INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY ADVANCED RESEARCH TRENDS
ISSN : 2349-7408
VOLUME II, ISSUE I, FEBRUARY 2015

EFFLUENTS FROM THERMAL POWER STATIONS ON THE QUALITY OF WATER BODIES

Y. Hanumantha Rao
[1]Department ofchemistry,AndhraLoyolaCollege,Vijayawada
*Corresponding author: Email id: yhr.chaya@yahoo.com

K.Srinivas
Department ofchemistry,SRR&CVR Government Degree college Vijayawada

ABSTRACT

Environmental pollution caused by Thermal power stations such as Fly ash, Thermal Pollution, contamination of water bodies by toxic ions. the impact of effluents from Vijaywada Thermal Power on the quality of water bodies of the surrounding areas by analyzing the water samples pertaining to surface waters and ground waters for various physico-chemical Parameters has been discussed . It deals with the description of Vijayawada Tehrmal Power Station, Establishment of Sample Stations, Collection of Samples for Surface waters and Ground waters and the detailed procedure of analyzing the samples for different parameters: pH , Alkalinity, Conductivity, Total Dissolved Solids, Total Suspending solids, Total Solid, Salinity, variations in temperature, D.O, B.OD., C.O.D., Total Hardness, Calcium hardness, Magnesium hardness have been discussed emphatically.

Key words: Pollution, Total Hardness, DO, BOD

Introduction:

Vijayawada Thermal Power Station (VTPS) has been established at Ibrahimpatnam about 16 km above this barrage . The water requirements for the thermal power station are met from the stagnated placid waters of the barrage and after the waters being used for different purposes of the thermal power station, it is being let into the same stagnated pool of Krishna River.The detailed strategic location of the Barrage, Thermal power station, Vijayawada township have been depicted.

Establishment of sample stations: In the present investigationsseven stations as earmarked in the diagram were established In studying the variations of temperatures, four more sampling station Nos,. 8,9 10 and 11 were established ground waters were collected from bore wells which were laid at depth of 60 ft.

Determination Methods:

The samples were analyzed using the standard methods available in the literature for different parameters: pH , Conductivity, Total Dissolved Solids, Total Suspending solids, Total Solid, Salinity, D.O, B.OD., C.O.D., Total Hardness, Calcium hardness, Magnesium hardness, Total Alkalinity.

The obtained results were presented in Table. The metal ions in the ash were presented in the Table and further chemical composition of pond ash.

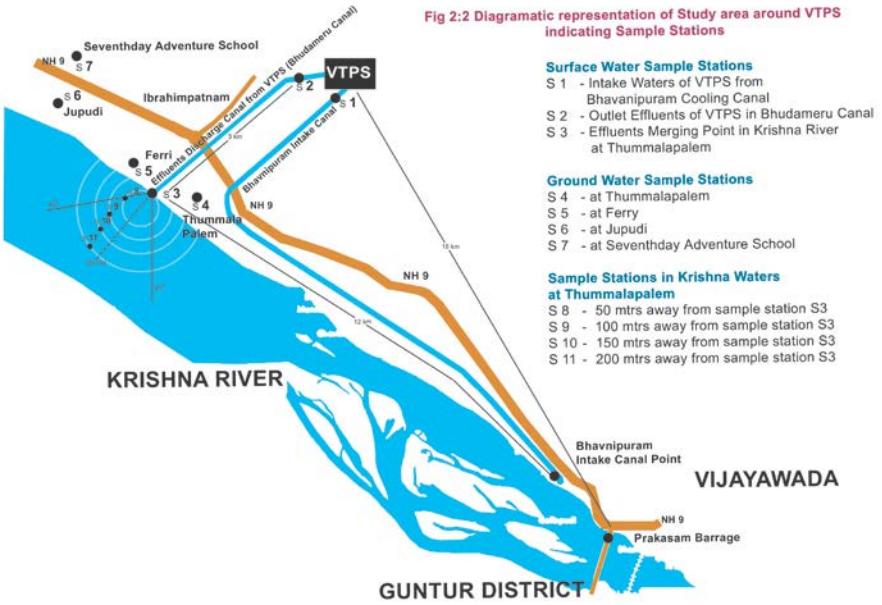

Fig 2:2 Diagramatic representation of Study area around VTPS indicating Sample Stations

Surface Water Sample Stations
S 1 - Intake Waters of VTPS from Bhavanipuram Cooling Canal
S 2 - Outlet Effluents of VTPS in Bhudameru Canal
S 3 - Effluents Merging Point in Krishna River at Thummalapalem

Ground Water Sample Stations
S 4 - at Thummalapalem
S 5 - at Ferry
S 6 - at Jupudi
S 7 - at Seventhday Adventure School

Sample Stations in Krishna Waters at Thummalapalem
S 8 - 50 mtrs away from sample station S3
S 9 - 100 mtrs away from sample station S3
S 10 - 150 mtrs away from sample station S3
S 11 - 200 mtrs away from sample station S3

Results and Discussions:

The various physico-chemical parameters studied during the period: April 08 to Dec.08 were presented in the Table enclosed. The following observations are significant.

pH and Alkalinity:

The increasing trend in pH values as in the case of surface stations was interesting to note. On comparing the pH values at a particular time for different Station Nos, the pH increased from Station No.1 to 3 for surface waters and from station No.4 to 7 for ground waters.

The water samples at the Station Nos. 1-7 were analyzed for alkalinity. The Alkalinity was found be more in all the ground waters than

surface waters. All these results indicate that VTPS is affecting the alkalinity of surrounding water bodies, both surface and ground waters.

Conductivity:

At surface water sample stations, the conductivity was comparatively lesser than the ground water stations, the conductivity showed some increase in dissolved salts from the up taking point of water: Station No.1, to the out coming waters: Station No.2 and 3. For example in the month April 08, the conductivity was found to be 542.3 µS at the Station No. 1 while the conductivity was 561.9 and 565.8 µS at the station No. 3 and 4 respectively.

Suspending solids:

The samples at the Stations 1-7, were analyzed for suspending solids, dissolved solids and total solid. Totalsolids (TS) as well as Total suspending (TSS) and Total dissolved solids (TDS) increased from Station No. 1 to Station No 3 during the period of study.TS, TSS and TDS found to be more in Ground water Station Nos. 4-7 than Surface water Station Nos. 1-3.

The presence of relatively more amounts of suspending solids (TSS) even in ground waters indicated the graveness of the pollution caused by the VTPS in the surrounding ground waters. Its impact was more in 7th Sample Station at Seventh Day Adventures School than at the other ground water sample stations. However, the dissolved solids were found to be relatively more in the Sample Station Nos. 5 and 6 than the other ground water station No 4and 7. It is interesting to note that in the Station No.7, the dissolved solids are relatively lesser but suspending solids are more, than in the Ground water Station Nos. 5 and 6.The results indicate that the Ground waters as well as surface waters are being affected by the VTPS.

Dissolved Oxygen:

The decrease of the D.O. content and the rise of the temp.was causing stress on biota and other aquatic life in the canals and in the merging area of the effluent waters in the waters in Krishna river at Station No 3. In fact no or scanty biota was found along the “Budameru out let Cananl of VTPS and further, at the merging point of the canal in the Krishna river at Tummalapalem. It is not out narration to state that even animal are hesitating to get themselves refreshed with pleasant Krishnan waters due to enhancement of temp. Even fisher men shifted their catching point of fish very far from the Station No 3 and 4 wherein they used to had a large and varity of catch of fish before the installation of VTPS. Our interaction with the fisher men revealed that they are quite unhappy both with the catch and

variety of aquatic life and in fact some fish species disappeared from the Krishna waters at the Thummalpalem surrounding due to the stress caused by the depletion of oxygen content and increase of temp. Thus the VTPS started the a cleaning effect of the biota and other aquatic life of Krishna river waters!?.

BOD:

These trends in observations may be accounted for the possibility of increase of ground water table in rainy season and thereby the pollution is diluted. This is not the case with Surface waters wherein BOD increases progressively from April 08 to August 08 and then decreases. This is obvious because the river waters are more polluted in the rainy season then in other seasons.

COD:

Like that of variation of BOD, the COD values varied with time and station.

- With time: In the case of surface water stations: 1, 2 and 3, the COD values were increased from April 08 to August 08 and then decreased. With Ground water Stations Nos. 4, 5, 6 and 7, COD values decreased from April 08 to August 08 and then increased to Dec. 2008
- With Station: The COD of ground waters in the Station Nos. 4, 5, 6 and 7 were lesser than the COD of surface water stations: 1, 2 and 3.

These observations may be understood, in the same lines of discussion made in the case of BOD variations except that the COD values are more than BOD values.

Hardness of Water:

The Ca-hardness as well as Mg-hardness showed increasing tendency from Apirl 08 to August 08 and then onwards decreased. As for example at the Station No. 1, the Ca-hardness increased from 135.0ppm in of April 08 to 152.3 ppm in August 08 and decreased to 130.9 ppm in Dec. 08. Similarly, Mg-hardness was found to be increasing 78.0 ppm in the month of April 08 at the Station No 1 to 95.5 ppm in the month of August and then wards, it started decreasing and was 65.6 ppm in the month of Dec. 08, This may be attributed to the more flow in Krishna river causing diluting effect on the hardness.

In ground waters, the Sample at 6 and 7 stations were found be more harder than at Samples at 4 and 5 stations both with regard to the Ca-hardness and Mg-hardness. For example in the month of April 08, Ca-hardness was found to be 230.2, 284.2,539.2 and 619.0 ppm and Mg-hardness was found to be 87.2, 94.2, 105.0 and 104.2 ppm at the station nos. 4,5,6 and 7 respectively. This indicates that the ground waters at the station nearer to VTPS namely, 6 and 7 are more polluted than the stations 4 and 5 which were nearer to the Krishna river.

The inference of the above observations is that the VTPS out letting waters are harder than the in taking waters and it indicates sufficient treatment is not being given to the waste water by the VTPS before letting into the environment.. The ground water around the areas Jupudi and Seventh Day adventure school are also being polluted by the VTPS.

Salanity (Chlorides) of Water:

The fact that the salinity (chloride) was found to be more in effluent waters of VTPS than in letting waters and the presence of more content of salt (chloride) in the Ground water samples 6 and 7 indicates that adequate measure are not being followed by VTPS authorities in safe guard the environment.

VARIATION OF pH VALUES

ITEM NO	SAMPLE STATION Nos.		pH VALUES								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	6.8	7.0	7.2	7.4	7.6	7.9	8.0	7.8	8.1
2		2	6.9	7.1	7.3	7.5	7.5	7.8	8.1	8.3	8.4
3		3	7.1	7.4	7.8	7.9	8.2	8.3	8.4	8.4	8.5
4	GROUND WATERS	4	6.7	6.9	7.1	7.2	7.3	7.4	7.3	7.4	7.5
5		5	6.8	6.9	7.1	7.3	7.4	7.3	7.5	7.6	7.6
6		6	6.9	7.0	7.0	7.1	7.2	7.4	7.3	7.6	7.7
7		7	7.1	7.3	7.4	7.5	7.6	7.6	7.7	7.5	7.8

VARIATION OF TOTAL ALKALINITY

ITEM NO	SAMPLE STATION Nos.		TOTAL ALKALINITY IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	200.0	205.2	210.3	215.3	220.2	225.2	230.3	235.6	240.9
2		2	211.2	216.5	222.2	226.2	231.2	236.5	242.5	247.2	251.5
3		3	210.2	215.5	221.3	220.2	227.2	234.2	241.0	246.0	250.0
4	GROUND WATERS	4	272..2	278.2	284.2	290.5	296.2	302.3	308.0	314.1	320.1
5		5	342.0	348.2	354.2	360.3	366.1	372.0	378.2	384.2	390.2
6		6	632.0	638.2	644.8	650.8	656.9	662.7	668.4	674.5	680.0
7		7	512.2	518.2	524.3	530.2	536.5	542.2	548.0	554.0	560.2

VARIATION OF CONDUCTIVITY

ITEM NO	SAMPLE STATION Nos.		CONDUCTIVITY IN µs								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	542.3	544.1	547.0	549.9	551.7	554.8	556.3	559.5	561.9
2		2	561.9	563.2	566.2	568.0	570.0	573.5	575.5	578.2	580.2
3		3	565.8	567.5	570.3	572.5	574.9	577.6	579.5	582.5	584.0
4	GROUND WATERS	4	935.2	937.5	940.2	944.1	947.8	949.5	9515	954.5	956.1
5		5	2390.2	2407.2	2416.0	2420.2	2430.5	2440.5	2446.5	2450.5	2460.6
6		6	2185.2	2193.8	2205.5	2219.2	2226.2	2236.2	2246.8	2250.2	2260.2
7		7	1398.2	1407.8	1416.9	1425.2	1435.1	1446.1	1456.5	1460.5	1480.2

VARIATION OF TOTAL SUSPENDED SOLIDS (TSS)

ITEM NO	SAMPLE STATION Nos.		TOTAL SUSPENDED SOLIDS IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	3.0	3.1	3.3	3.5	4.2	4.3	4.6	4.9	5.0
2		2	6.1	6.2	6.4	6.8	7.2	7.3	7.6	7.9	8.2
3		3	8.0	8.1	8.3	8.5	9.1	9.3	9.6	9.85	10.0
4	GROUND WATERS	4	6.0	6.2	6.4	6.8	7.0	7.3	7.6	7.85	8.0
5		5	7.9	8.1	8.2	8.4	8.9	9.2	9.5	9.75	10.1
6		6	7.8	7.9	8.1	8.3	8.8	9.1	9.4	9.65	10.0
7		7	12.8	12.9	13.1	13.3	13.8	14.1	14.4	14.65	15.0

VARIATION OF TOTAL DISSOLVED SOLIDS (TDS)

ITEM NO	SAMPLE STATION Nos.		TOTAL DISSOLVED SOLIDS IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	320.2	332.2	340.2	349.5	358.5	368.1	379.0	389.5	395.5
2		2	321.2	332.5	341.2	350.2	358.2	369.5	380.1	390.9	400.5
3		3	321.2	332.2	341.6	350.5	358.5	369.6	379.2	390.5	405.2
4	GROUND WATERS	4	579.2	588.5	597.2	605.6	614.2	623.1	641.0	650.2	660.5
5		5	1618.2	1629.5	1640.2	1649.0	1660.5	1666.0	1675.4	1684.0	1695.0
6		6	1450.0	1457.2	1468.5	1474.5	1482.3	1491.2	1502.0	1511.2	1520.5
7		7	904.0	913.3	914.5	933.5	942.0	952.4	959.1	970.8	980.9

VARAITION OF TOTAL SOLIDS (TS)

ITEM NO	SAMPLE STATION Nos.		TOTAL SOLIDS IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	324.0	335.0	344.1	353.1	362.2	373.3	384.6	395.8	400.0
2		2	327.0	338.5	347.5	356.6	365.0	376.2	387.5	398.3	408.6
3		3	329.2	340.2	349.9	358.3	367.5	378.2	389.8	400.0	415.1
4	GROUND WATERS	4	585.2	594.0	603.1	612.2	621.2	630.6	649.2	658.1	668.2
5		5	1626.5	1637.9	1648.9	1657.2	1669.2	1676.2	1685.1	1694.0	1705.2
6		6	1458.0	1465.1	1476.5	1482.5	1491.6	1501.3	1512.5	1521.8	1530.0
7		7	917.0	926.1	937.2	946.3	955.3	964.2	973.3	984.3	995.0

VARIATION OF DISSOLVED OXYGEN (DO)

ITEM NO	SAMPLE STATION Nos.		DISSOLVED OXYGEN IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	5.5	5.8	4.9	4.8	5.2	5.5	5.8	6.0	6.0
2		2	3.7	3.8	3.9	4.0	4.2	4.3	4.3	4.4	4.4
3		3	3.8	3.9	4.1	4.2	4.2	4.4	4.4	4.5	4.5
4	GROUND WATERS	4	2.2	2.4	2.6	2.7	2.9	3.1	3.3	3.6	3.8
5		5	3.2	3.4	3.7	3.9	4.1	4.3	4.5	4.7	4.9
6		6	4.0	4.1	4.3	4.6	4.8	5.0	5.2	5.4	5.6
7		7	4.2	4.3	4.5	4.8	5.0	5.2	5.4	5.6	5.8

VARIATION OF BIOLOGICAL OXYGEN DEMAND (BOD)

ITEM NO	SAMPLE STATION Nos.		BIOLOGICAL OXYGEN DEMAND IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	28.1	33.2	38.2	44.1	50.5	45.1	41.1	38.1	35.2
2		2	33.2	36.3	39.2	42.3	45.6	43.3	42.3	42.2	42.3
3		3	35.3	38.3	41.3	44.4	47.2	46.7	45.2	44.3	43.1
4	GROUND WATERS	4	26.0	24.2	22.3	20.3	17.3	18.25	19.5	20.75	22.0
5		5	25.0	23.2	21.2	20.5	19.2	20.2	21.0	22.2	23.3
6		6	31.2	29.5	28.2	26.5	25.3	26.3	28.3	30.0	32.0
7		7	32.0	30.0	28.3	26.2	24.1	27.9	30.0	32.5	34.2

VARIATION OF CHEMICAL OXYGEN DEMAND

ITEM NO	SAMPLE STATION Nos.		CHEMICAL OXYGEN DEMAND IN PPM								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	SURFACE WATERS	1	38.5	43.2	48.1	54.2	60.2	57.2	54.2	49.2	45.2
2		2	43.6	45.1	49.2	52.1	55.3	54.1	53.3	53.3	52.3
3		3	44.7	46.1	52.3	55.4	57.1	56.1	55.2	54.4	54.2
4	GROUND WATERS	4	32.1	31.2	29.1	27.2	25.2	27.1	28.3	29.4	30.1
5		5	33.2	32.1	29.3	28.2	27.1	28.3	29.5	30.4	31.2
6		6	37.2	37.2	36.3	34.2	32.2	34.3	37.2	38.2	40.3
7		7	40.4	38.4	37.2	35.2	32.3	35.2	38.3	41.2	42.2

CONCLUSSIONS:

Generally power station effluents are merged either into sea, or into the down waters of stream or river. But in this case, effluent waters are let into the Prakasahm barrage which is severing the water requirements of 6 districts through three major canals, viz., Eluru, Bandar and Bahimhang canals and for which the prosperity in this area is attributed. Any contamination of these waters leads in effecting the health and wealth of the peopleSo, unless the purity of effluent waters is almost equal to that of in-taking waters, the effluent waters from VTPS should not be allowed to mix because thus entered impurity into the stagnated waters get accumulated during the course of time and this is so, especially with respect to the non-degradable ions such as metal ions. Even a small enhancement of concentration of impurities in the effluent waters should not be tolerated.

REFERENCES:

1. Janez Oman, Andrej Seneganik, and Boris Dejanovi , Influence of lignite composition on thermal power plant performance: Part 1: Theoretical survey, Energy Conversion and Management Volume 42, Issue 3, February 2001, Pages 251-263
2. D'YAKOV A. F. ; GORDIN I. V. ; BERSENEV A. P. ; FEDOSEEV B. S. ; The environmental control activities of thermal power stations in protecting reservoirs Journal Title: Thermal engineering ISSN 0040-6015 1997, vol. 44, pp. 967-973 (8 ref. in it)
3. Subhes C. Bhattacharyya, An Estimation of Environmental Costs of Coa-based Thermal PowerGeneration in India, International Jouranl of Energy Research,1997, vol. 21, pp. 289-298 (21 ref. in it)
4. KYAKK V. A,. Thermal pollution of water bodies by the circulating water of power stations and relevant environmental legislation, Journal Thermal Engineering, 2002, vol. 49, pp. 306-310 (6 ref in it.)
5. Thermal power plant water treatment process: United States Patent 4347704
6. Kapur, S.L. Swamy, C.N Environmental and regulatory issues related to thermal power stations in India,. : Engineering Management Conference, 1993. 'Managing Projects in a Borderless World'. Pre Conference Proceedings., 1993 IEEE International p 180-186