



Unit 3

- 1 Air Conditioner & Refrigerator: type, working & energy conservation approach
- ~~AC~~: Refrigeration: Transfer of heat from low to high temp. level by low boiling refrigerant. Type: i) Vapour compression: Heat flow from hot to cold body in natural condition but vice versa should occur here. Refrigerant absorbs heats & boils or evaporate at low temp. to form gas. Gas is then compressed to high pressure to transfer heat & turns back to liquid. ii) Vapour Absorption: Uses heat source (solar, fuel flame, etc). Mechanical compression process is replaced by thermal compression process. Thermal compression is achieved by absorbing fluid vapour into another carrier liquid, pumping this soln. to high pressure cycle, producing vapour from solution.
- AC: Elements are fans, filter, heating element, control system, grill, tray, refrigerating plant. Types of AC: i) Window AC: commonly used & cheap, slot space in wall & open space behind ii) Split AC: two parts outdoor & indoor iii) Centralized AC: In large buildings, hotels, airports, etc. Heavy duty. iv) Packaged AC: Used for cooling capacities in b/w these two extremes. Available in fixed rate capacities 3, 5, 7, 10 & 15 tonnes. Used in restaurants, halls, etc.

- 2 Diesel Generator: working, application, advantage.

Working: drives an alternator to produce electrical energy. Air is drawn in cylinder & compressed to a high ratio. Air is heated to temp. $700-900^{\circ}\text{C}$. Diesel engine also called compression ignition.

Application: i) Electrical power generation ii) Mobile power generation & transportation system \rightarrow railroads, ships, airplanes iii) Used as standby power plants iv) Utilized as peak load plants for some other type plants.

Advantage: i) Simple for installation ii) Simple layout iii) Limited quantity of cooling water required iv) No problem in ash handling v) Quickly started & put on load vi) Respond to varying load without difficulty.

Disadvantage: i) High maintenance & operating cost ii) Produce too much noise iii) Tough to construct on large scale iv) Working life is small.

4 HVAC

Heating, Ventilation, Air Conditioning. Refer to systems used for moving air b/w indoor & outdoor areas.

Energy saving opportunities:

- 1) Cold Insulation: Insulate all cold lines using economic thickness insulation to min. heat gains
- 2) Building Envelope :- Optimize air conditioning volume by false ceiling & segregation of critical area for AC by curtain
- 3) Building Heat Load Minimisation: Roof cooling, Roof painting, efficient lighting, air-to-air exchange.
- 4) Process Heat Loads Minimization: Flow optimization, Avoid heat gains, loss of chilled water;



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7. Cooling towers:

Reject heat into atmosphere. Inexpensive & dependable means of removing low-grade heat from cooling water. Impt part of chemical plants. Hot water from heat exchanger is sent to cooling tower. The water exits the cooling tower & is sent back to exchangers or other units for further cooling.