

METAL IONS POLLUTION ASSESSMENT IN NEARBY WATER BODIES OF THERMAL POWER STATION

¹Y.Hanumantha Rao, ¹G.V. Ramana, ¹D.B.K. Kumar, ²M.C. Rao

¹Department of Chemistry, ² Department of Physics,
Andhra Loyola College, Vijayawada.

*Corresponding author: Email Id: yhr.chaya@yahoo.com

ABSTRACT

A Through study is made to assess the metal ion pollution caused by Vijayawada Thermal Power Station in the surrounding water bodies. Certain interval of time, the samples are analyzed. It is found that surface and ground waters are contaminated with respect to heavy metal ions like Cr, Mn, Fe, Ni, Cu & Zn are being leached from fly ash due to anaerobic conditions in the bottom. The accumulations of these ions bio-amplification signals the alarming situation ahead for the people in the surrounding districts as the same impounding waters are being supplied for their drinking and agricultural purposes.

Key words: Vijayawada Thermal Power Station and metallic ion pollution.

INTRUDUCTION

Thermal power has emerged as the major source of electric power in India over the years and is expected to rise further. The environmental effects of thermal power generation are becoming a major concern. Power generating units are mega project, which require not only huge capital investment but also various natural resources like, fossil fuels and water and any callous attitude on the part of the managing and controlling authorities of the power plant, create impacts on the environment and generate a stress in the local eco system. Although stringent norms have been made by the regulatory agencies to control and mitigate the damages cost to the environment by the power plants, the efficiency of implementation of the regulatory measures, turns to be “bane” to the habitation. In this contest, Vijayawada Thermal Power Station established at Ibrahimpatnam of Vijayawada rural area is interesting on three major points.

1. EFFECT OF HOT EFFLUENTS:

The hot effluents of VTPS are being merged into the lake waters of Prakasham barrage from where the water is drawn for meeting the water requirements of the VTPS and also from the lake, originate three important canals namely, Eluru, Bandar and Bhakimham canal which are catering water needs of people of six districts and any pollution of the lake waters of the barrage effect the wealth and health of the people. In Thermal power stations effluents are generally, let into Seas or in the downward side of the River but in the case of VTPS, contrary to the general practice, the up taking waters are from the lake waters of the barrage and effluents are let into the same waters. As the waters are stagnated, this results in the accumulation of impurities especially of non-degradable impurities.

The saline and beautiful greenery of Ibrahimpatnam surroundings of Vijayawada rural area before establishing the VTPS, has slowly been disappeared with the time resulting in dry and desperate environment and there is a great public mummer turned into huge cry in this spirited and busy city Vijayawada with regard to the visible pollution caused by fly ash coming out of chimney along with plumes and dusting the nearby fields to a large extents. Further, alarming situation is that visibly it can be seen that fly ash containing toxic elements in one way or other finding its destination into the Lake waters.

2. EFFECT OF TEMPARATURE:

The temp. of the effluents is almost nearly 10°C more than the room temp. resulting thermal stratification of lake, decrease of DO and the subsequent loss of ecological balance due to thermal stress; in fact even animals are hesitating to get into the placid waters of Krishna River to get themselves freshen.

The thermal pollution is dangerous parameter found to have marked affect on the biota of the Lake of the Barrage as the temperature zone extended up to 200 meters in to the Krishna waters from Tummalapalem merging point of effluents and this results in the thermal stratification, decrease of DO content and consequential loss ecosystems in the Lake. Various Remedial measures to be taken to control the Environmental pollution of VTPS has been discussed to emphasize the point that our comforts should not cost our lives.

In view of these, an effort is made in this work in assessing the impact of effluents from Vijayawada Thermal Power Station on the quality of water bodies of the surrounding areas of VTPS and suggesting the remedial measures. Very interesting observations have been found.

Environmental pollution caused by Thermal power stations such as Fly ash, Thermal Pollution, contamination of water bodies by toxic ions has been discussed. Geographical location of Vijayawada, Thermal Power Station, Prakasham barrage, its lake waters, method of meeting the water demand by VTPS and mode of letting off effluents again into the lake of barrage waters and the importance of keeping the waters protected for the prosperity of Krishna delta people, have been discussed. Finally, the endeavor of this work of assessing the impact of effluents from Vijayawada 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 studied.

Table No: Variation Of Temperatures

ITEM NO	SAMPLE STATION Nos.		TEMPERATURE IN °C								
			APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
1	surface waters	1	41.1	48.2	43.3	39.2	37.2	32.2	28.1	25.2	24.3
2		2	53.1	58.2	55.2	51.2	49.2	44.3	40.3	37.1	36.2
3		3	52.1	56	50.1	48.3	48.1	43.1	39.1	36.5	35.5

Table no: Temperature variations in krishna river around the elluent merging point at tummalapalem station no.3

SAMP LE STATION Nos.	LOCATION		TEMPERATURE IN °C								
	Sector	Point on the Sector w.r.t. Krishna bank	APRIL 08	MAY 08	JUNE 08	JULY 08	AUGUST 08	SEPT 08	OCT 08	NOV 08	DEC 08
8	50 METERS AWAY FROM STATION No. 3	Normal	49.2	54.3	48.2	47.1	45.3	41.1	37.1	34.4	34.3
		45° clock wise	49.3	54.2	48.2	47.2	45.2	41.0	37	34.3	34.2
		45° anti clock wise	49.1	54.1	48	47.3	45.1	41.2	37.3	34.4	34.4
		Average temp.	49.2	54.3	48.2	47.3	45.3	44.1	37.2	34.3	34.4
9	100 METERS AWAY FROM STATION No. 3	Normal	45.2	52.4	46.3	45.1	42.3	39.2	34.2	31.3	30.3
		45° clock wise	45.1	52.3	46.2	45	42.2	39.1	34.1	31.2	30.2
		45° anti clock wise	45.3	52.1	46	44.9	42.1	39	34	31.1	30.1
		Average temp.	45.3	52.4	46.25	45	42.3	39.15	34.15	31.3	30.3
10	150 METERS AWAY FROM STATION No. 3	Normal	42.2	51.2	44.5	43.1	40.1	35.1	31.1	28.4	27.5
		45° clock wise	42.1	51.1	44.4	43	40	35	31	28.3	27.4
		45° anti clock wise	42	51	44.3	42.9	39.9	34.9	30.9	28.2	27.3
		Average temp.	42.15	51.15	44.6	43	40	35	31	28.5	27.6
11	200 METERS AWAY FROM STATION No. 3	Normal	41.1	48.4	43.5	40	37.4	32.9	28.5	26.6	25.6
		45° clock wise	41.3	48.3	43.4	39.8	37.2	32.7	28.3	26.4	25.4
		45° anti clock wise	41.2	48.5	43.6	39.9	37.3	32.8	28.2	26.5	25.5
		Average temp.	41.3	48.6	43.75	39.9	37.45	32.8	28.5	26.75	25.75

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.O.D., C.O.D., Total Hardness, Calcium hardness, Magnesium hardness, Phosphates, Nitrates, Nitrites, Ammonia, and metals: Fe, Mn, Cr, Ni, Cu and Zn, have been discussed emphatically.

3. ACCUMALATION OF TOXIC METALS:

The lucid and detailed account of the typical observation found, their significance and inferences in assessing the extent of pollution caused by VTPS in the nearby water bodies. The danger of the loss of ecological balance in the Lake waters of Krishna River due to the Thermal pollution, danger of stratification of barrage lake waters around the merging pint of VTPS effluent waters in Krishna River at Tummalapalem, accumulation of toxic metals like Cr, Mn, Fe, Zn and Ni in the effluents and subsequently in the lake and the appearance of dangerous pollutants like nitrites in the effluents, have been discussed in detail in the light of the observations made with regard to the various water quality parameters studied.

Element	Wave length (in nm)	Slit width (in nm)	Lamp current (in mA)	Optimum working rang(µg/ml)	Sensitivity (µg/ml)
Fe	248.3	0.2	7.0	2-9	0.05
Mn	279.5	0.2	5.0	3.6	0.02

Cr	357.9	0.2	6.0	2-15	0.05
Ni	232.0	0.2	4.0	1.8-8	0.04
Cu	327.4	0.2	3.0	2.5-10	0.05
Zn	231.9	0.2	5.0	0.4-1.5	0.008

In view of heavy metal pollution, an attempt was made in this work to assess the metal ion contamination caused by VTPS in water bodies. Hence, the samples were analyzed for some well-known metal ions using AAS and it was found that the water bodies had some traces of the ions of Zinc, Copper, Nickel, Iron, Manganese and Chromium

LOI	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Na ₂ O	K ₂ O	CaO	MgO
0.50-2.50	59.0-61.0	28.0-28.8	2.7-5.52	0.24-0.50	1.26-1.76	0.7-1.0	1.40-1.90

Table: The content of Heavy Metals found in the Pond Ash Samples of VTPS using AAS method

Sl. No.	Metal	Concentration: mg/Kg
1	Zinc	38.0 mg/Kg
2.	Copper	45.8 mg/Kg
3.	Nickel	17.4 mg/Kg
4.	Iron	16450.4 mg/Kg
5	Manganese	116 mg/Kg
6.	Chromium	0.95 mg/kg

4. Conclusions:

The results indicated that the effluent waters are not adequately been treated and the enrichment of metallic impurities and other polluting ions in the effluents signal the dangerous days of human threat a head for the Krishna delta people. It is emphasized that the callous attitude of managing and controlling persons of VTPS in not adopting adequate measures and care in protecting the environment, makes the fly ash to fall in the nearby fields and due to rain run off or by other some fluid dynamics, the ashes are being collected into the pond and thereby enriching the heavy metal ions due to the anaerobic conditions prevails at the bottom of the pond and thus enriched waters with metal ions, are detrimental for health and wealth of the people. The thermal pollution is another dangerous parameter found to have marked affect on the biota of the Lake of the Barrage as the temperature zone extended up to 200 meters in to the Krishna waters from Tummalapalem merging point of effluents and this results in the thermal stratification, decrease of DO content and consequential loss ecosystems in the Lake. Various Remedial measures to be taken to control the Environmental pollution of VTPS has been discussed to emphasize the point that our comforts should not cost our lives.

. So, it is very appropriate to initiate studies in all thermal power stations throughout India to keep a check on ground water quality as well as surface waters to know whether the quality of water bodies are fulfilling the requirements of environmental protection laws or not. If not, the controlling measures to be taken immediatly.

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