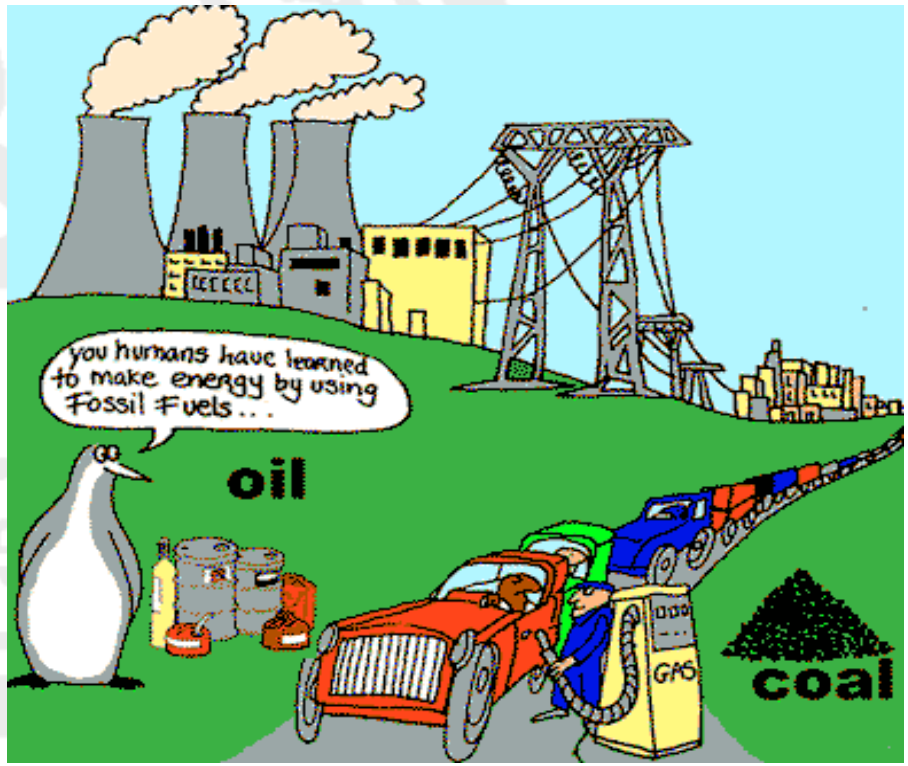
Thermal Pollution



Thermal Pollution

- The basic definition of thermal water pollution is the deterioration of water quality as a result of any process that changes ambient water temperature
- It is usually associated with the increases of water temperatures in a stream, lake, or ocean due to the discharge of heated water from industrial processes, such as the generation of electricity from the thermal power plants
- However this rise in the ambient water temperature can also occur in streams where shading vegetation along the banks is removed or where sediments have made the water more turbid. Both of these effects allow more energy from the sun to be absorbed by the water and thereby increase its temperature
- Instances in which the effects of colder-than-normal water temperatures can be also observed. For example, the discharge of cold bottom water from deep-water reservoirs behind large dams has changed the downstream biological communities in systems such as the Colorado River (Reference 1)

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- As a matter of fact nearly half of all water withdrawn in the United States each year is for cooling purpose of the electric power plants (Reference 2). Infact it's a common trend to withdraw water from a nearby body of surface water, then pass it through the plant and return the waste heat to the same source to exchange heat

- In addition to the emission of air toxics (the direct and indirect GHGs) from the thermal power plants contributing to the phenomenon of "Global Warming", this thermal water pollution is equally an issue to be given importance to considering the following effects of it:

Effects of Thermal Pollution

1. Direct Thermal Shock
2. Change in Dissolved Oxygen Level
3. Redistribution of Aquatic Species in a local community

Environmental Effects Elaborately Explained

- Warmer temperatures of the discharged effluents from the thermal power plants lower the dissolved oxygen content of the lake or stream by decreasing the solubility of oxygen in water.
- These warmer water also enhance the respiration rates of the aquatic organisms thus forcing them to consume oxygen faster
- With the decrease in the dissolved oxygen level and increase in the respiration rate of the aquatic species, breathing problems arise in the aquatic organisms which may prove to be fatal
- It also increases their susceptibility to disease, parasites, and toxic chemicals

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- Discharge of heated water into shallow water near the shore of a lake may also damage spawning and kill young fish
- The adaptability of the fishes and other aquatic organisms do not safeguard them from sudden and sharp changes in temperature of the effluent water from the thermal power plants
- These effect of sharp changes in water temperature when new power plants open up or when plants shut down for repair is known as thermal shock
- Fish and other organisms adapted to a particular temperature range can also be killed from thermal shock
- Many fish do die on the intake screens which are employed to prevent the fishes from clogging the heat exchanger-pipes

Concept of Thermal Enrichment

- It is the concept of using heated water released from the thermal power plants for beneficial purposes
- Warm water released from the power plants can be used for irrigation purpose to prolong the growing season of some species in frost-prone areas
- Cycled through aquaculture pens it can be also used to enhance the growth of commercially valuable fish and shellfish. For example, waste hot water is used to cultivate oysters in aquaculture lagoons in Japan and in New York's Long Island Sound and to cultivate catfish and redfish in Texas (Reference 3)

Continued:

- Heated water can be also used to heat buildings and greenhouses
- Can be run under sidewalks to melt snow in the cold countries
- To desalinate ocean water

Abatement Strategies for Thermal Water Pollution

- Using and wasting less electricity
- Restricting the amount of heated water discharged into the same source of water
- Employing wet or dry cooling towers to transfer the heat from the water to the atmosphere
- Particularly in areas where enough affordable land is available the heated water can be discharged into shallow ponds or canals, allowing it to cool and then reusing it as cooling water
- To return the heated water at a point away from the ecologically vulnerable shore zone

References

1. Rao. M N., Rao, H V N., “ Air Pollution” ISBN 0-07-451871-8, pp 252-253
2. Thermal Pollution.htm
3. http//:www.pollutionissues.com