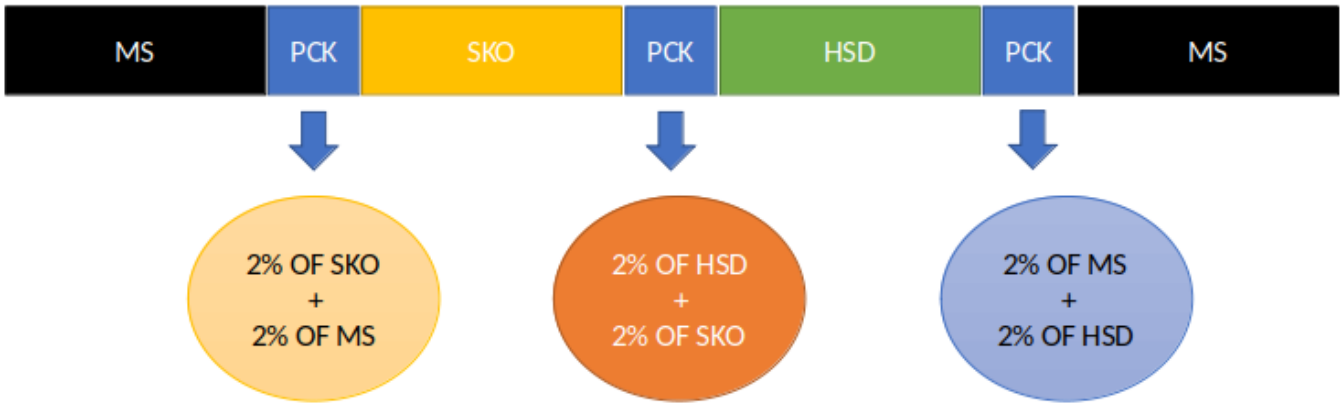

Figure 2.1: Interface cutting norms

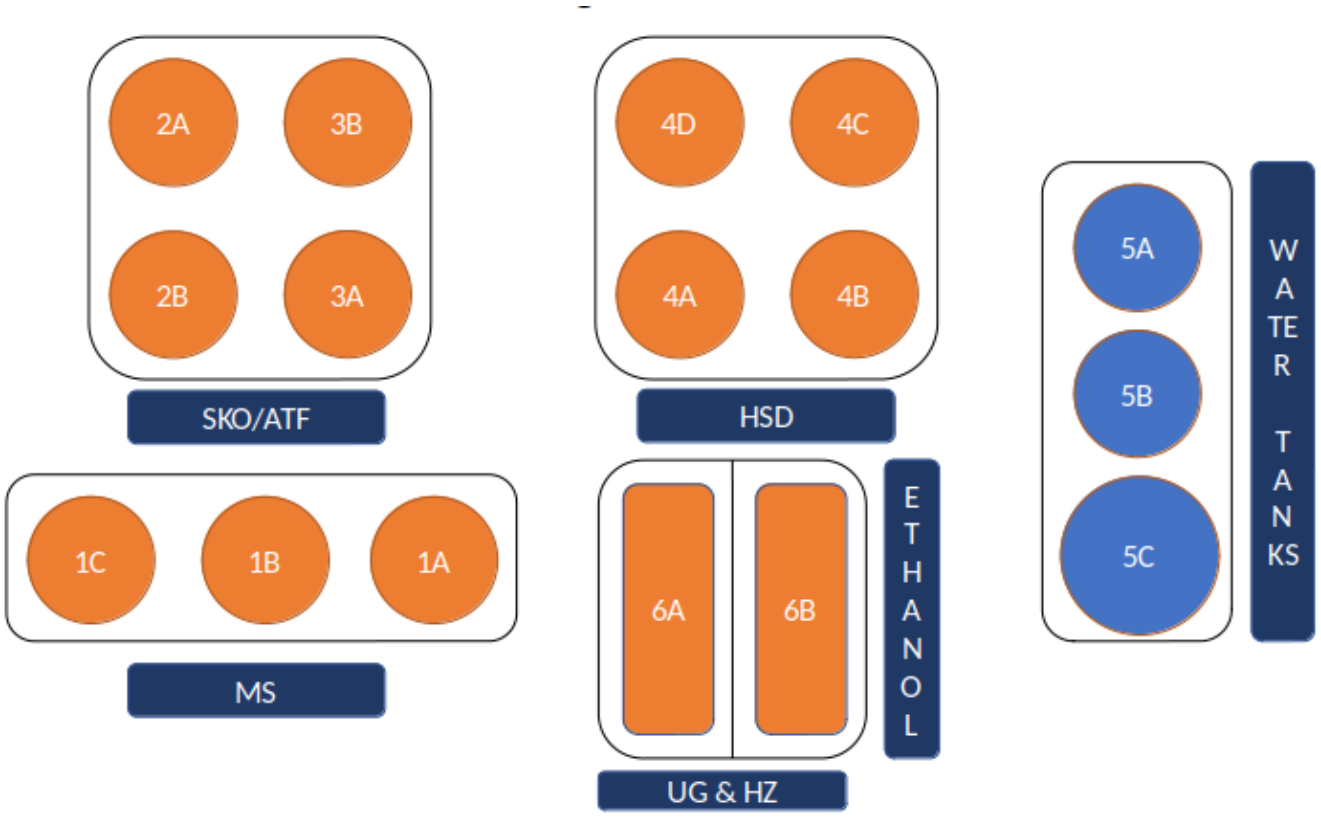

Figure 2.2: Pictorial representation of the storage tanks present at the Bareja terminal

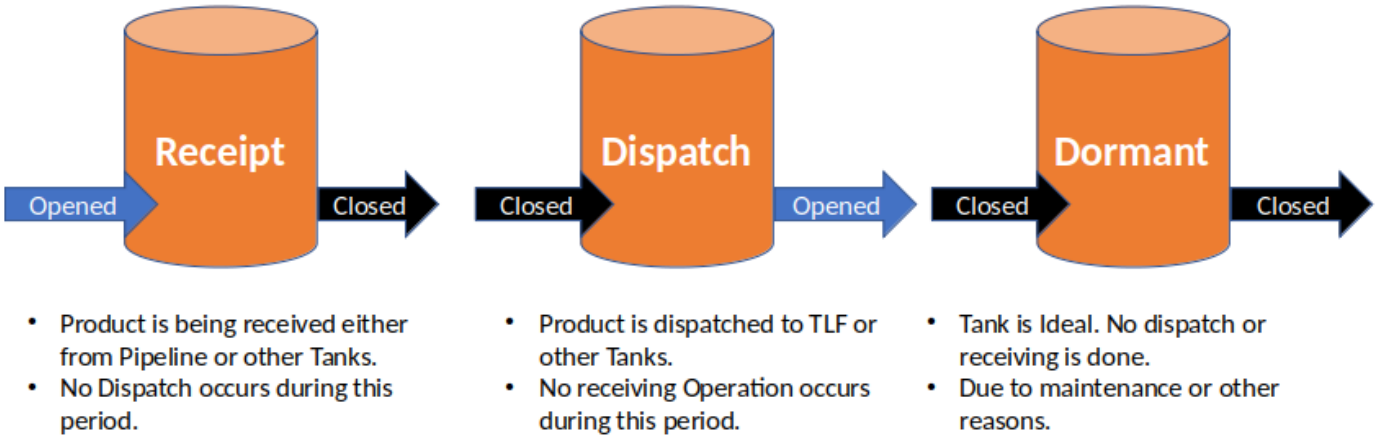

Figure 2.3: Modes of operation of tanks

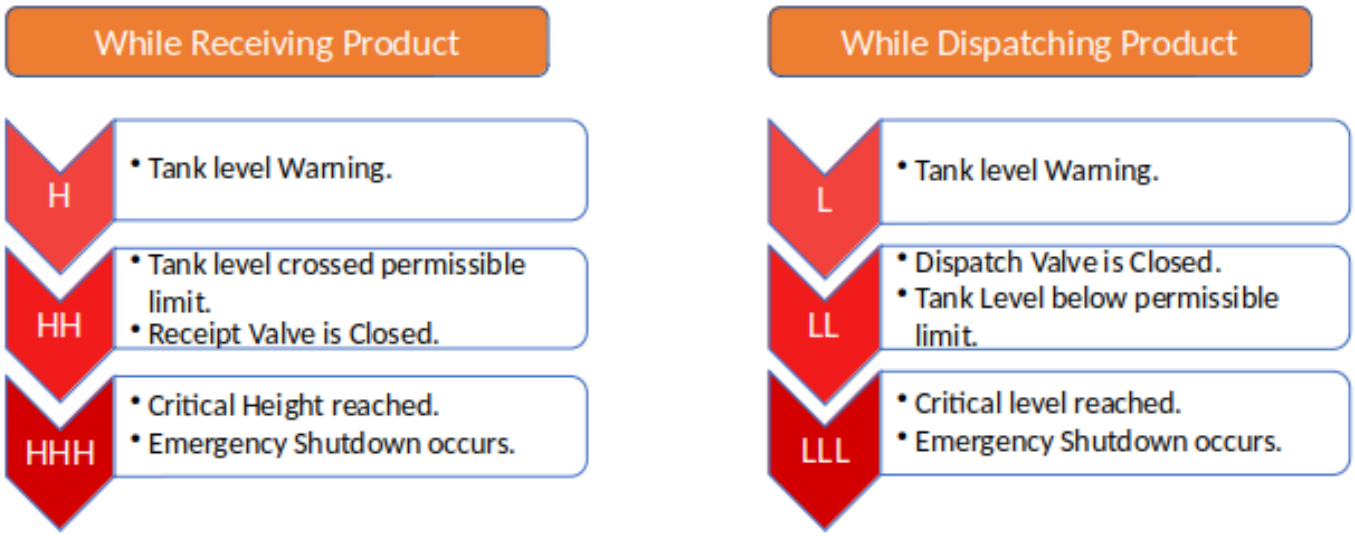

Figure 2.4: Alarms to prevent over filling or over emptying a tank

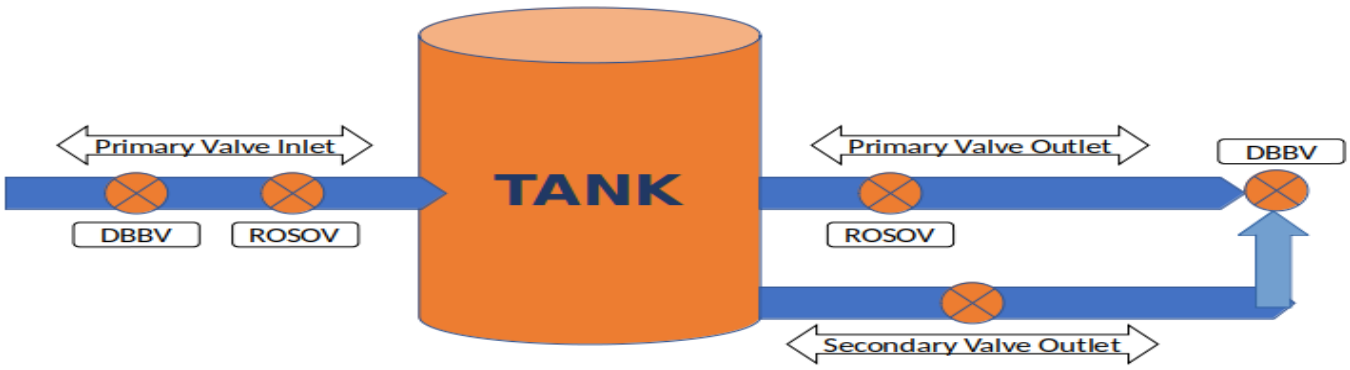

Figure 2.5: Valves attached to a tank

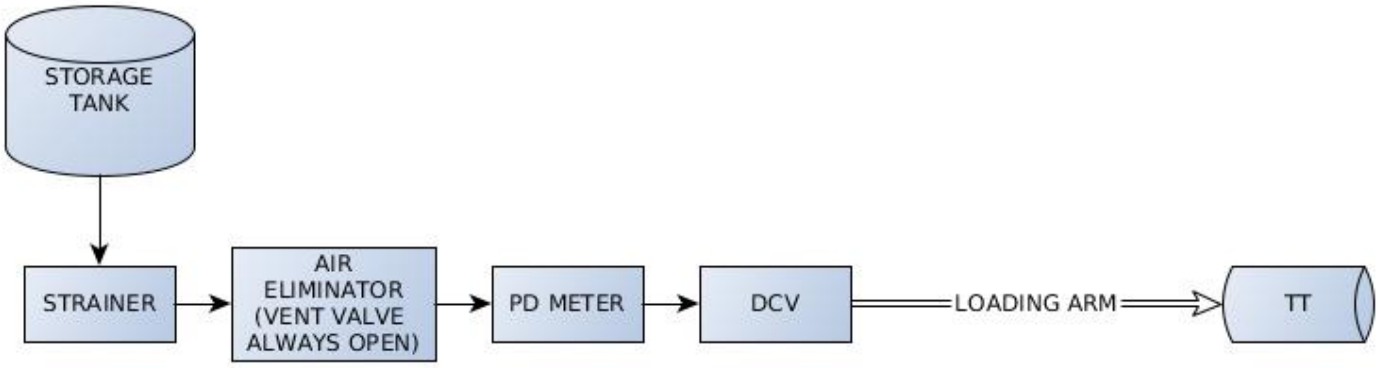

Figure 2.6: Equipments and process flow enabling the completely automatic filling of TTs

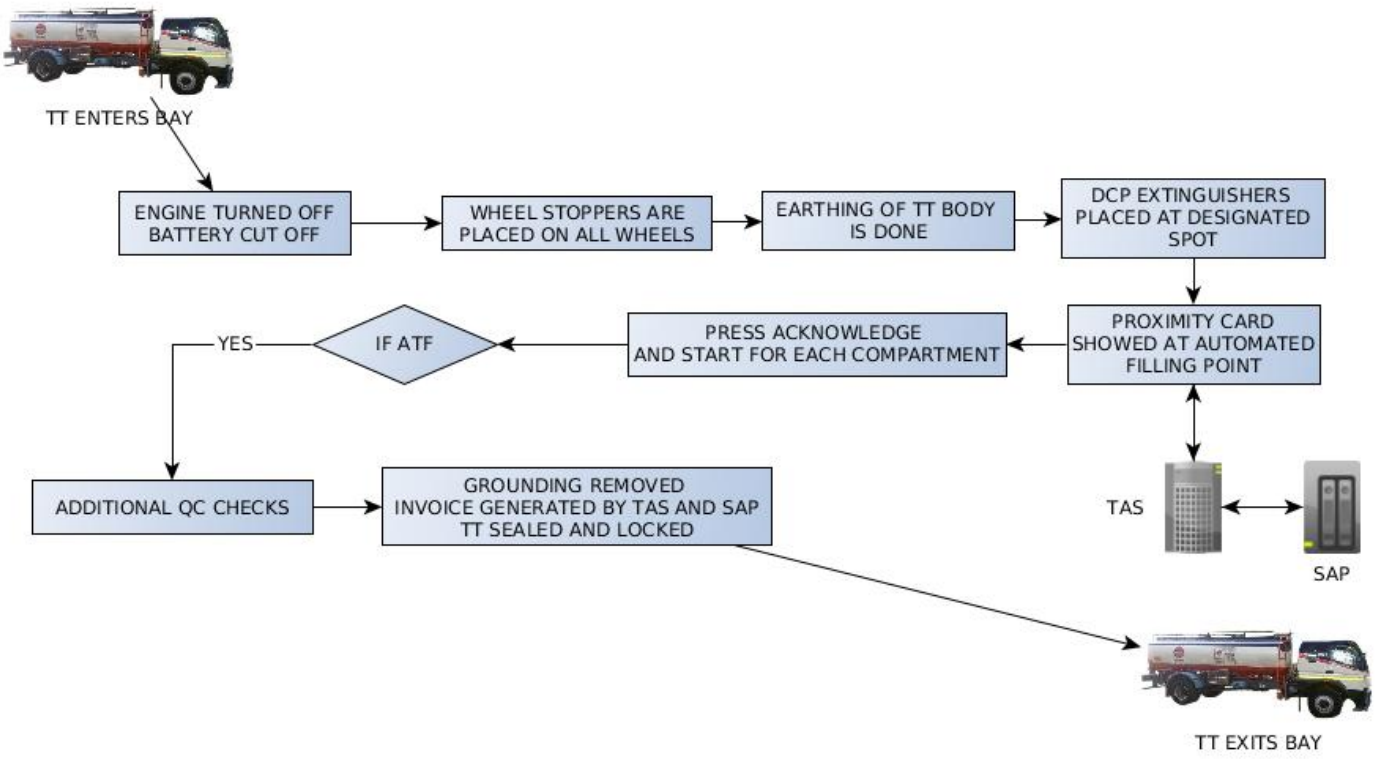

Figure 2.7: The TLF process flow (magnified to the filling part)

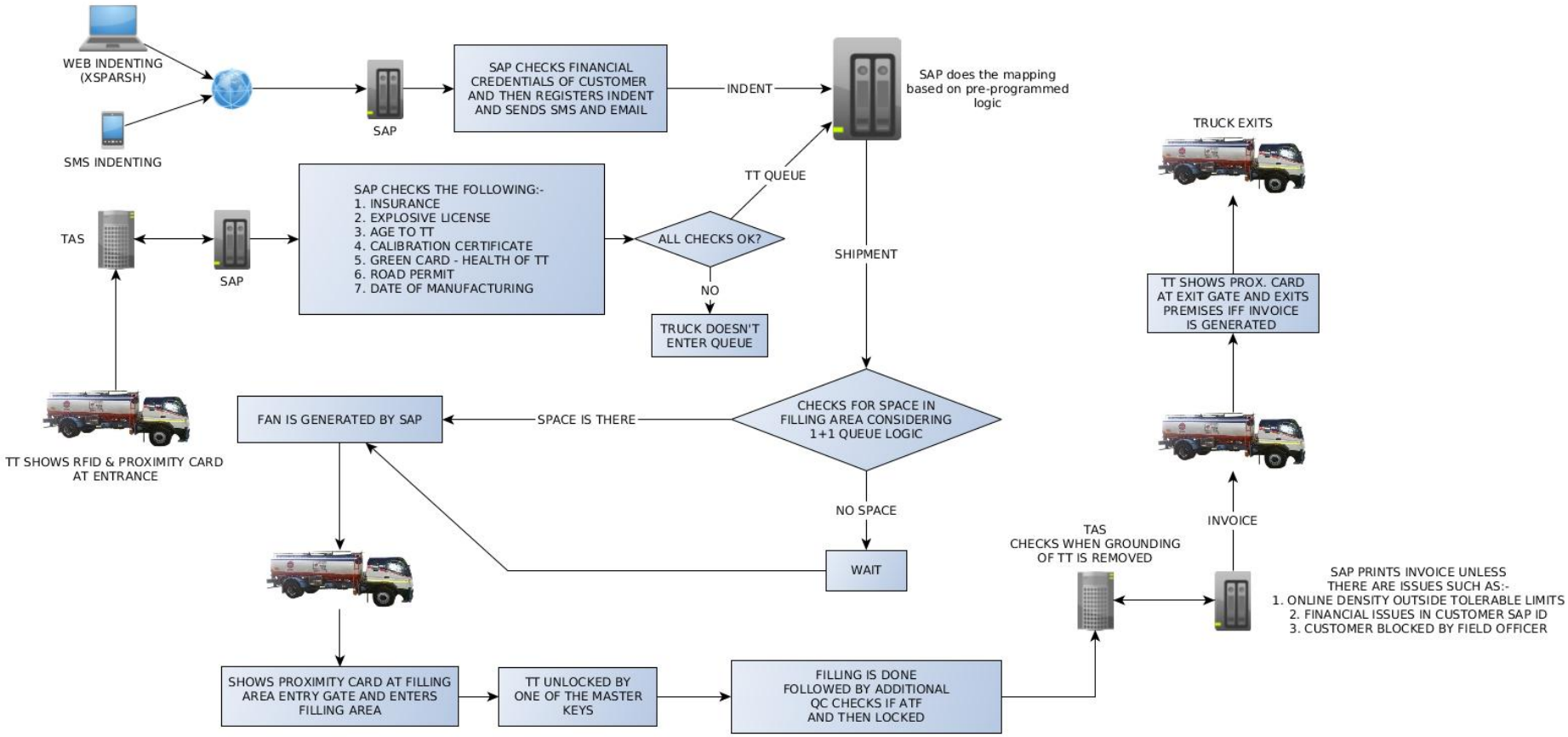

Figure 2.8: The complete TLF process flow

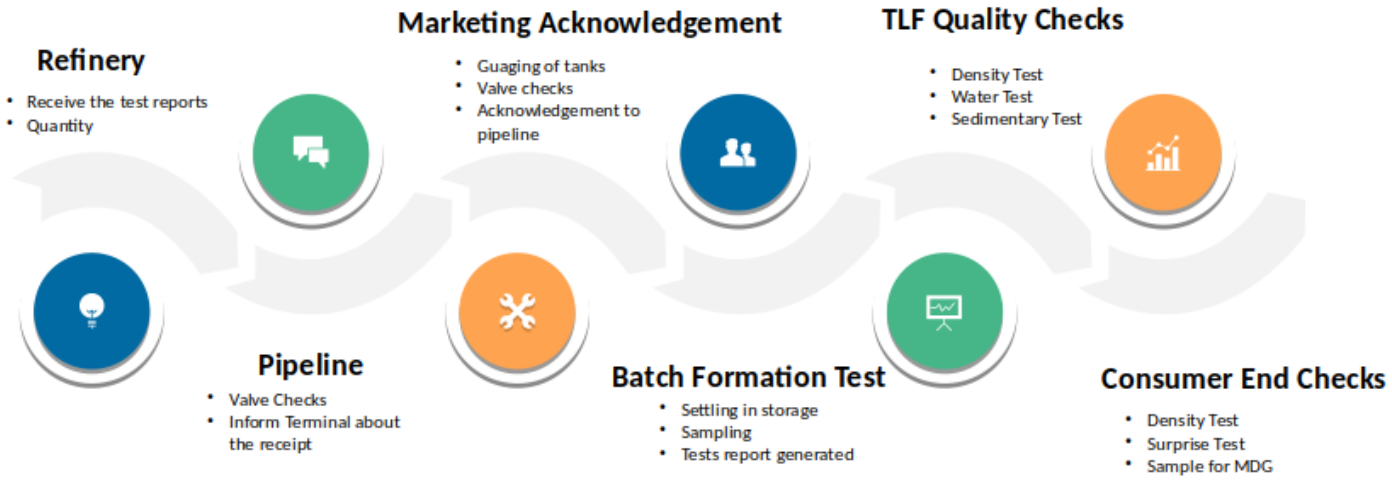

Figure 2.9: Quality flow at Bareja terminal