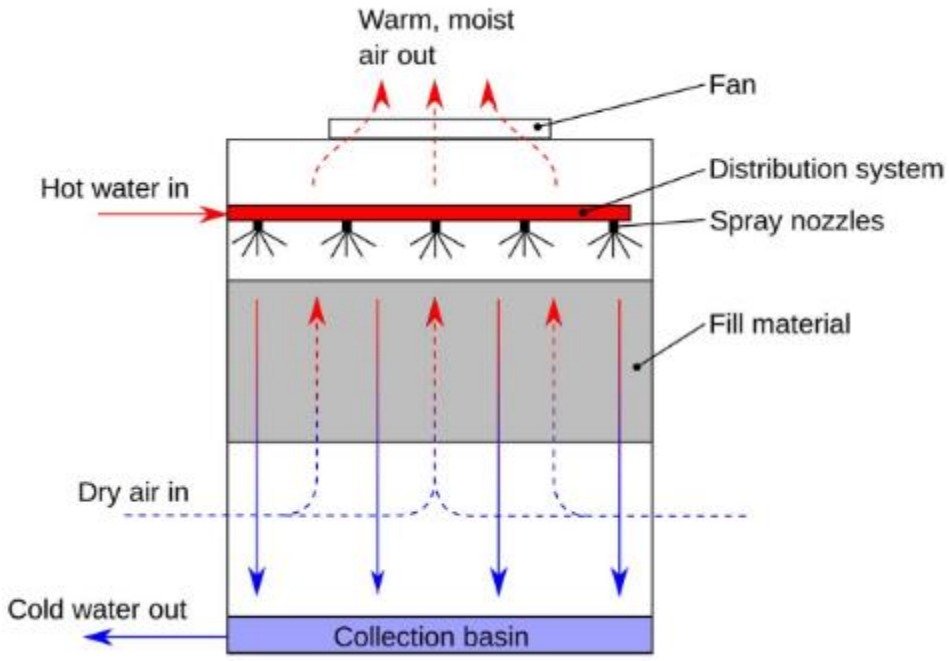
UNIT-5 COOLING TOWER AND LIGHTING SYSTEM

COOLING TOWER:

A **cooling tower** is heat removal device that uses water to transfer process waste heat into the atmosphere. All **cooling towers** operate on the principle of removing heat from water be evaporating a small portion of water that is recirculated through the unit.



Cooling tower is an important part of power plant. The basic **working principle of cooling tower** is to cool the hot water with the help of atmospheric air. Though it is widely used in different engineering sector and other refrigeration plant. The height of the cooling tower in thermal power plant is about 9 feet or above from the ground level. A water store unit called pond is placed at the base of the ***cooling tower***.

Insteam power plant, cooling tower first collects hot water from the condenser at a certain height from the ground level, after that the hot water falls down by the radial spray. The atmospheric air which is comparatively cool enters at the bottom of the tower.

Now the hot air in the cooling tower expose in the atmospheric air which reduces the temperature of the hot water by partial evaporation. This cooled water is collected in the pond at the base of the tower and pumped into the condenser for further use. Doing so, limited quantity of water can be used again and again.

It is used such type of power plant where supply of water is limited.

Some important factors which is essential for cooling tower to cool the water:-

1. Size and height of the cooling tower.
2. Temperature of the air.
3. Humidity of the air.
4. Arrangements of plate in the cooling tower.

5. Velocity of air entry of the cooling tower.
6. Accessibility of air to all parts of the cooling tower.

EFFICIENT OPERATION OF THE COOLING TOWER

Cooling towers may be generally cost-effective for industrial cooling compared to other options, but efficiency challenge can be a letdown. **Monitoring the efficiency factor is crucial** as it ensures the following:

- Reduced water consumption
- Energy savings
- Extended equipment service life
- Reduced operating costs

To keep the cooling tower running efficiently, three things are important: understand the type of cooling tower you are using, use chemicals efficiently and track down system water loss.

Energy Saving Opportunities in Cooling Towers

- Follow manufacturer's recommended clearances around cooling towers and relocate ormodify structures that interfere with the air intake or exhaust.
- Optimize cooling tower fan blade angle on a seasonal and/or load basis.
- Correct excessive and/or uneven fan blade tip clearance and poor fan balance.
- Replace splash bars with self-extinguishing PVC cellular film fill.
- Install new nozzles to obtain a more uniform water pattern
- Periodically clean plugged cooling tower distribution nozzles.
- Balance flow to cooling tower hot water basins.
- Cover hot water basins to minimize algae growth that contributes to fouling.
- Control cooling tower fans based on leaving water temperatures especially in case of smallunits

INDUSTRIAL APPLICATIONS:

- Water cooled air compressors
- Plastic Injection & Blow Moulding Machine
- Die casting machine
- Refrigeration and chilling plant
- Cold storage
- Anodizing processes plant
- Electrical power generation plant
- Water cooled air conditioning systems and VAM machines

LIGHTING SYSTEMS

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment.

Lighting is an area, which provides a major scope to achieve energy efficiency at the design stage, by incorporation of modern energy efficient lamps, luminaires and gears, apart from good operational practices

Lumen

It is a unit of light flow or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp. The most common measurement of light output (or luminous flux) is the lumen. Light sources are labeled with an output rating in lumens

Lux

It is the metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter.

Lamp Circuit Efficiency

It is the amount of light (lumens) emitted by a lamp for each watt of power consumed by the lamp circuit, i.e. including control gear losses. This is a more meaningful measure for those lamps that require control gear. Unit: lumens per circuit watt (lm/W).

Types of Lightings

a.Ambient Indoor Lighting

General or ambient lighting is intended to light up a room in its entirety, to provide a uniform level of illumination throughout the space, independently of other lighting sources. Moreover, its purpose is to ensure safe and easy traffic, as well as to create an overview of the room. The ambient light 'bounces' off the walls to illuminate as much space as possible

Types of fixtures that can provide general ambient indoor lighting:

- Chandelier
- Ceiling mounted fixture
- Wall-mounted fixture
- Traditional recessed fixtures and/or LED Downlights
- Track light
- Floor lamp
- Table lamp

Ambient Outdoor Lighting

Outdoor lighting is usually installed in order to ensure visibility and increase security around a building. It is also recommended to light up the exterior of the building, entrances and stairs to

reduce and perhaps eliminate the risk of injury that can occur when entering and leaving the building.

Types of fixtures that provide ambient outdoor lighting

- Spotlight
- Hanging fixture
- Garage and canopy lighting
- Post lantern
- Wall lighting
- Recessed fixture used in overhanging structures

Task Lighting

Task lighting sheds light on the tasks a person carries out in a given space such as reading, cooking, computer work, for which a brighter light is required in a smaller focal point of the room.

For a more pleasant lighting, it is often best to avoid harsh lights or lighting that casts troublesome shadows. It is also practical to install a single switch for focal lighting, independent from the room's overall lighting switch.

Types of Fixtures that Provide Task Lighting:

- Directional gimbal recessed fixture or downlight
- Pendant lighting
- Slim line bar and undercabinet
- Tape and extrusion
- Portableor desk lamp

Accent Lighting

Accent lighting is used mainly to focus on a specific point of interest or to achieve a desired effect. This type of lighting gives the impression of a larger room; it is more frequently used to highlight an architectural feature, a plant (in outdoor layout), a sculpture, or a collection of objects.

As a general rule, effective accent lighting requires the installation of three times more light on the focal point than ambient lighting generallyprovides

Types of Fixtures that Provide Accent Lighting:

- Track light
- Slim line bar and undercabinet
- Tape and extrusion
- Directional recessed fixture or downlight
- Wall-mounted fixtures

LED Lighting

The LEDs have the following merits over the filament lamps.

- Lesser power consumption (Less than 1 W/lamp)
- Withstand high voltage fluctuation in the power supply.
- Longer operating life (more than 1,00,000 hours)

Energy conservation Measures in Lighting

- Install energy efficient fluorescent lamps in place of "Conventional" fluorescent lamps.
- Install Compact Fluorescent Lamps (CFL's) in place of incandescent lamps.CFL's are highly suitable for places such as Living rooms, Hotel lounges, Bars, Restaurants, Pathways, Building entrances, Corridors, etc.
- Install metal halide lamps in place of mercury / sodium vapourlamps.These lamps are highly suitable for applications such as assembly line, inspection areas, painting shops, etc.
- Install High Pressure Sodium Vapour (HPSV) lamps for applications where colour rendering is not critical such as street lighting, yard lighting, etc.
- Install LED panel indicator lamps in place of filament lamps. These lamps are suitable in industries for monitoring, fault indication, signaling, etc.
- Grouping of lighting system, to provide greater flexibility in lighting control**.**
- Install microprocessor based controllers. Advanced lighting control system uses movement detectors or lighting sensors, to feed signals to the controllers
- Ensure optimum usage of day lighting.
- Installat servo stabilizer for lighting feeder for improving lighting efficiency
- Installation of high frequency (HF) electronic ballasts in place of conventional ballasts