



EFFECTS OF THERMAL POWER PLANT ON ENVIRONMENT

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ABSTRACT

Thermal Power Plants have been found to affect Environmental segments of the surrounding region very badly. Environmental deterioration is attributed to emission of large amount of SO_x, NO_x & SPM & RSPM which disperse over 25 Kms radius and cause respiratory and related ailments to human beings and animal kingdom. It also affects photosynthesis process, balance of minerals & micro and major nutrients in the plants, soil strata, structures & buildings get affected due to corrosive reactions.

Key words: Coal, Thermal power impact, Environment.

INTRODUCTION

Power generating units are mega project, which require not only huge capital investment but also various natural resources like, fossil fuels and water, thus create an immeasurable & everlasting impacts on the environment and generate tremendous stress in the local eco-system in spite of stringent government norms to control and mitigate the damages to the environment by the power plants.

Environmental Impacts and cost-benefit analysis of Power stations like STPS, Chandrapur, Gandhi Nagar, Gujarat, gas based power plant, Jhenor- Gandhar, Gujarat & STPS, Ramagundam, Andhra Pradesh carried out by Khan et al.¹, (1990) is discussed below.

Out of reported SO_x (3-37 µg/m³), NO_x (5-34 µg/m³) & SPM (53-482 µg/m³) the values of SPM are much higher than the limits of NAAQ standards². The maximum tolerable limits on annual average basis are SO₂ (60 µg/m³), NO_x (60 µg/m³) & SPM (140 µg/m³). The reported values of SO₂ and NO_x lies within the limits, however, they are toxic on long term basis. It is pertinent to note that the values of the pollutants reported are even after all the mitigative, modern and state of the art preventive control equipments installed and working in all the Power Stations.

The SPM also includes RSPM (Respirable suspended particulate matters) and both types of fine particles normally spread over 25 Kms from the Thermal Power station. These pollutants cause respiratory and related ailments to human beings and animal kingdom. Because of deposition of SPM on the plants, photosynthesis process of plants is affected very badly. These particles penetrate inside the plants through leaves & branches thereby creating imbalance of minerals & micro and major nutrients in the plants. All

these affect the plant growth very badly. Due to this no big industrial zone is developed within 20 Kms radius of the source and the habitations too are facing severe problems. Spreading & deposition of SPM on soil disturbs the contents of minerals, micro and major nutrients. Continuous and long term deposition of SPM causes the fertile and forest land to be unproductive for plants & farming.

Due to continuous & long lasting emission of SO_x & NO_x , which are the principal pollutants coal based plants, surrounding structures, buildings, monuments of historic importance & metallic structures too are affected very badly due to corrosive (Acid rain) reactions. Well known example of this is the victimized Tajmahal of Agra which is being deteriorated due to these toxic gases. It is also worth to note that very high amount of carbon dioxide (CO_2) emission (0.9-0.95 kg/kwh) from thermal power plants contribute to global warming leading to climate change.

Impact on water

The water requirement for a coal-based power plant is about 0.005-0.18 m^3/kwh . At STPS, the water requirement has been marginally reduced from about 0.18 m^3/kWh to 0.15 m^3/kwh after the installation of a treatment facility for the ash pond decant. Still the water requirement of 0.15 m^3/kwh = 150 Liters per Unit of electricity is very high compared to the domestic requirement of water of a big city.

Ash pond decant contains harmful heavy metals like B, As, Hg which have a tendency to leach out over a period of time. Due to this the ground water gets polluted and becomes unsuitable for domestic use. At Ramagundam STPS leakage of the ash pond decants was noticed into a small natural channel. This is harmful to the fisheries and other aquatic biota in the water body. Similar findings were noted for Chandrapur.

The exposure of employees to high noise levels is very high in the coal based thermal power plant. Moreover, the increased transportation activities due to the operation of the power plant leads to an increase in noise levels in the adjacent localities.

Impact on land

The land requirement per mega watt of installed capacity for coal, gas and hydroelectric power plants is 0.1-4.7 ha., 0.26 ha. and 6.6 ha. respectively. In case of coal based power plants the land requirement is generally near the area to the coal mines. While in the case of gas-based it is any suitable land where the pipeline can be taken economically. Land requirement of hydroelectric power plants is generally hilly terrain and valleys. 321 ha., 2616 ha. and 74 ha. of land were used to dispose flyash from the coal based plants at Ramagundam, Chandrapur and Gandhinagar respectively. Thus large area of land is required for coal based thermal power plant. Due to this, natural soil properties changes. It becomes more alkaline due to the alkaline nature of flyash.

Biological & thermal impact

The effect on biological environment can be divided into two parts, viz. the effect on flora and the effect on fauna. Effect on flora is due to two main reasons, land acquisition and due to flue gas emissions. Land acquisition leads to loss of habitat of many species.

The waste-water being at higher temperature (by 4-5°C) when discharged can harm the local aquatic biota. The primary effects of thermal pollution are direct thermal shocks, changes in dissolved oxygen, and the redistribution of organisms in the local community. Because water can absorb thermal energy with only small changes in temperature, most aquatic organisms have developed enzyme systems that operate in only narrow ranges of temperature. These stenothermic organisms can be killed by sudden temperature changes

that are beyond the tolerance limits of their metabolic systems. Periodic heat treatments used to keep the cooling system clear of fouling organisms that clog the intake pipes can cause fish mortality.

Socio-economic impact

The effect of power plants on the socio-economic environment is based on three parameters, viz. Resettlement and Rehabilitation (R & R), effect on local civic amenities and work related hazards to employees of the power plants. The development of civic amenities due to the setting up of any power project is directly proportional to the size of the project. The same has been observed to be the highest for the coal based plants followed by the natural gas based plant and lastly the hydroelectric plant. The coal based plant has the highest number of accidents due to hazardous working conditions.

A similar study was undertaken by Agrawal & Agrawal³ (1989) in order to assess the impact of air pollutants on vegetation around Obra thermal power plant (1550 MW) in the Mirzapur district of Uttar Pradesh. 5 study sites were selected northeast (prevailing wind) of the thermal power plant. Responses of plants to pollutants in terms of presence of foliar injury symptoms and changes in chlorophyll, ascorbic acid and S content were noted. These changes were correlated with ambient SO_x and suspended particulate matter (SPM) concentrations and the amount of dust settled on leaf surfaces. The SO_x and SPM concentrations were quite high in the immediate vicinity of the power plant. There also exists a direct relationship between the concentration of SPM in air and amount of dust deposited on leaf surfaces.

In a lichen diversity assessment carried out around a coal-based thermal power plant by Bajpai et al.⁴, (2010) indicated the increase in lichen abundance. Distributions of heavy metals from power plant were observed in all directions.

Manohar et al.⁵, (1989) have carried out the study on effects of thermal power plant emissions on atmospheric electrical parameters, as emissions from industrial stacks may not only cause environmental and health problems but also cause substantial deviation in the fair weather atmospheric electric parameters. Observations of the surface atmospheric electric field, point discharge current and wind in the vicinity of a thermal power plant were found to be affected.

Warhate⁶ (2009) has studied the impact of coal mining on Air, Water & Soil on the surrounding area of coal mining at Wani dist. Yavatmal. Environmental segments namely air, water & soil in this area are affected within 10-15 Kms from the source. Human beings, animal kingdom, plants & soil are extensively affected within 5 Kms of the source.

CONCLUSION

Thermal Power Plant affects environmental segments of the surrounding region very badly. Large amount of SO_x, NO_x & SPM are generated which damage the environment and are highly responsible for deterioration of health of human beings, animal kingdom as well as plants. Emission of SPM & RSPM disperse over 25 Kms radius land and cause respiratory and related ailments to human beings and animal kingdom.

SPM gets deposited on the plants which affect photosynthesis. Due to penetration of pollutants inside the plants through leaves & branches, imbalance of minerals, micro and major nutrients in the plants take place which affect the plant growth severely. Spreading & deposition of SPM on soil, disturb the soil strata thereby the fertile and forest land becomes less productive. Because of continuous & long lasting emission of SO_x & NO_x, which are the principal pollutants emitted from a coal based power plant, structures & buildings get affected due to corrosive reactions.

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