

Control of Gaseous Pollutants

Process and equipment for the removal by

Chemical methods

Wastewater originates from homes, businesses, industry, as well as storm drains and rainwater runoff.

Generally, wastewater contains around 99.9% water by weight, with the remaining 0.1% representing dissolved solids or other suspended materials. This material may include excrement, detergents from washing clothes and dishes, food scraps, grease, oils, plastics, salts, sand, grit, and heavy metals.

Some wastewaters from industrial or agricultural processes may also contain chemicals that may be hazardous to the environment or to public health and which need to be neutralized or removed from the water before it can be safely reintroduced into the environment.

Mechanical wastewater treatment process

The initial stage of wastewater treatment involves mechanical processes, which remove some 20-30% of solids in the water. First, the wastewater is directed to a screen or a sieve drum that filters out impurities that are relatively coarse, such as leaves, textiles, paper, or other large materials. A series of screens are used with various degrees of fineness from several centimeters down to a few millimeters to screen

out coarse contaminants in the water. The speed with which the wastewater flows through the screens at each step is carefully controlled to assure the effectiveness of the screening process.

Biological wastewater treatment processes:

Following the mechanical treatment stage, effluent is passed to a biological-based process for further purification. Aeration tanks are utilized to add oxygen to the water and to put the water into circulation through the use of propellers. The oxygen stimulates the growth of bacteria and microorganisms which feed off of any organic contaminants in the water and convert those into inorganic substances. This process forms cultivated sludge flocks that float freely in the water.

Chemical wastewater treatment processes

Chemicals are used during wastewater treatment in an array of processes to expedite disinfection.

These chemical processes, which include chemical reactions, are called chemical unit processes and are used alongside biological and physical cleaning processes to achieve various water standards.

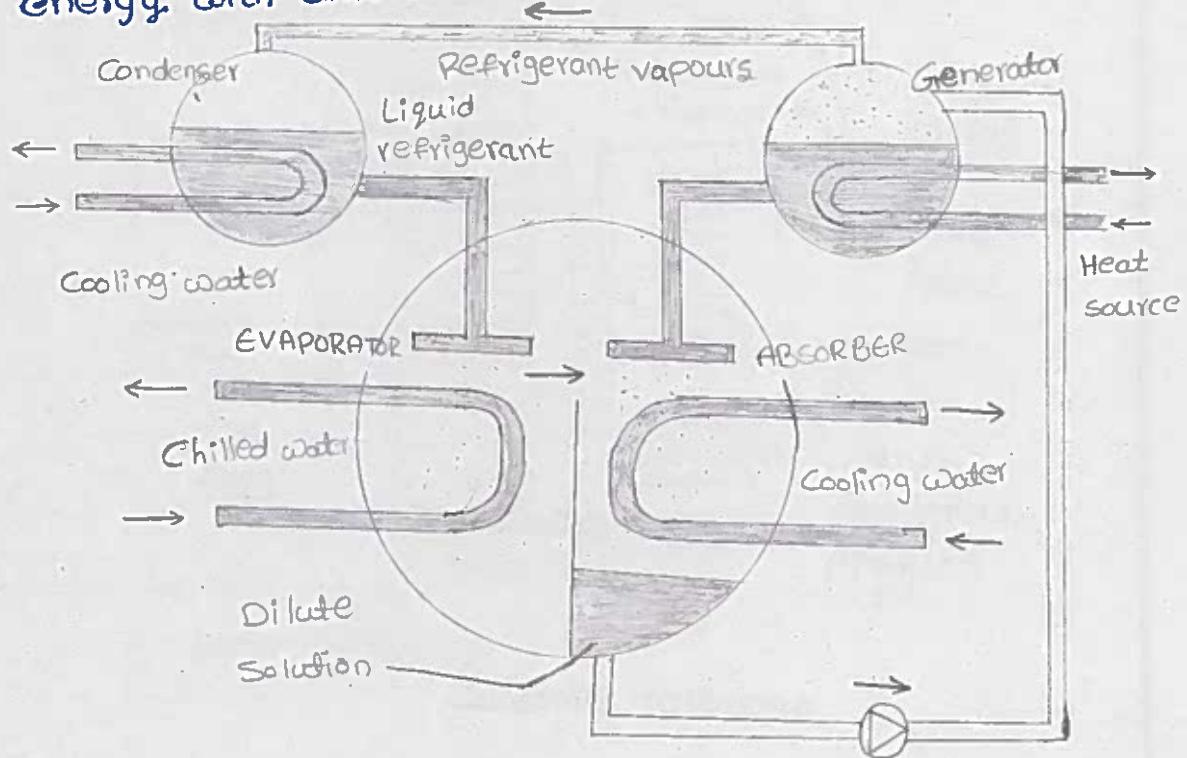
Specialized chemicals such as chlorine, hydrogen peroxide, sodium chlorite, and sodium hypochlorite act as agents that disinfect, sanitize, and assist in the purification of wastewater at treatment facilities.

Working principles and operation of absorption and adsorption equipment.

Absorption :-

Developments in absorption cooling technology present an opportunity to achieve significant improvements on micro-scale to buildings, coolings heating and power systems for residential and light commercial buildings. Their resultant effects are effective, energy efficient and economical.

- Absorption chillers are thermally driven chillers or refrigerators using a liquid refrigerant / sorbent solution and a heat source to provide cooling.
- They provide cooling to buildings by using heat. Also, they do not only use energy than conventional equipment, but they also cool buildings without the use of ozone depleting chlorofluorocarbons. Unlike conventional electric chillers which use mechanical energy in a vapour compression process to provide refrigeration, absorption chillers primarily use heat energy with unlimited mechanical energy for pumping



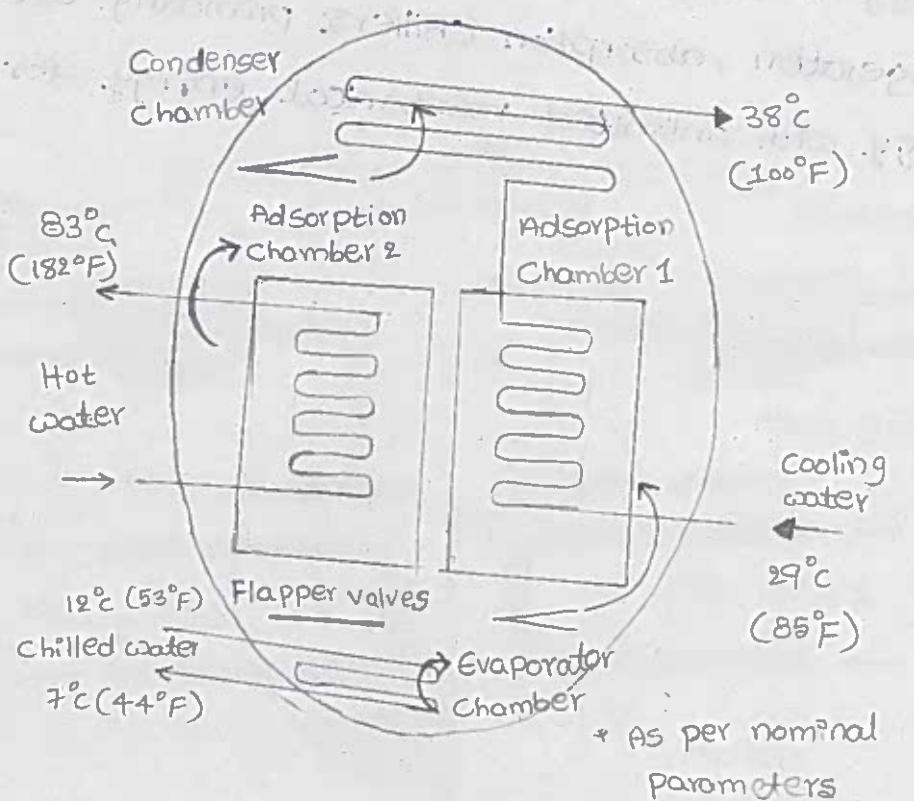
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working principle of an absorption chiller
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Adsorption:-

The principle of adsorption works with the interaction of gases and solids. With adsorption chilling, the molecular interaction between the solid and the gas allow the gas to be adsorbed into the solid.

The Adsorption Chamber of the chiller is filled with solid material, silica gel, eliminating the need for moving parts and eliminating the noise associated with those moving parts. The silica gel creates an extremely low humidity condition that causes the water refrigerant to evaporate at a low temperature.

As the water evaporates in the evaporator, it cools the chilled water. The adsorption chiller has four chambers; an evaporator, a condenser and two adsorption chambers. All four chambers are operated at nearly a full vacuum.



operating principle

Combustion and Condensation equipment

Combustion equipment

- Combustion equipments are those appliance that are used for burning fuels for heating.
- These includes heaters, ovens, stoves, furnaces, fireplaces, dryers, burners, stokers, and many more.
- Combustion equipments can be used for solids, liquids, and gaseous fuels.
- The design can be further identified by the fuel source such as oil, natural gas, coal, or wood.
- A furnace, or direct-fired heater, is a type of enclosed chamber where heat is generated by combustion of some type of fuel.

Condensation equipment :-

Condensation is the change of the state of matter from the gas phase into the liquid phase, and is the reverse of vaporization. The word most often refers to the water cycle.

- It can also be defined as the change in the state of water vapor to liquid water when in contact with a liquid or solid surface or cloud.
- Condensation nuclei within the atmosphere.

- When the transition happens from the gaseous phase into the solid phase directly, the change is called deposition.