Chandrapur Super Thermal Power Station- Environment Management Perspectives

V. Yeul, M.S. Dafade, M.B. Gutte, D.M. Shiwankar, C.M. Dange, V.R. Borkar and R.S. Ghuge*

Abstract-- **Chandrapur Super Thermal Power Station is a unit of Maharashtra State Power Generation Co. Ltd. (MSPGCL) owned by Govt. of Maharashtra. Its installed capacity is 2920MW (2 x 210MW + 5 x 500MW) power generation. The fuel utilized for power generation is coal. Electrostatic Precipitators (ESP) are provided to all these units. Also provided Four ETP's for treatment of trade effluent & STP for treatment of domestic effluents. The treated effluents are reutilized for ash slurry disposal. The treated effluents of ETP's and STP are completely recycled. In this communication, authors have explored the various steps taken by CSTPS for significant reduction of water/air/land foot prints to mitigate the diverse situations and for the protection of environment with electricity generation by taking into account of both ecological and socioeconomic aspects. It is pertinent to mention here that CSTPS is following the latest norms stipulated by MoEF&CC/CPCB/MPCB, wherein all the real time online Continuous Emission (CEMS)/Effluent (CEQMS)/Ambient Air Quality (CAAQMS) systems are connected to online portal developed by regulatory/statutory bodies.**

Key words -- CSTPS, Thermal Power, Environment Management, Protection of Environment, MPCB

I. INTRODUCTION

Chandrapur Super Thermal Power Station (CSTPS) is having installed capacity of 2920MW (2 x 210MW + 5 x 500MW) power generation. The fuel utilized for power generation is coal. Electrostatic Precipitator (ESP) is provided to all these units. The fly ash generated in furnace is arrested and removed by ESP technique. ESP of Unit No. 3 to 7 has provided Permanent FGCS by Ammonia dosing to reduce SPM and promptly performing all O&M practices and carried out all possible modifications to achieve SPM level of stack emission within statutory limits.

CSTPS Chandrapur is an environment adoring Power Plant of MSPGCL. CSTPS is complying almost all environmental norms prescribed by various apex as well as regulatory bodies time to time. CSTPS has carried out massive tree plantation.

II. ENVIRONMENT MANAGEMENT AT CSTPS

The best environmental management practices followed at CSTPS is as:-

a) Emission Control:

Electrostatic Precipitator (ESP) is provided to all units. The fly ash generated in furnace is arrested and removed by ESP technique. ESP of Unit No. 3 to 7 has provided Permanent FGCS by Ammonia dosing to reduce SPM and promptly performing all O&M practices and carried out all possible modifications to achieve SPM level of stack emission within statutory limits. To control NOx emission CSTPS has provided Over Fire Air (OFA) to the unit No. 3 to 9. CSTPS is achieving NOx emission within statutory limit prescribed by the Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India. To control the SOx emission CPCB has given time line up to March 2021 for installation of FGD. Dust suppression & fogger systems are installed to arrest fugitive dust emission in Coal Handling Plant (CHP). Online Continuous Emission Monitoring System (OCEMS) is installed at each unit & is connected to CPCB & MPCB server. The emission monitoring results are presented in Table No.1

b) Effluent Control and Effluent Recycling:

CSTPS has adopted zero discharge policy. Four ETP's of capacity 1600, 500, 100 & 675 m3/hr respectively for treatment of trade effluent and STP of capacity 240 M3/hr for treatment of domestic effluents are provided at CSTPS. The treated effluents are reutilized for ash slurry disposal. Recovery pump house is installed to recover & reuse water from ash bund. The treated effluents of ETP's and STP are completely recycled. The effluents are regularly analyzed from MoEF&CC, Govt. of India recognized laboratory. Online Continuous Effluent Quality Monitoring Systems (CEQMS) are installed at all four ETPs & connected to CPCB/MPCB server. CCTV cameras are also installed at ETP's to ensure zero discharge. CSTPS is also having the facility of rainwater harvesting.

*Corresponding author: R.S. Ghuge
Chief Engineer & Station Head, Chandrapur Super Thermal Power Station, Chandrapur, MSPGCL, (Govt. of Maharashtra u/t)-442404
Tel. No. 07172-220159 Email- envcellcstps@mahagenco.in

TABLE NO.1
Emission Monitoring Results

MONTH	PARAMETERS	UNIT # 3	UNIT # 4	UNIT # 5	UNIT # 6	UNIT # 7	UNIT # 8	UNIT # 9
	SPM (mg/NM^3)	84.00	79.33	94.75	98.00	93.75	23.83	24.25
	SO_2 (mg/NM3)	1146.46	1135.97	1348.93	1404.85	1333.49	1516.29	1532.50
Apr-19	NOx (mg/NM^3)	312.14	308.68	355.76	342.89	349.15	264.59	256.56
	Hg (mg/Nm3)	NA	NA	0.007	0.01	0.006	0.007	0.005
	NH_3 (PPM)	1.24	1.22	1.30	ND	1.30	ND	ND
	SPM (mg/NM^3)	84.67	81.00	94.67	86.50	93.50	24.00	25.25
	SO_2 (mg/NM3)	1222.30	1183.49	1378.23	1386.65	1379.34	1469.63	1490.16
May-19	NOx (mg/NM^3)	271.07	276.14	295.45	301.71	299.33	263.08	272.09
	Hg (mg/Nm3)	0.006	0.005	0.006	0.007	0.006	0.006	0.006
	NH_3 (PPM)	1.14	1.19	ND	1.27	1.31	ND	ND
	SPM (mg/NM^3)	82.75	80.75	91.13	86.50	90.67	26.50	22.25
	SO_2 (mg/NM3)	1245.95	1257.35	1396.07	1411.31	1439.27	1395.29	1403.07
Jun-19	NOx (mg/NM^3)	285.20	271.33	299.52	294.30	308.88	279.62	273.52
	Hg (mg/Nm3)	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	NH_3 (PPM)	1.18	1.14	1.30	ND	1.13	ND	ND
	SPM (mg/NM^3)	84.75	85.25	91.67	96.33	89.75	33.33	30.00
	SO_2 (mg/NM3)	1184.05	1165.91	1289.80	1266.41	1279.23	1370.28	1344.59
Jul-19	NOx (mg/NM^3)	283.38	275.37	291.29	280.29	294.99	277.41	283.72
	Hg (mg/Nm3)	0.006	0.005	0.006	0.007	0.007	0.005	0.005
	NH_3 (PPM)	1.18	ND	ND	ND	ND	ND	ND
	SPM (mg/NM^3)	91.50	87.13	89.88	91.75	S/D	32.25	28.75
	SO_2 (mg/NM3)	1123.94	1119.99	1235.48	1221.23	S/D	1240.31	1201.02
Aug-19	NOx (mg/NM^3)	269.48	270.06	277.91	273.14	S/D	275.33	273.79
	Hg (mg/Nm3)	0.006	0.005	0.006	0.006	S/D	0.006	0.006
	NH_3 (PPM)	ND	ND	ND	ND	S/D	ND	ND
	SPM (mg/NM^3)	89.50	91.25	92.50	93.75	S/D	21.50	20.00
	SO_2 (mg/NM3)	1173.39	1199.07	1233.09	1231.60	S/D	1267.50	1263.98
Sep-19	NOx (mg/NM^3)	280.39	275.62	286.19	283.21	S/D	283.62	280.16
	Hg (mg/Nm3)	0.006	0.006	0.007	0.007	S/D	0.006	0.006
	NH_3 (PPM)	ND	ND	ND	ND	S/D	ND	ND
	SPM (mg/NM^3)	93.00	87.00	94.00	93.00	S/D	24.00	28.25
	SO_2 (mg/NM3)	1177.08	1180.91	1275.94	1274.40	S/D	1253.83	1256.24
Oct-19	NOx (mg/NM^3)	282.09	280.79	298.79	292.87	S/D	281.60	276.85
	Hg (mg/Nm3)	0.006	0.005	0.007	0.006	S/D	0.006	0.006
	NH_3 (PPM)	ND	ND	ND	ND	S/D	ND	ND

c) Ambient Air Monitoring:

CSTPS has installed its own meteorological and 04 continuous ambient air quality monitoring stations (CAAQMS) at Major stores, Coal marshall yard, Chummery & Solar plant to monitor continuously the ambient air quality in the CSTPS premises. The all four CAAQMS and One meteorological station are connected to MPCB server. The AAQ results are presented in Table No.2

d) Online CEMS/CEQMS/CAAQMS connectivity to MPCB/CPCB server:

The status of online connectivity of CEMS/CEQMS/ CAAQMS to MPCB/CPCB server is presented in Table No.3

TABLE NO.2
Ambient Air Quality at major store location of CSTPS

Location	Parameters	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19
	$PM_{2.5}$ (µg/M^3) (60)	40.00	45.63	46.88	14.75	16.38	11.88	18.13
	PM_{10} (mg/ M^3)(100)	78.88	82.75	82.25	37.00	33.63	31.50	36.50
	SO_2 (mg/ M^3)(80)	47.28	42.39	40.63	31.84	28.20	23.74	22.88
	NOx (mg/ M^3)(80)	42.51	45.34	44.21	36.93	34.10	27.38	27.64
	Ozone (µg/ M^3)(180)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Location No.1 (Major Store Adm. Bldg.)	Lead (mg/ M^3)(1.0)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	CO (mg/ M^3)(4.0)	1.72	1.77	1.70	0.89	0.98	0.82	0.83
	NH_3 (µg/ M^3)(400)	29.00	28.38	28.75	26.00	25.25	24.75	26.25
	Benzene (µg/ M^3) (5.0)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	BaP (ng/ M^3)(1.0)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Arsenic (ng/ M^3)(6.0)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Nickel (ng/ M^3)(20.0)	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE NO.3
Online connectivity of CEMS/CEQMS/CAAQMS to MPCB/CPCB server

Unit No.	Parameters				Connected to MPCB	Connected to CPCB
3	PM	SOx	NOx	__	Connected	Connected
4	PM	SOx	NOx	__		
5	PM	SOx	NOx	__		
6	PM	SOx	NOx	__		
7	PM	SOx	NOx	__		
8	PM	SOx	NOx	__	Connected	Connected
9	PM	SOx	NOx	__		
ETP-I	pH	TSS	BOD	COD		
ETP-II	pH	TSS	BOD	COD		
ETP-III	pH	TSS	BOD	COD		
ETP-IV	pH	TSS	BOD	COD		
CAAQMS-1	PM	SOx	NOx	CO	Connected	Ready to connect.
CAAQMS-2	PM	SOx	NOx	--		
CAAQMS-3	PM	SOx	NOx	--		
CAAQMS-4	PM	SOx	NOx	CO		

e) Solid Waste Management:

CSTPS is taking every possible steps to achieve 100% ash utilization, presently CSTPS has in agreement with Cement Industries & Bricks manufacturer. CSTPS has its own ash bund which spread over 2668 Hectare Area where remaining ash is stored through closed pipeline.

f) Hazardous Waste Management:

CSTPS is a member of Common Hazardous Waste Treatment Storage Disposal Facility (CHWTSDF) M/s Maharashtra Enviro Power Limited, Butibori, Nagpur.

CSTPS is carrying out regular Environmental monitoring & analysis from Govt./MoEF&CC, Govt. of India recognized laboratories.

- Stack Monitoring
- Ambient air quality monitoring
- Fugitive dust emission
- Noise level
- ESP Performance
- Particle size distribution
- Ground level concentration
- Effluent Quality analysis
- Soil analysis and Ground water analysis of fourteen villages in periphery of ash bund area.
- Daily collection and analysis of water samples from water sources in and around of CSTPS premises to ensure water quality.

g) Plantation:

CSTPS has carried out massive tree plantation. Every year the plantation program is taken up. MSPGCL has undertaken green belt development in and around CSTPS. CSTPS has planted 13, 15, 460 trees till date, which covered 48.77 % (statutory required 33%) of open area of CSTPS under plantation.

h) Training Program & Conferences:

CSTPS is taking regular training program on Environment awareness and water conservation for employees and contractor labours. CSTPS has successfully conducted three International Conferences on the theme Thermal Power: Chemistry & Sustainable Environment (TPCSE) on the eve of World Environment Day in 2015, 2017 & 2019, to address the environmental issues & its probable solutions related to Thermal Power Generation.

CSTPS Environmental Achievement:

- Four-Star rating from MPCB:

Maharashtra Pollution Control Board has awarded **"Four Star rating"** to CSTPS for the compliance of environmental norms for the year 2017-18 and 2018-19.

- Central Board of Irrigation & Power (CBIP), Govt. of India Awarded **Best Power utility award to CSTPS** for the year 2018
- Green Maple Foundation awarded CSTPS for **Best Environment Management & Water Conservation** for the year 2018
- Green Energy Mission Foundation awarded CSTPS **4th SOx NOx Environment Excellence Award** 2019 at New Delhi