SHRI VILE PARLE KELAVANI MANDAL'S

Institute of Technology, Dhule

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"Industrial Visit to Air Conditioning Plant."

Students: Third Year B. Tech Mechanical Engineering

Faculty:Mr. Dattatray Doifode

Resource Person: Mr. Pramod Thakare (Project Office)

Name of Organization: Air Conditioning Plant of SVKM Campus,Dhule.

Date of Visit: 25th May 2022

Objectives of visit:

1. To understand the construction and actual workingof Air conditioning.
2. To understand the basic components and their design of air conditioning plant.

Acknowledgement

There is always a sense of gratitude which one express towards others for their help and supervision in achieving the goals. This formal piece of acknowledgement is an attempt to express the feeling of Gratitude towards people who helpful us in successfully completing of Industrial visit.

We would like to thanks to all supporting staff of "**Shri Vile Parle KelavaniMandal's Air Conditioning Plant**" who guide us in industrial visit. I Would Also Like to thanks to **Mr. PramodThakre** for Giving us valuable Knowledge and making this visit possible. I am also highly indebted to Principal **Dr. Nilesh P. Salunke**, for the facilities provided to accomplish this Industrial visit. I would like to thank my Head of the Department **Dr. Hitesh Thakare** for his constructive criticism throughout Industrial visit. I would like to thank **Prof. D.S. Doifode** Department Industrial visit for their support and advice to get and complete an industrial visit in the above-said organization. I am extremely grateful to my department staff members and friends who helped me in the successful completion of this industrial visit.

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Department of Mechanical Engineering SVKM'S IOT, Dhule

INTRODUCTION:

We the student of third year mechanical engineering of Shri vile parleKelvanimandal's institute of technology, Dhule have visited Shri Vile Parle KelavaniMandal's Air Conditioning Plant Dhule as a part of the Refrigeration and air conditioning academic activity, under guidance of Prof. DattatrayDoifode sir and Prof. BhushanBehede sir.

Shri Vile Parle KelavaniMandal's Air Conditioning Plant located at Survey No. 499, Plot No. 2, Mumbai Agra Highway, behind Gurudwara, Dhule, Maharashtra 424001. This Plant Is used for providing cooling effect in Engineering Building and Pharmacy Building in SVKM Campus. This Air Conditioning Plant have 2 units, one unit have a capacity of 250 Tons and another Plant have a capacity of 210 tons. Third unit of this Plant is Under Progress and it have a capacity of 400 tons. This plant covered near about 2000 Sq. Ft Area of land. There are Air Handling Units (AHU) planted in Both Engineering Building and Pharmacy building for distribution of Cooling Effect in every Room. This Air conditioning system is type of centralized air conditioning System, and system works on Vapor Compression Cycle (VCC).

Infrastructure of Air Conditioning Plant	
Capacity	215 + 210 + 400 Tons
Plot Size	2000 Sq. Metre
Plant Manufacturers	TRANE PVT. LTD.
AHU	2 AHU per Floor
Pumps Used	6 pumps of 11.5 kW and 3 Pumps of 5 kW Pumps are Manufactured by GRUNDFOS DK- 8850 EAC Made in Hungary.

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➢ Refrigerant Used in System:

Tetrafluoroethane (also known as norflurane (INN), R-134a, Freon 134a, Forane 134a, Genetron 134a, Green Gas, Florasol 134a, Suva 134a, or HFC-134a) is a hydrofluorocarbon (HFC) and haloalkane refrigerant with thermodynamic properties similar to R-12 (dichlorodifluoromethane) but with insignificant ozone depletion potential and a lower 100-year global warming potential (1,430, compared to R-12's GWP of 10,900). It has the formula CF_3CH_2F and a boiling point of −26.3 °C (−15.34 °F) at atmospheric pressure. R-134a cylinders are colored light blue. A phaseout and transition to HFO-1234yf and other refrigerants, with GWPs similar to CO_2, began in 2012 within the automotive market.

➢ Construction and Working of Plant Equipment's.

The Vapor Compression Refrigeration Cycle involves four components: compressor, condenser, expansion valve/throttle valve and evaporator. It is a compression process, whose aim is to raise the refrigerant pressure, as it flows from an evaporator. The high-pressure refrigerant flows through a condenser/heat exchanger before attaining the initial low pressure and going back to the evaporator. A more detailed explanation of the steps is as explained below.

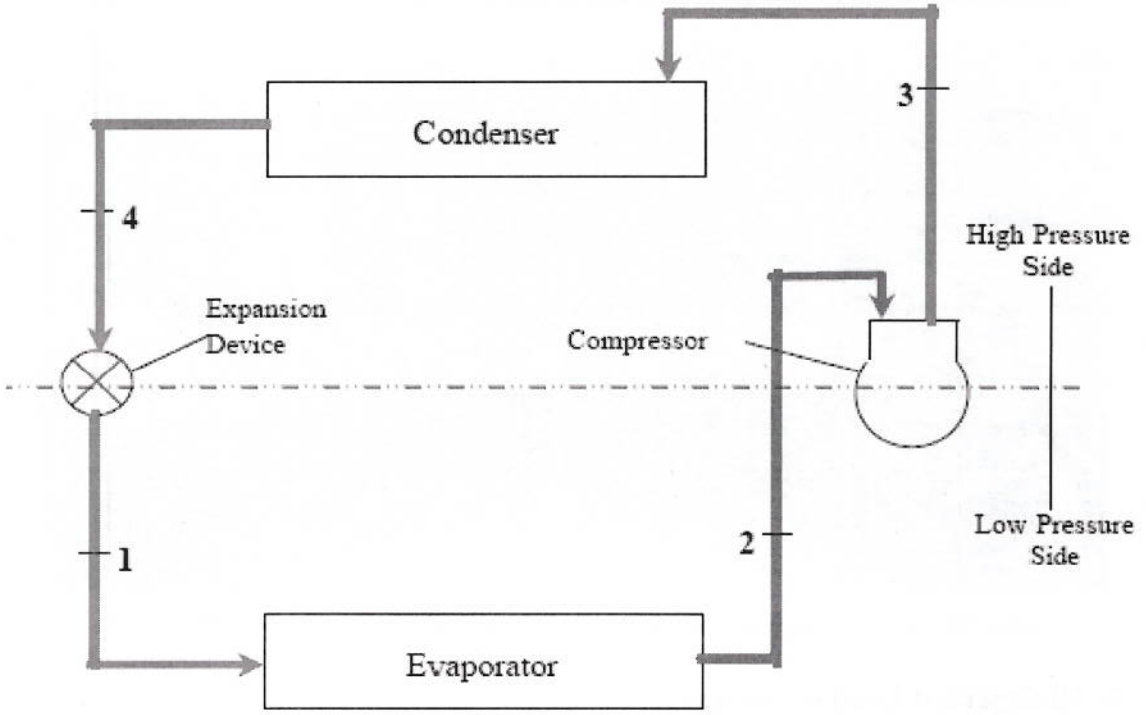


Figure 2 Vapor Compression Cycle

- **Compression**

The refrigerant (for example R-134A) enters the compressor at low temperature and low pressure. It is in a gaseous state. Here, compression takes place to raise the temperature and refrigerant pressure. The refrigerant leaves the compressor and enters to the condenser. Since this process requires work, an electric motor may be used. Compressors themselves can be scroll, screw, centrifugal or reciprocating types.

- **Condensation**

The condenser is essentially a heat exchanger. Heat is transferred from the refrigerant to a flow of water. This water goes to a cooling tower for cooling in the case of water-cooled condensation. Note that seawater and air-cooling methods may also play this role. As the refrigerant

flows through the condenser, it is in a constant pressure. One cannot afford to ignore condenser safety and performance. Specifically, pressure control is paramount for safety and efficiency reasons. There are several pressure-controlling devices to take care of this requirement.

- **Expansion**

When the refrigerant enters the throttling valve, it expands and releases pressure. Consequently, the temperature drops at this stage. Because of these changes, the refrigerant leaves the throttle valve as a liquid vapor mixture, typically in proportions of around 75 % and 25 % respectively. Throttling valves play two crucial roles in the vapor compression cycle. First, they maintain a pressure differential between low- and high-pressure sides. Second, they control the amount of liquid refrigerant entering the evaporator.

- **Evaporation**

At this stage of the Vapor Compression Refrigeration Cycle, the refrigerant is at a lower temperature than its surroundings. Therefore, it evaporates and absorbs latent heat of vaporization. Heat extraction from the refrigerant happens at low pressure and temperature. Compressor suction effect helps maintain the low pressure. There are different evaporator versions in the market, but the major classifications are liquid cooling and air cooling, depending whether they cool liquid or air respectively.

➢ Problems in the Vapor Compression Cycle

The Coefficient of Performance (COP) expresses the efficiency of this cycle. Knowing that the aim of the refrigerator is heat removal and that this process requires work, the COP of the cycle becomes: Where "h" is the enthalpy in the system. Some of the Vapor Compression Refrigeration Cycle Problems that may affect this value are

- **Compressor Leakage/Failure**

The failure of an industrial refrigeration compressor can be expensive affair to the company and damaging to the manufacturer's reputation. Often, manufacturers will tear down returned compressors in search faults. Over years of studies, some common reasons for compressor failure have been identified to include lubrication problems, overheating, slugging, flood back and contamination.

- **Fouling – Evaporator and Condenser**

Fouling is any insulator hinders transfer between the water and the refrigerant. It could result from algae growth, sedimentation, scale formation or slime. As this problem increases head pressure, it can lead to increased energy use by the compressor. What is the best practice? Keep the evaporator surface and condenser tubes clean. Water treatment practices need to be on point to keep this problem at bay.

- **MotorCooling**

The motor is easily the highest energy consumer in the vapor compression cycle. Most times when efficiency drops in this device, it is because of a cooling problem. Many issues could lead to this- blocked air filters, dirty air passages etc. Regular checks of the chiller logs should unearth any anomaly, specifically the comparison between amperage and voltage.

- **Liquid Line Restriction**

If you are a refrigeration technician and you encounter low evaporator pressure, one of the areas to check is the liquid line, specifically for any form of restriction. Many other symptoms could point to the problem that affects the system enthalpy as shown by the following examples.

- Abnormally high discharge temperature
- Low current draw
- High superheats
- Low condensing pressures
- Local frost close to the restriction
- Bubbles in sight glass

Air conditioning, or cooling, is more complicated than heating. Instead of using energy to create heat, air conditioners use energy to take heat away. The most common air conditioning system uses a compressor cycle (similar to the one used by your refrigerator) to transfer heat from your house to the outdoors.

Picture your house as a refrigerator. There is a compressor on the outside filled with a special fluid called a refrigerant. This fluid can change back and forth between liquid and gas. As it changes, it absorbs or releases heat, so it is used to "carry" heat from one place to another, such as from the inside of the refrigerator to the outside.

Well, no. And the process gets quite a bit more complicated with all the controls and valves involved. But its effect is remarkable. An air conditioner takes heat from a cooler place and dumps it in a warmer place, seemingly working against the laws of physics. What drives the process, of course, is electricity — quite a lot of it, in fact.

Types of Cooling Systems

- Central Air Conditioning system
- Heat Pumps
- Evaporative Air conditioning system
- Ductless Mini-Split Air Conditioners

Shri Vile Parle KelavaniMandal's Air Conditioning Plant is Central Type Air Condition System. The most common way to cool a home or Offices, or any commercial hall are with a central air conditioning system. The system includes an external condenser unit which sits outside your home and expels heat as well as an evaporator coil, which generally sits above your furnace and cools the air within your home. Finally, your furnace or air handle work with your AC using the fan to blow the chilled air through your home's duct work. As a central air conditioner is integrated with your furnace system, it can take advantage of the furnace filter and any additional air purifying equipment you have added. This helps to clean the air throughout your home

- When a liquid turns into a gas or "evaporates" it absorbs heat. This is why pouring water over your skin makes you feel cooler in hot weather. Air conditioners use a chemical compound known as refrigerant that turns from liquid to gas at low temperatures. Refrigerant moves through the air conditioning system, absorbing heat from your house and transferring it outdoors in a continuous cycle.
- Cold refrigerant is pumped through the evaporator coil. A fan blows air over the coil, and the refrigerant in the coil absorbs heat from the air. The now-cool air is blown into your ducts to be distributed through your home. As the refrigerant absorbs heat, it evaporates into a low-pressure gas.

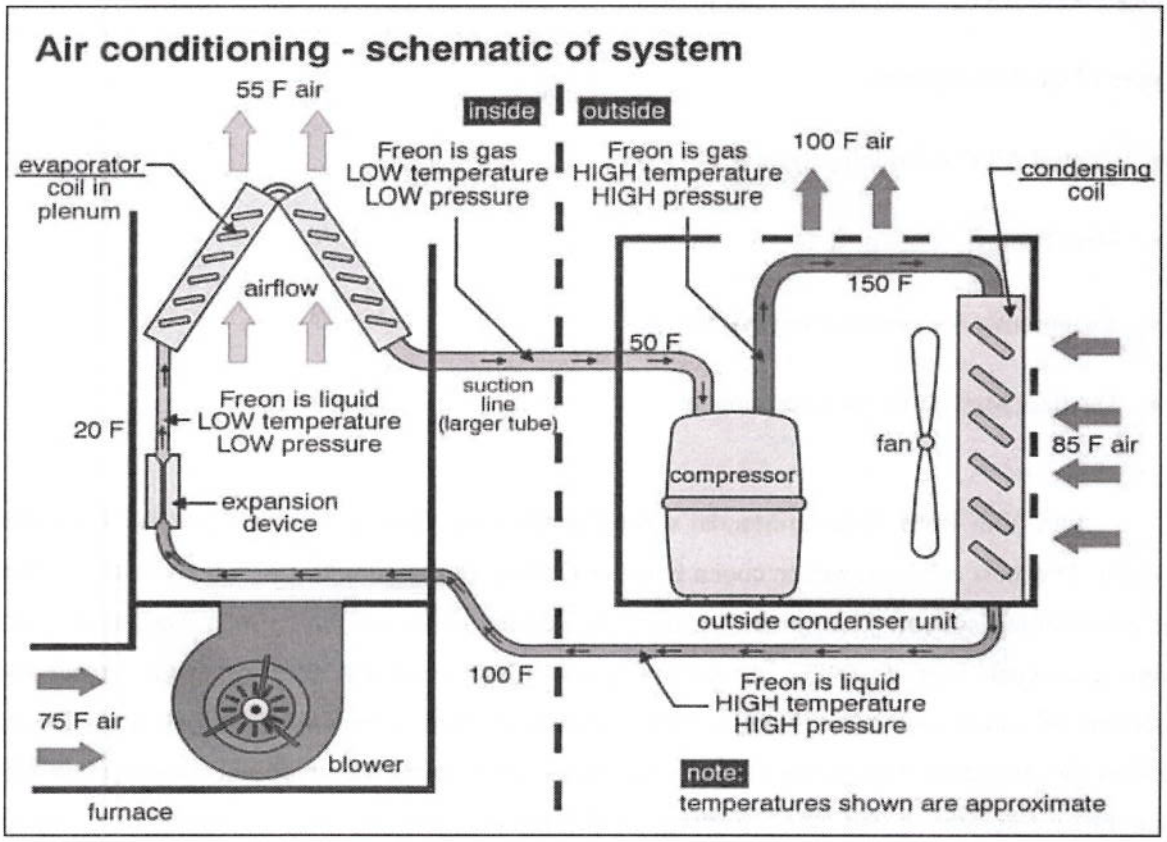


Figure 3 General Layout of Centralize Air Conditioning System.

- Hot, low-pressure refrigerant gas moves to the compressor, which increases the pressure and temperature of the gas.
- Hot, high-pressure refrigerant gas moves to the condenser. The gas releases heat and, as it does so, it condenses back into a liquid.
- The liquid refrigerant flows to the expansion valve, which regulates how much refrigerant gets through to the evaporator. From here, the refrigerant flows to the evaporator to start the cooling cycle over again.

Types of Central Air Conditioning:

Central air conditioning systems come in two basic designs: split and packaged.

- **Split systems** are the most commonly used type, and are split between an outdoor and an indoor unit, as the name suggests.
- **In a packaged/ductless system**, all the components are housed in one unit that is installed outside your home. Split and packaged systems both contain the same components and can provide the same amount of cooling, but there are some differences.

Benefits of Central Air Conditioning System

- **Indoor comfort during warm weather** – Central air conditioning helps keep your home cool and reduces humidity levels.
- **Cleaner air** – As your central air conditioning system draws air out of various rooms in the house through return air ducts, the air is pulled through an air filter, which removes airborne particles such as dust and lint. Sophisticated filters may remove microscopic pollutants, as well. The filtered air is then routed to air supply duct-work that carries it back to rooms.
- **Quieter operation** – Because the compressor-bearing unit is located outside the home, the indoor noise level from its operation is much lower than that of a free-standing air conditioning

Specification of Components of Air Conditioning System.

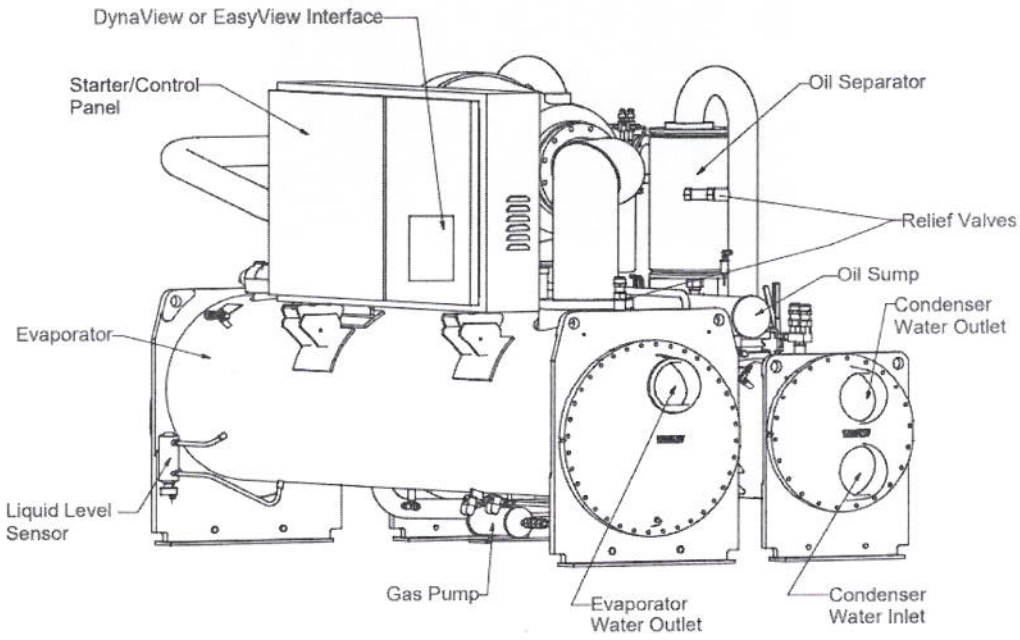


Figure 4 Actual Diagram of Major Components Arrangement in Air Conditioning Plant

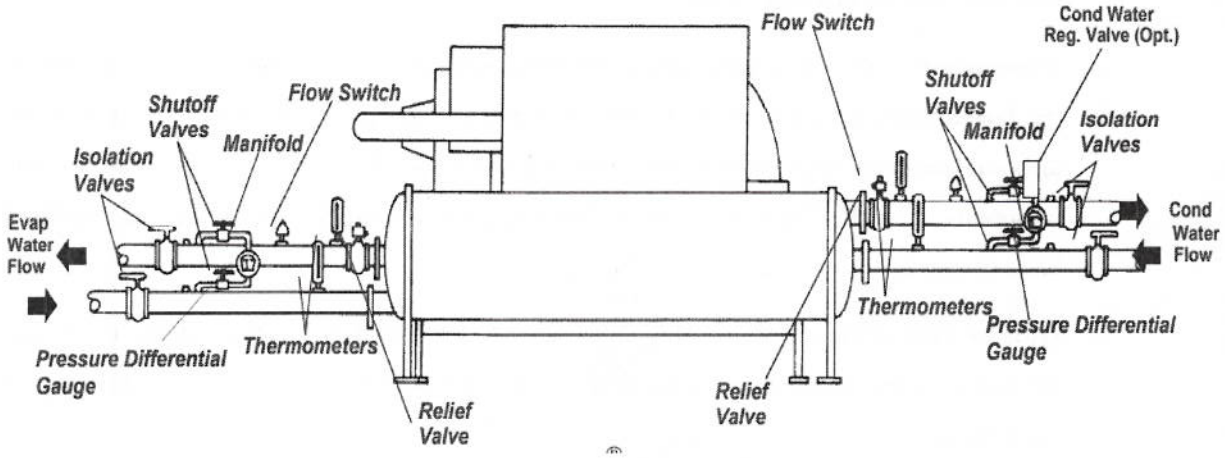
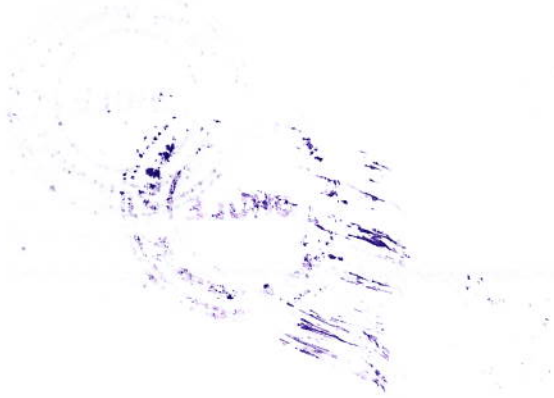


Figure 5 Compressor

Figure 6 Operating Panel Overview



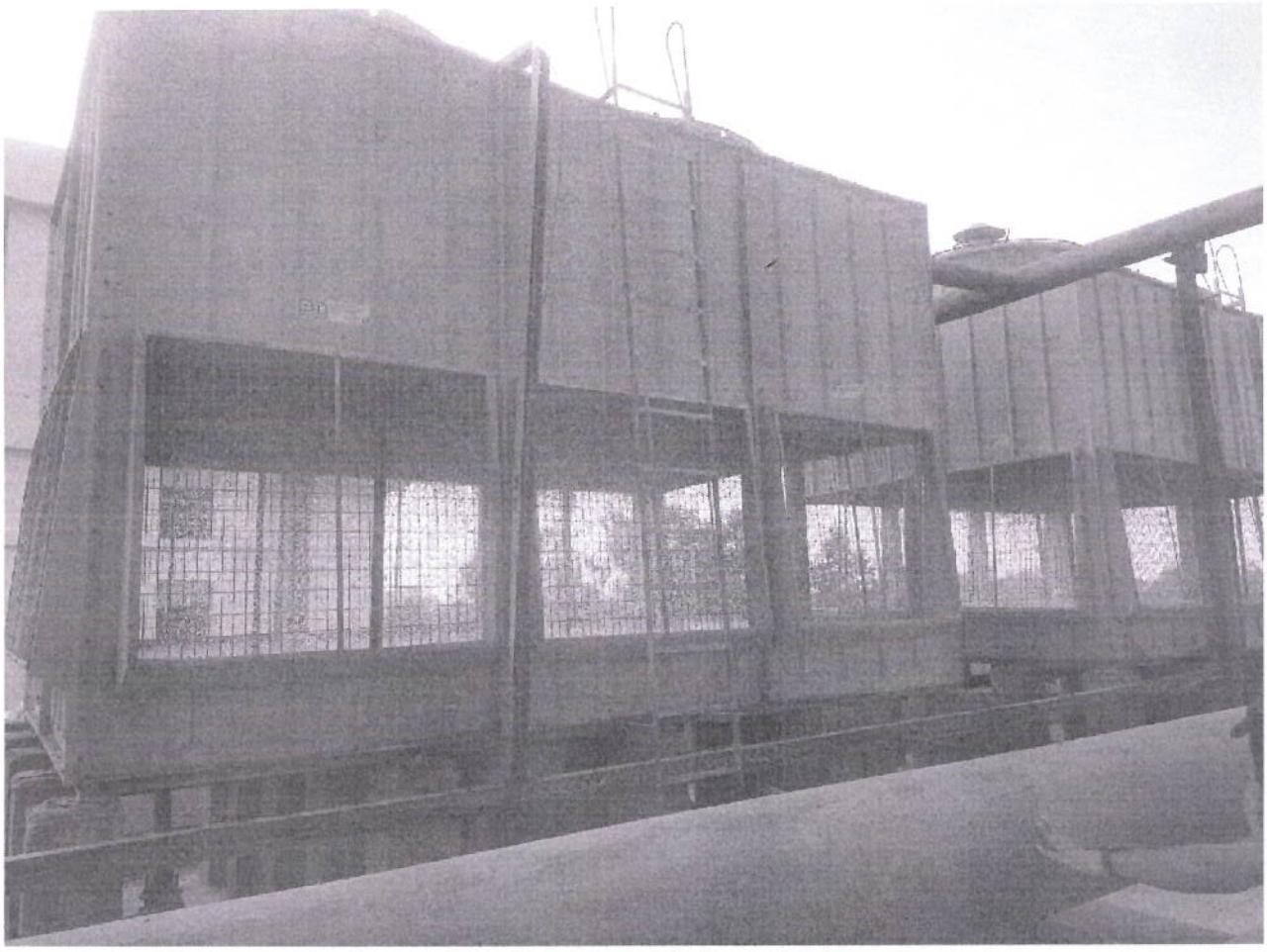


Figure 7. Chiller

Conclusion:

From this industrial visit students have learned the actual working of Air Conditioning System and the importance of Refrigerant in the industry. Students have also experienced the Function of whole system as well as their accessories & mounting. The Air Conditioning System work was running on R-134A refrigerant.

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