Environmental Impact Assessment of Kota Super Thermal Power Station

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Abstract- Environmental Impact Assessment (EIA) is an important management tool for ensuring optimal use of natural resources for sustainable development. A beginning in this direction was made in our country with the impact assessment of river valley projects in 1978-79 and the scope has subsequently been enhanced to cover other developmental sectors such as industries, thermal power projects, mining schemes etc. To facilitate collection of environmental data and preparation of management plans, guidelines have been evolved and circulated to the concerned Central and State Government Departments. EIA has now been made mandatory under the Environmental (Protection Act, 1986 for 29 categories of developmental activities involving investments of Rs. 50 crores and above. In present study we have studied environmental aspects of kota super thermal power on Kota city.The KSTPS in Rajasthan was commissioned in 1983 and presently operating at 1045MW capacity,The Kota Super Thermal Power Station came in five stages and a total of 7 units have been commissioned.KSTPS is situated at the left bank of "Chambal River" in Rajasthan principal industrial city Kota.The present total area covered under KSTPS is 688 ha.The power generation system comprises mainly boiler, turbine, generator and transformers with accessories all arranged to operate as complementary parts of a common monolithic set.The allowable limits for discharge of water as specified in Schedule 4 of Environmental Protection Act And Amendment 1983 isAmmonical Nitrogen - 50,Arsenic-0.2,Biochemical oxygen demand-30,Cadmium -2, Chemical oxygen demand -250, Chromium hexavalent-0.1, Chromium total-2, Copper-3,Cyanide-0.1,Fluoride-2,PH-5.5-9.0Phenols-1,Dissolve Phosphate -5,Residual Chloride 1,Sulphide 2,Total Suspended Solid 100,Zinc 5.0 . Various effluent samples are analysed to assess the effluent quality from KSTPS.Any major industrial activity have tendency to degrade the environment viz. air environment, water, noise, land and biological also. It is duty of every industry it should have its own environmental unit that allow to minimum quantity of pollutants emit into environmental and keep this pollutant range with in permissible limit described according to central and state pollution control board and MOEF. So we should think in the terms of sustainable development means development without destruction.

Index Terms- KSTPS, MOEF,EIA, pollutants

I. INTRODUCTION

Environmental Impact Assessment (EIA)

The planned development in the power sector of Rajasthan was initiated to meet the growing demand and with a view to create the status own power generating capacity under the implementation programe initiated by RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED. The KSTPS in Rajasthan was commissioned in 1983 and presently operating at 1045MW capacity.

Table-1 Per unit power generation capacity

STAGES	UNITS	CAPACITY (Mw)	COMMISONING DATE
I	Unit – 1 Unit - 2	110 110	17 Jan 1983 13 July 1983
II	Unit – 3 Unit – 4	210 210	25 Sept 1988 01 May 1989
III	Unit – 5	210	26 March 1994
IV	Unit – 6	195	13 July 2003
V	Unit – 7	195	30 May 2005

II. PROCESS DESCRIPTION:-

Raw material - coal and water.Coal requirement for Existing plant is 17000tonns per day and for the proposed expansion will be 2800tonnes per day.The power generation system comprises mainly boiler, turbine, generator and transformers with accessories all arranged to operate as complementary parts of a common monolithic set. The super saturated steam from the boiler of designed

pressure and temperature devices the turbine which in turn devices the generator where mechanical energy is converted into electrical energy.

III. ENVIRONMENTAL CONSULTANT:-

KSTPS gives contract to provide environmental labs on yearly tender basis for conducting environmental studies and environmental monitoring in KSTPS contract duration start from 1 May of every year . In year 1999-2000 the contract was given to M.S. AQUARIA LABS PRIVATE LIMITED. For the year 2000-2001 contract was given CTRL (Chemical Testing And Research Laboratory) and for the year 2001-2002 the contract was given to AQUARIA LABS again .And 2002-2003 the contract was given to POORVA ENVIROTECH SERVICES. Report on environmental management and performance evaluation of pollution control equipment at KSTPS is done regularly by BHEL Pollution Control Research Institute, Ranipur, Haridwar.

IV. AIM OF STUDY –

Study of KTPS is aimed at assessment of environmental status, leading to identification evaluation of environmental impacts. This study would also provide data on present status of

(i) Stack emission monitoring
(ii) Fugitive emission
(iii) Water usage – recycling and resources
(iv) Soil quality
(v) Noise environment

V. ENVIRONMENTAL STATUS AND QUALITY IN AND AROUND KSTPS:-

The intensity of environmental impacts from a specific project depends on several factors such as types of process (physical, chemical fuel combustion process) involve in the developmental project , processing capacity (scale or size of the project) level of pollution control measures , project location , surrounding geomorphology etc. to assess environmental quality prevailing in the surrounding area prior to implementation of the proposed project. Environmental quality of KSTPS is assessed in various area through quantitative and qualitative assessment viz-

-Air Quality
-Water Quality
-Noise Environment
-Coal, Ash and Soil quality

Sr. No.	Environmental Component	Sampling Locations	Sampling Parameters	Total Sampling Period	Sampling Frequency	Methodology
1	Meteorology	One central location	Temperature, Wind Speed, Wind Direction	3 months	Hourly	The meteorology parameters were recorded using automatic micro-meteorological equipment consisting of anemometer, wind wane and thermometer. Review of secondary data collected from IMD station at Ramagundam
			Rainfall	3 months	Daily	Rainfall was recorded every morning at 0830 hours
			Relative Humidity, Cloud Cover	3 months	Hourly	Humidity recorded using wet and dry thermometer and psycometric charts on hourly basis.
2	Ambient Air Quality	4 locations	As per NAAQS 2009	Two days per week for 13 weeks	24 hourly	Gravimetric method for $PM_{2.5}$ and PM_{10}. Modified West & Gaeke method for SO_2 (IS-5182 part-II 1969) using Tetrachloro mercurate 0.01 N absorbing solution. Jacob-Hochheiser method (IS-5182 part-IV 1975) for NOX using Sodium Arsenate absorbing solution of 0.01 N absorbing solution. CO was measured by GC method.
3	Water Quality	6 locations (3-Surface water 3-Ground water)	As per IS:10500-2012	Grab sampling	Monthly once in study period	As per APHA methods. The conductivity, temperature were analyzed at site laboratory and rest of the parameters were analyzed at VIMTA's Central Laboratory at Hyderabad.
			Heavy metals (As, Hg, Pb, Cd, Cr^{+6}, Total Cr, Cu, Zn, Se, Fe)	Grab sampling	Once during study period	
4	Noise	10 locations	Leq	Hourly readings for 24 hours	Once during study period	Integrated on hourly basis
5	Soil	10 locations	Soil profile, Chemical constituents, Suitability for agricultural growth	Composite sample up to 90-cm depth	Once during study period	Analysis was carried out as per Soil Chemical analysis by ML Jackson
6	Terrestrial Ecology	Total study area	Flora and fauna	Field observations	Once during study period	Through field visits and collected secondary data. Count and quadrate method

AIR QUALITY-

(1)Determination of moisture contents in stack gases
(2)Determination of stack gas velocity and volumetric flow rate.
(3)Determination of particulate matter in stack gases
(4)Determination of gaseous pollutants such as SO2, SO3,NOx etc.

Table-2 Air quality parameters for emit in the environment

SR.N.	DESCRIPTION	PRESCRIBED LIMIT
1	Stack Emission- SPM	
	Unit-1	150mg/Nm^3
	Unit-2	150mg/Nm^3
	Unit-3	150mg/Nm^3
	Unit-4	150mg/Nm^3
	Unit-5	150mg/Nm^3
	Unit-6	150mg/Nm^3
	Unit-7	50mg/Nm^3
2	Ambient Air Monitoring-SPM	500micro gram/m^3
3	SO_2	120micro gram/m^3
4	NO_x	120micro gram/m^3
5	CO	500micro gram/m^3

Techniques For Ambient Air Quality Monitoring-

Parameters	Test Method	Low Detection Limit ($\mu g/m^3$)
Respirable Particulate Matter, PM_{10}	Respirable Dust Sampling /High Volume Sampling (Gravimetric)	5.0
Particulate Matter, $PM_{2.5}$	FRM Method/Low Volume sampling (Gravimetric)	5.0
Sulphur dioxide (SO_2)	Modified West and Gaeke Method	4.0
Nitrogen dioxide (NO_x)	Sodium Arsenite method	4.0
Carbon Monoxide (CO)	Adsorption and extraction followed by GC-MS analysis	50
Ozone (O_3)	Spectrophotmetric method	2.0

Table-3 Different observation of stack monitoring

WATER

SR.N.	PARAMETERS	VALUE
1	Initial Weight Of Thimble(W1)	158.09 gm
2	Final Weight Of Thimble(W2)	250.71 gm
3	Ambient Temperature(T_m)	323K
4	Stack Temperature(T_s)	371K
5	Avg. Static pressure(H)	821N/m^2
6	Avg. Dynamic pressure(P)	629 N/m^2
7	Volume Of condensate(V_c)	965m^3
8	Diffential pressure(P_m)	192 N/m^3
9	Sampling time(t)	7.30am
10	Area Of Stack at Sample(A_s)	100.571m^2
11	Flue diameter	8m
12	Flue gas velocity/flue	28m/sec.
13	Volumetric flow rate	950Nm^3/sec.
14	Rate of coal combustion	2500 ton/day/unit
Estimated Emission of Gases and Particulate Matter		
15	Sulphur dioxide	1109.5 g/s/unit
16	Nitrous and Nitrate oxides	452.2 g/s/unit
17	Suspended particulate matter	25.49 g/s/unit

ENVIRONMENT-

Total water requirement of KSTPS is around 3155750m3/day. This includes water require for condenser cooling, boiler make up and other large single use of water is for condensing low pressure of steam leaving the turbine. There are no changes in physic chemical characteristic of this water by the process except for an increase in its temperature. Fraction of water consumed as condenser cooling water, Auxiliary cooling water, D. M. plant ,Water back wash and regeneration water, service water and potable water is 86.88%, 11.54%, 0.34%, 0.33%, 0.62% and 0.29% respectively.

To assess the water quality of KSTPS a number of sample are regularly collected from with in and around the plant. These sample are then analyzed in laboratory for various parameter and compared with applicable standard.

Table-4 Prescribed limits for water effluent discharge

SR.N.	PARAMETER	VALUE LIMIT
1	Ammonical Nitrogen	50
2	Arsenic	0.2
3	Biochemical oxygen demand	30
4	Cadmium	2
5	Chemical oxygen demand	250
6	Chromium hexavalent	0.1
7	Chromium total	2
8	Copper	3

9	Cyanide	0.1
10	Fluoride	2
11	Iron	3.01
12	Lead	0.01
13	Manganese	2.0
14	Mercury	0.01
15	Nickel	3
16	Nitrate	10
17	Oil &Greese	10
18	P^H	5.5-9.0
19	Phenols	1
20	Dissolve Phosphate	5
21	Residual Chloride	1
22	Sulphide	2
23	Total Suspended Solid	100
24	Zinc	5.0

Table- 5 Water quality assessment from different location

Sr. N.	Site	pH	TDS	Total Alkalinity	Chloride	BOD	Phosphate	Nitrate	Fe
1.	Ash pond outlet	7.8±0.625	1.143±0.137	420±102	312.4±54.12	40.204±5.623	6.543±0.514	10.289±1.361	1.21±0.411
2.	Ash pond inlet	9.4±0.215	17.540±1.584	680±58	410.6±64.3	36.036±2.341	10.27±0.763	15.474±3.209	1.58±0.313
3.	Common plant drain	8.7±0.103	18.90±5.854	380±62.3	430.2±29.50	25.610±3.104	17.02±1.74	20.173±0.421	2.01±0.014
4.	Oil handling area	8.1±0.402	7.101±2.114	400±24.4	200.5±40.12	21.384±2.120	7.21±0.43	10.211±0.312	1.41±0.121
5.	Coal handling area	9.1±0.323	19.103±2.432	230±54.21	230.1±34.10	17.209±1.397	11.14±2.13	18.015±0.189	2.78±0.155
6.	D. M. plant effluents	7.9±0.7	3.184±1.075	330±44.23	190.7±26.174	15.131±2.417	13.481±1.512	14.154±0.216	1.40±0.183
7.	Water treatment plant	7.1±0.5	2.001±0.124	74±12.164	102±12.342	0.0	1.002±0.004	5.284±0.641	1.05±0.259
8.	Township STP	7.2±0.4	2.211±0.132	86±10.032	120±18.275	0.128±0.004	3.104±0.014	4.437±0.426	1.12±0.314
9.	Condenser cooling water	7.4±0.3	6.201±1.153	180±32.743	241.5±54.09	4.238±1.037	5.259±0.476	15.024±1.354	1.24±0.385

NOISE ENVIRONMENT-

The noise from KSTPS is very complex in nature as it is generated from multiple sources. The generated noise is distributed over the entire frequency spectrum. The important source of noise in KSTPS complex are-

*Boiler
*Turbine
*ESP
*Pumps
*Compressor
*Air Cooling Tank
*Coal Mills
*P.A. Fans, F.D. And I.D. Fans

To measure the noise in KSTPS the sound level meter is calibrated with the help of an acoustic calibration period. Except during day time when stream releases the noise from KSTPS is audible from distance of 1km. The noise measure at location in KSTPS premises ranges between 56 and 120db.KSTPS has provided earplugs/muffs for the operators working in high noise.

VI. CONCLUSION

Any major industrial activity have tendency to degrade the environment viz. air environment, water, noise, land and biological also.It is duty of every industry it should have its own environmental unit that allow to minimum quantity of pollutants emit into environmental and keep this pollutant range with in permissible limit described according to central and state pollution control board and MOEF. Thousands of people residing within 2KMs from KSTPS suffer from asthma attacks, cardiac problem and upper and lower respiratory problems associated with fine particles from power plant, and coal dust powder. People Living in Shakti Nagar , Waqf Nagar , Dadabari , Khishorpura , Complaining of Black shoot , coal dust coming from the the KSTPS , blacken their Terries , walls and cloths. In this study it has been found that most of the people are unaware of particulate matters and its impacts on their health. Even due to ignorance people thought that respiratory problems are seasonable that comes with winter and vanished with time when summer arrives. However KSTPS have its own environmental unit which monitor environmental data time to time, but some parameters are more than permissible limit specially particulate matter. So KSTPS need to lead towards more eco- friendly technologies. So the common there is a recognition of the linkage between environment and development and the need to deal with both in an integrated manner in order to address pressing global regional issues, So we should think in the terms of sustainable development means development without destruction.

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