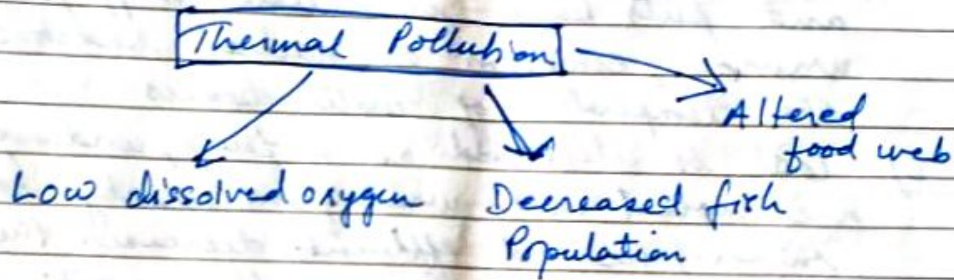


Thermal Pollution

Introduction - Thermal Pollution is the harmful increase in water temperature in streams, rivers, lake or occasionally coastal ocean waters. It is the degradation of water quality by any process that changes ambient water temperature. A temperature increase as small as 1 or 2 Celsius degrees (about 2 to 4 Fahrenheit degrees) can kill native fish, shellfish, and plants, or drive them out in favor of other species, often with undesirable effects.



Causes of thermal pollution - It occurs when an industry removes water from a source (eg - a river) uses the water for cooling purposes, and then returns the heated water to its source. Power plants heat water to convert it into steam, to drive the turbines that generate electricity. For efficient functioning of steam turbines, the steam is condensed into water after it leaves the turbines. This condensation is done by taking water from a water body to absorb the heat. This heated water, which is at least 15 degree Celsius higher than the normal, is later discharged back into the ~~hot~~ water body.

Sources of Thermal Pollution - The major sources of thermal pollution are discharge of

heated water or hot waste material into water bodies from -

- 1) Nuclear Power plant
- 2) Industrial effluents.
- 3) Domestic Sewage.
- 4) Hydro electric power
- 5) Coal fired power plants
- 6) Thermal Shock

Other causes are - Deforestation and Soil erosion

- 1) Nuclear power plants use water as cooling agent and puts back into water supply at 9-20° warmer, emission of nuclear reactors increase the temperature of water bodies
- 2) Coal is utilized as a fuel, condenser coil are cooled with water from nearby lake or river, heated effluents decrease the dissolved oxygen of water damaging the aquatic organisms.
- 3) Discharged water from steam electric power industry using turbo generators will have a higher temperature ranging from 6 to 9°C than the receiving water in modern stations using producing 100 MW nearly one million gallons are discharged in an hour, with increase in temperature of cooling water passing by 8 to 10°C
- 4) Domestic Sewage also causes rise in temperature of water bodies and emanates foul smelling gases resulting in death of water organisms.
- 5) Generation of hydro electric power sometimes results in negative thermal loading in water systems
- 6) When a power plant first opens or shuts down for repair, fish and other organisms

adapted to a particular temperature range can be killed by the abrupt change in water temperature known as thermal shock.

- 7) Deforestation also leads to rise in temperature as trees and other tall plants block sunlight.
- 8) Removal of vegetation far away from a stream or lake can contribute to thermal pollution by speeding up the erosion of soil into the water, making it muddy, which increases the light absorbed.

Effects of Thermal Pollution -

- 1) Decrease in Dissolved oxygen in water bodies
- 2) Increase in the metabolic rate of aquatic animals, as enzyme activity, resulting in these organisms consuming more food in a shorter time, which increases their need for oxygen.
- 3) High temperature limits oxygen dispersion into deeper water, contributing to anaerobic conditions.
- 4) Increase in bacterial levels when there is ample food supply. Many aquatic species will fail to reproduce at elevated temperature.
- 5) Primary producers are affected by warm water because higher water temperature increases plant growth rates, resulting in a shorter lifespan and species overpopulation.
- 6) Biotic effects - Changes in the environment may also result in a migration of organisms to another, more suitable environment, and the migration of organisms that normally only live in warmer water.

closure. As a result one has the problem of comprising food chain of the old and new environments, Biodiversity can also be decreased as a result.

Changes of even one to two degrees Celsius can cause significant changes in organism metabolism and other adverse cellular biology effects. Principal adverse changes can include rendering cell walls less permeable to necessary osmosis coagulation of cell proteins, and alteration of enzymes metabolism. These cellular level effects can adversely affect mortality and reproduction.

Control Measures -

- 1) Energy chips
- 2) Desalination Plants
- 3) Less nuclear Power
- 4) End of Shoreline deforestation
- 5) Prevent Soil erosion

Cooling ponds, manmade body bodies designed for cooling by evaporation convection and radiation cooling towers, which transfer waste heat to the atmosphere through evaporation and or heat transfer, cogeneration a process where waste heat is recycled for domestic and/or industrial heating purposes

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