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Research Paper

Environment Impact Assessment of Thermal Power Plant for Sustainable Development

Engineering

KEYWORDS : Thermal Power plant, Environment Impact assessment, Open cycle system, Close cycle system, SOX, NOX.

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ABSTRACT

Thermal Power plants are the major source of generation of electricity for any developing country. The thermal power plant has serious impacts on land, soil, air and various social impacts the thermal power plant are also said to emit large amount of mercury and generate large quantity of fly ash which destroys the surrounding environment. These plants also consume a large amount of water. Due to these problems they require a proper Environmental impact assessment before commencement of the project which is not done judiciously in our country. Various mitigation measures for the control of pollution caused by thermal power plants along with some new technologies are discussed.

1. INTRODUCTION

Environment assessment involves a study to determine any unique environmental attributes from endangered species to existing hazardous waste to historical significance. Environment Assessment procedure ensures consideration of environmental implications before making a final decision of assessing the environmental attribute. Process of assessment analyses the effects on environment and is useful for reporting those effects undertaking a public consultation exercise and lastly it reveals decision to public after reviewing the comment of the report. One of the main strengths of environmental assessment (EA) is its flexibility. Project planning processes can integrate EA as essential step giving sensitivity to the social and economic as well as environmental impacts of projects. In this way project managers can compensate shortcomings in the project planning process.

2. NEED FOR EIA

As per EIA notification 2006 by Ministry of Environment and Forests (MoEF) any new project in any part of India or the expansion or modernization of any existing industry or project listed in the Schedule–I (Thermal Power Plants) shall submit an application to the Secretary, MoEF, New Delhi.

The application shall be made in the proforma specified in the notification and shall be accompanied by a project report which shall, inter alia, include an Environmental Impact Assessment Report, prepared in accordance with guidelines issued by the Ministry of Environment & Forests. In all Thermal Power Projects, activities must co-exist satisfactorily with its surrounding environment so as to reduce the environmental impact envisaged due to the proposed project. To control the impacts, proper environmental management plan has to be implemented by the proponents, which makes environmental protection as essential requirement(Smith and Egan, 1979).

As per the guidelines of the Ministry of Environment and Forests (MoEF) July 2012. Government of India, Environmental Impact Assessment (EIA) is a prerequisite for launching any major development project. The EIA report presents the objectives and scope of this study, the environmental baseline status of the project area, identification of major environmental impacts, and prediction of various impacts during and after the proposed developmental activities, evaluation of these impacts, followed by suggestions for effective environmental management plan to minimize the adverse impacts.

3. PROPOSED 540 MW POWER PLANT

The proposed 540 MW coal fired power plant will be a base load station comprising four (4) CFBC coal fired steam generators and its auxiliaries and four Steam Turbine Generators & its Auxiliaries. The following are the project highlight of the plant (TED, 1997).

4. OBJECTIVES

- Environmental monitoring to establish the baseline environmental status of the study area
- Identification of pollution levels that may rise due to establishment of the proposed power plant
- Prediction of impacts on environmental attributes due to proposed plant
- Evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted Environmental Impact Assessment methodologies

Fig-1 Showing location map of the study area



A) PROJECT HIGHLIGHTS

Table 1: Showing the Project Highlights of the study area

Location	Thamminapatnam and Mommidi village,Chillakur Mandal, Nellore District, Andhrapradesh
Capacity	Phase- I 2×135 Phase- II 2×135
Land Requirement	480 acres
Mode of operation	Base load
Fuel	Imported coal and Indian coal
Fuel Source	Imported coal from PTC &International Traders Indian coal from domestic sources

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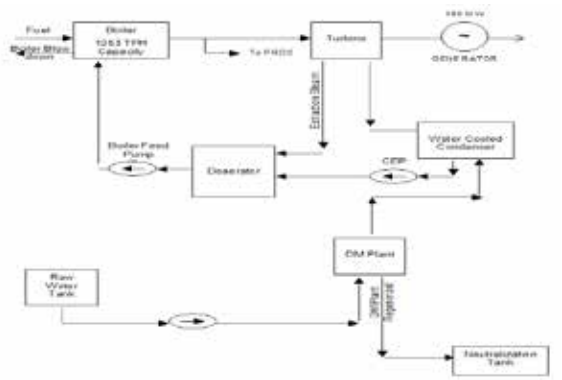
Type of cooling system	Induced Draft cooling towers
Source of water	Kandaleru creek

B) PROCESS FLOW CHART THERMAL POWER PROJECT

Fig 2: Showing the flowchart of thermal power plant



5. RESULTS AND DISCUSSION

- The proposed power plant will result in emission of particulate Matter, Sulphur dioxide and oxides of nitrogen due to burning of coal in the boilers.
- The boiler will be based on Circulating Fluidised Bed Combustion Technology. Boilers are designed for the worst coal quality of 24 %ash and sulphur content of 3.15 %.
- SEPL will initially commission 2×135 MW plant under Phase-1. 2×135 MW will be commissioned under phase-II making the total installed power generation capacity of the plant at 540 MW. However predictions are carried out for both phase –I and Phase-II to estimate the cumulative impact (CES, 2009).
- As the plant will use either 100% imported coal or blend coal having ratio of 70 % imported coal and 30% Indian coal, predictions are estimated for both the scenarios as shown below:

Table 2: Showing the Operation and Capacity Scenario

	OPERATION	CAPACITY
SCENARIO-A	100% imported coal	Phase-I and Phase-II
SCENARIO-B	100% blend coal(70% Imported coal and 30% Indian coal)	

a) EMISSION DETAILS

i) The emission details and results of phase-I and phase-II related to imported and blend coal are given bellow:

Table 3: Showing the imported coal and blend coal phases

	IMPORTED COAL		BLEND COAL	
	PHASE-I	PHASE-II	PHASE-I	PHASE-II
	2×135 MW	2×135 MW	2×135 MW	2×135 MW
No. of Units	2	2	2	2
Capacity of each boiler, TPH	460	460	460	460
Coal Consumption (t/hr/units)	59.3	59.3	77.15	77.15
Sulphur content (%)	3.15	3.15	1.87	1.87
No. of stacks	1	1	1	
Number of flues	2	2	2	2
Height of stack (m)	220(combined stack with two parallel flues)		220(combined stack with two parallel flues)	
Diameter of flue(m)	3.43	3.43	3.43	3.43
Temperature of flue gas(°C)	120	120	120	120
Velocity of flue gas (m/s)	20	20	20	20
Particulate matter at outlet of ESP (g/sec/flue) (based on 100 mg / Nm³ at outlet)	14.38	14.38	14.38	14.38
Sulphur dioxide emission (g/sec/flue) (NAAQS, 2006)	103.77(After Lime Injection)	103.77(After Lime Injection)	80.15(After Lime Injection)	80.15(After Lime Injection)
NO_x (g/sec/flue) (based on 400 mg / Nm³ at out let)	57.52	57.52	70.08	70.08

b) ESTIMATION OF GROUND LEVEL CONCENTRATIONS

Ground level concentration are computed taking into consideration emissions the following two scenarios

c) MAXIMUM CUMMULATIVE GROUN LEVAL CONCENTRATION

Ground level concentrations of SPM SO2 and NOx were estimated using the mean meteorological data to project the incremental increase of concentrations above base line concentrations due to emission from the power plant(State of Environment, 2005). The following table shows the summary of the same.

d) INCRIMENTAL GROUND LEVEL CONCENTRATION, ug/m³

Table 4: Showing the Concentration

	Suspended particulate Metter	Sulphur dioxide	Oxide of Nitrogen
SCENARIO –A	3.80	27.45	15.72
SCENARIO -B	4.51	20.65	18.06

e) POST PROJECT SCENARIO

Predicted maximum ground level concentrations considering 24-hr mean meteorological data of summer season superimposed on the maximum base line concentrations obtained during the study period to estimate the post project scenario(Fulekar, 2013).. The ov5erall scenario with predicted concentrations over the maximum baseline concentrations is shown below.

f) OVERAL SCENARIO WITHIN STUDY AREA (ug/m³)

Table 5: Showing the overall scenario of the study area

24-Hourly Concentration	Suspended particulate Metter(SPM)	Sulphur Dioxide(SO2)	Oxide of Nitrogen (NOx)
SCENARIO –A (Phase –I+ Phase –II with imported coal)			
Baseline scenario(max)	158	16.2	18.3
Predicted Ground level Concentration (max)	3.80	27.45	15.72
Overall Scenario (Worst case)	161.80{200}	43.65{80}	34.02{80}
SCENARIO –B (Phase –I + Phase –II with Blend coal			

Baseline **scenario(max)**	158	16.2	18.3
Predicted Ground level Concentration (max)	4.51	20.65	18.06
Overall Scenario (Worst case)	162.52{200}	36.85{80}	36.36{80}

NOTE: The values in parentheses are the CPCB limit for rural and residential areas.

6. CONCLUSION

On studying the whole thermal power plant we have come to a curb that though thermal power plant generates electricity but it is troublesome for the environment so we have to deal it with the technique mentioned in our research for educating its consequences.

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