

“Preliminary Observation of Physico-Chemical Characteristic of Industrial Waste water Influenced by Textile and Dyeing Based Industries of Pali”.

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Preliminary Observation of Physico-Chemical Characteristic of Industrial Wastewater Influenced by Textile and Dyeing Based Industries of Pali

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Abstract

In the present investigation textile based effluent were collected during November 2009 to April 2011, from the inlet and outlet of Common Effluent Treatment Plants (CETPs) of Mandia Road and Punayta Road Unit I,II,III,IV, which treated the textile and dyeing industrial waste-water of Pali. These studies find out that the discharge effluents from CETPs are not proper Treated. These effluents have high values of temperature, pH, TSS, TDS, alkalinity, hardness, COD and BOD as recommended by CPCB and Bureau of Indian Standards (BIS). It may be adversely affect groundwater quality and agricultural land of the downstream area of Bandi River.

Key Word: Waste Water, CETP, Effluent, Treatment, COD, BOD.

Introduction

Water pollution is one of the major problems caused by industrial effluent in Pali Rajasthan. The printing and dyeing industries cover major portion of industrial section in Pali. The wastewater discharged through these industries is of toxic nature that was also reported by Satish, *et., al*, (2008). In this study, it was reported that improper treated wastewater from textile and dyeing industries of Pali affecting ground water quality and its surrounding areas due to discharge of improper treated Effluent from CETPs.

It was also reported the Pollution in Bandi River by Textile industries of Pali from Rajasthan Patrika, Dainik Bhasker, and Center for Science and Environment, (Dec.2007and May.2006).

Study Area:

Pali is near to Jodhpur about 75 km. It connects to Pali from NH 65. Pali district directly connects to eight districts of Rajasthan. The wastewater emanating from textile and dyeing industries of Pali is treated in CETPs located at Punayta Road and Mandia Road Industrial area.

These Industrial Area located at longitude 73°19' 11" East and latitude 25°47'23" North. Mandia Road Industrial Area (MRIA) was developed by RIICO in the year 1978, as Industrial Area Phase III. and Punayta Road Industrial Area was developed in 1996-1997. It derived this name as the road leading to Mandia and Punayta village passes through this industrial area.

Materials and Methods

The wastewater emanates from textile and dyeing industries of Pali is treated in CETPs located at Punayta Road and Mandia Road Industrial areas. Mandia Road CETPs (unit I, II) receives wastewater from Mandia Road industrial area (Phase III), Bajrang Bari, Sumerpur Road and Opposite Bandi River. Whereas CETPs (unit III, IV) located at Punayta Road receives wastewater from industrial area-Phase (I, II), Maharaja Shree Umaid Mills and Mahaveer Udyog Nagar.

Water samples of industrial effluents were collected from dyeing and printing units of different industrial area during the study period. In the present study waste water samples were collected in November 2009 to April 2011 from the inlet and outlet of Common Effluent Treatment Plants of Mandia Road and Punayta Road Unit I, II, III, IV.

The water samples were collected in BOD bottles of 300 ml capacities. All these bottles were carried in laboratory in ice box for analysis of different physico-chemical parameters and analyzed by standard methods (APHA 1998).

Observation Table:-**Table 1-Mandia Road CETPs (unit I, II) Inlet and Outlet effluents Parameter**

	PH		Hardness		TDS		Temp.		COD		Alkalinity		TSS		D.O.		BOD	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Nov.09	9.6	8.4	800	600	7200	8820	23.8	21.6	2440	1010	820	420	1710	256	0.8	0.6	220	50
Dec.09	9	8.2	610	620	7260	10800	25.3	22.4	2460	1660	990	410	1660	410	0	0	200	80
Jan.10	10	7.5	810	460	7140	8810	25.3	21.6	2430	1860	810	375	1640	310	0	0	320	110
Feb.10	9.5	8.5	720	610	7330	8800	22.2	23.6	2600	960	840	520	1940	890	0	0	602	48
Mar.10	9	8.5	840	660	7340	8900	24.6	24.4	3300	1760	960	390	1890	240	0	0	825	56
Apr.10	8.5	7.5	680	560	7010	8800	23.9	24.6	2960	1200	1060	480	1780	658	0	0	810	80
May.10	8.5	8.3	780	690	7340	8610	24.6	24.2	2980	910	1160	320	1290	340	0	0	340	40
Jun.10	9	7.6	840	610	7230	8200	23.4	24.6	2100	820	940	650	1660	210	0	0	360	30
Jul.10	8.2	7.8	710	560	8800	9010	23.6	25.6	1960	890	810	320	1810	710	0	0	210	60
Aug.10	9.8	7.9	750	680	7220	9190	27.2	23.6	1860	800	840	260	1510	610	0	0	420	30
Sep.10	8.5	7.8	880	510	7600	8110	23.8	24.6	1660	560	910	510	1180	220	0	0	120	20
Oct.10	9	8.1	650	450	8110	8610	23.6	24.3	2560	450	620	320	1420	310	0	0	410	30
Nov.10	8.1	7.5	510	320	6180	7100	22.8	22.4	2160	310	770	520	916	480	0	0	230	20
Dec.10	8.6	8	440	330	5020	5080	26.6	23.5	2100	380	890	210	880	220	0	0	420	20
Jan.11	8.9	8.2	580	460	4320	5010	23.2	22.2	1540	390	520	280	660	160	0	0	180	20
Feb.11	8.5	7.5	710	660	4060	4660	23.3	22.8	1220	260	660	260	780	220	0	0	180	30
Mar.11	9.2	8.8	660	640	5600	6710	22.4	22.2	1570	240	710	372	1010	160	0	0	220	20
Apr.11	8.8	8.2	400	320	4020	4090	24.4	23.2	1810	280	680	510	700	310	0	0	320	20
Min.	8.1	7.5	400	320	4020	4090	22.2	21.6	1220	240	520	210	660	160	0	0	120	20
Max.	10	8.8	880	690	8800	10800	27.2	25.6	3300	1860	1160	650	1940	890	0.8	0.6	825	110
Average	8.94	8.03	682.5	537.5	6580	7710	24.17	23.43	2212	842	833.5	399.4	1352	388.2	0	0	366.6	44.7

All value in mg/lit exempt pH

Table 2-Punayta Road CETPs (unit III, IV) Inlet and Outlet effluents Parameter

	PH		Hardness		TDS		Temp.		COD		Alkalinity		TSS		D.O.		BOD
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet
Nov.09	9	8.8	720	580	8080	8900	21.6	23	2820	1620	1060	540	1810	560	0	0	105
Dec.09	10.5	8.8	700	580	8070	8900	20.6	23	3200	1610	1050	640	1860	560	0	0	105
Jan.10	9	8.5	890	560	9400	10900	20.6	23.8	2810	1840	1090	410	1760	620	0	0	600
Feb.10	10	9	920	590	8900	9200	21.3	24.2	3240	1890	940	310	1810	760	0	0	632
Mar.10	10.5	8.2	800	580	7320	8310	27.5	23.4	3300	1960	1140	506	1840	210	0	0	822
Apr.10	8	7.8	920	590	8100	9200	27.4	25.1	2880	1820	1080	380	1820	880	0	0	990
May.10	8.9	8.1	800	660	7600	8900	28.3	24	2800	640	1140	410	1310	310	0	0	460
Jun.10	8.6	8.1	780	590	7060	9060	24.4	24.3	2480	760	840	420	1920	360	0	0	210
Jul.10	8.7	8.2	780	640	9010	8800	23.9	25.2	2310	680	640	460	1691	650	0	0	320
Aug.10	8.2	7.6	800	690	8500	8810	26	23.2	1940	960	760	310	1310	310	0	0	520
Sep.10	8.8	8	650	420	8100	8200	24.4	24.8	1890	600	750	660	1230	320	0	0	320
Oct.10	8.5	7.4	460	360	9010	10860	23.9	24.2	2590	380	580	460	1270	410	0	0	520
Nov.10	8.5	8.2	660	420	7110	7880	23.6	21	2470	320	710	668	890	620	0	0	360
Dec.10	8.9	7.9	710	560	6030	6220	22.2	20.8	1680	280	990	340	1080	120	0	0	110
Jan.11	9	8.8	620	510	5330	6110	22.2	20.1	1450	410	480	260	300	320	0	0	160
Feb.11	9.5	7.7	790	730	5010	5570	24.1	23.7	1460	1620	620	210	980	320	0	0	210
Mar.11	8	7.4	730	560	6100	7180	25.9	23.8	1620	310	810	468	1100	210	0	0	350
Apr.11	8.5	8.1	800	400	7100	7400	26.2	25.1	1340	280	760	390	1010	310	0	0	90
Min.	8	7.4	460	360	5010	5570	20.6	20.1	1340	280	480	210	300	120	0	0	90
Max.	10.5	9	920	730	9400	10900	28.3	25.2	3300	1960	1140	668	1920	880	0	0	990
Average	8.95	8.144	751.67	556.67	7512	8344	24.15	23.4	2346	1011	853	436	1360.6	442.5	0	0	398.2

Sample of November 09, January 10, March 10, May 10, July 10, September 10, November 10, January 11, March 11 collected from CETP Unit III

Sample of December 09, February 10, April 10, June 10, August 10, October 10, December 10, February 11, April 11 collected from CETP Unit IV

All value in mg/lit exempt pH

Results and Discussion

All data and samples collected from November 2009 to April 2011. All effluent parameters Minimum, Maximum and Average Value find out. The treated waste water from CETPs is discharged in to Bandi River. These discharged effluents have high values of pH, COD, BOD, Hardness, TDS, alkalinity, TSS, and Temperature. (**Table 1 & 2**). Treated water is turbid, coloured and has odour which shows its undrinkable quality and unsuitability for agriculture purpose due to its toxic nature. In this investigation it is found that significant variation was noticed in the values of different parameters of inlet and outlet samples. This study was started due to reporting by Rajasthan Patrika, Dainik Bhasker, and Center for Science and Environment, (Dec.2007 and May2006), the Pollution in Bandi River by Textile industries of Pali. Satish *et.al.* (2008) studied that CETPs of Pali not working properly. Their improper treated effluent can be converting the fertile land into Barren land and this effluent is slow poison for Human being which is using it. That was also reported by Kushal *et., al.*, (2005), that the Ground Water Quality Monitoring in Problem Area of Jodhpur and Pali Districts of Rajasthan. That type of study also done by Bharti *et.al.*, (2004), to find out the Toxicity of improper treated textile based effluents of jodhpur and their effect on Aquatic animals (*Saccobranchus fossilis*). This type of study was also reported by Bharati, *et., al.*, (1990).

At Inlet of CETPs of Mandia road effluents pH varies from 8.1 (November, 2010) to 10.0 (January, 2010) with the average value of 8.94. The outlet of CETPs of Mandia road effluents pH was 7.5 (February, 2011, Table-1) to 8.8 Recorded (March, 2011, Table-1). The Average value of PH 8.03 Observed. At Inlet of CETPs of Punayta Road effluents pH varies from 8.0 (April, 2010, March, 2011, Table-2) to 10.5 (December, 2009, & March, 2010, Tabel-2) with the average value of 8.94 recorded. The outlet of CETPs of Punayta road effluents pH was 7.4 (October, 2010, & March, 2011, Table-2) to 9.0 Recorded (March, 2011, Table-1). The Average value of pH 8.144 Observed. The high value of pH may be due to minerals assemblage and several physico chemical characters of industrial effluent. Similar results were also supported by Dhanapal, *et. al.*, (1990).

The Hardness of Inlet effluent of CETPs of Mandia road recorded from 400 mg/lit (April, 2011, Table-1) to 880 mg/lit (September 2010, Table-1). The Average Inlet value of Hardness 682.5 Observed. The Hardness of Outlet of effluent of CETPs of Mandia road was Recorded 320 mg/lit (April 2011, Table-1) to 690 mg/lit (May 2010, Table-1). The Average Outlet value of Hardness 537.5 mg/lit. Observed. The Hardness of Inlet effluent of CETPs of Punayta road recorded from 460 mg/lit (October, 2010, Table-2) to 920 mg/lit (April, 2010, Table-2). The Average Inlet value of Hardness 751.66 mg/lit. Observed. The Hardness of Outlet of effluent of CETPs of Punayta road was Recorded 360 mg/lit (October, 2010, Table-2) to 730 mg/lit (February, 2011, Table-2). The Average Outlet value of Hardness 556.66 mg /lit. recorded. This high

sample in large quantity. High value of effluent Hardness were also reported by several authors Bharti,et.al., (2004).

The TDS of Inlet effluent of CETPs of Mandia road varies from 4020 mg/lit (April, 2011, Table-1) to 8800 mg/lit (July 2010, Table-1).The Average Inlet value of TDS 6580 mg/lit. Observed. The TDS of Outlet effluent of CETPs of Mandia road varies from 4090 mg/lit (April, 2011, Table-1) to 10800 mg/lit (December, 2009, Table-1).The Average Inlet value of TDS 7710 mg/lit. Observed. The TDS of Inlet effluent of CETPs of Punayta road varies from 5010 mg/lit (February, 2011, Table-2) to 9400 mg/lit (January, 2010, Table-2).The Average Inlet value of TDS 7512 mg/lit. Observed. The TDS of Outlet effluent of CETPs of Punayta road varies from 5570 mg/lit (February, 2011, Table-2) to 10900 mg/lit (January, 2010, Table-2).The Average Inlet value of TDS 8343.50 mg/lit. recorded. According to Rabinove *et. al.*, (1958),the water containing the amount of TDS higher than permissible limits of 1000 mg/lit. (WHO 1992) is Saline water.

The Temperature of Inlet effluent of CETPs of Mandia road varies from 22.2 °c (February, 2010, Table-1) to 27.2 oc (August 2010, Table-1).The Average Inlet value of Temp. 24.17 oc recorded. The Temperature of Outlet effluent of CETPs of Mandia road varies from 21.6 oc (November & December, 2009, Table-1) to 25.6 oc (July 2010,Table-1).The Average Outlet value of Temp. 23.43oc recorded. The Temperature of Inlet effluent of CETPs of Punayta road varies from 20.6 oc (December, 2009, & January, 2010, Table-2) to 28.3 oc (May,2010, Table-2).The Average Inlet value of Temp. 24.15 oc recorded The

(January, 2011, Table-2) to 25.20c (July 2010, Table-2). The Average Outlet value of Temp. 23.43c recorded. Variations in Temperature directly affecting the effluents D.O. It was also observed by Higorani, *et.al.*, (1977). Similar results were also supported by Dhanapal, *et. al.*, (1990).

The COD of Inlet effluent of CETPs of Mandia road varies from 1220 mg/lit (February 2011, Table-1) to 3300 mg/lit. (March, 2010, Table-1). The Average Inlet value of COD 2211.50 mg/lit. Observed. The COD of Inlet effluent of CETPs of Punayta road varies from 1340 mg/lit (April, 2011, Table-2) to 3300 mg/lit. (March, 2010, Table-2). The Average Inlet value of COD 2346 mg/lit. Observed. The COD of Outlet effluent of CETPs of Punayta road varies from 280mg/lit. (April, 2011, Table-2) to 1960 mg/lit. (March, 2010, Table-2). The Average Outlet value of COD 1011 mg/lit. recorded. High concentration of COD was also recorded by several authors such as Prasad, *et.al.*, (1994), Sukla, *et.al.*, (1968). The COD of Outlet effluent of CETPs of Mandia road varies from 240 mg/lit. (March, 2011, Table-1) to 1860 mg/lit. (January, 2010, Table-1). The Average Outlet value of COD 842 mg/lit. recorded.

The Alkalinity of Inlet effluent of CETPs of Mandia road was varies 520 mg/lit. (January, 2011, Table-1) to 1160 mg/lit. (May, 2010, Table-1). The Average Inlet value of Alkalinity 833.50 mg/lit. Observed. The Alkalinity of Outlet effluent of CETPs of Mandia road was varies from 210 mg/lit. (December, 2010, Table-1) to 650 mg/lit. (January, 2010, Table-1). The Average Outlet value of Alkalinity 399.35 mg/lit. recorded. The Alkalinity of Inlet effluent of CETPs of Punayta road was varies 480 mg/lit. (January, 2011, Table-2) to 1140

Observed. The Alkalinity of Outlet effluent of CETPs of Punayta road was varies from 210 mg/lit. (February, 2011, Table-2) to 668 mg/lit. (November, 2010, Table-2).The Average Outlet value of Alkalinity 436 mg/lit. recorded. This high Alkalinity was due to bicarbonates, sulphides and chromates that was also suggested by Manivasakam,*et.al.*, (1987).

The TSS of Inlet effluent of CETPs of Mandia road was varies from 660 mg/lit. (January, 2011, Table-1) to 1940 mg/lit. (February, 2010, Tabel-1).The Average Inlet value of TSS 1351.80 mg/lit. Observed. The TSS of Outlet effluent of CETPs of Mandia road varies from 160 mg/lit. (January and March, 2011, Tabel-1) to 890 mg/lit. (February, 2010, Tabel-1).The Average Outlet value of TSS is 388.20 mg/lit. Observed. The TSS of Inlet effluent of CETPs of Punayta road was varies from 300 mg/lit. (January, 2010, Table-2) to 1920 mg/lit. (June, 2010, Tabel-2).The Average Inlet value of TSS 1360.55 mg/lit. Observed. The TSS of Outlet effluent of CETPs of Punayta road varies from 120 mg/lit. (December, 2010, Tabel-2) to 880 mg/lit. (April, 2010, Tabel-2).The Average Outlet value of TSS is 442.50 mg/lit. recorded

The DO of Inlet effluent of CETPs of Mandia road was 0.8 mg/lit (Nov.2009, Table 1) and Outlet Treated Effluents DO of theses CETPS was only 0.6 mg/lit (Nov.2009, Table 1) observed. The inlet and outlet effluents of Punayta Road CETPs Dissolve oxygen Nil (zero) found. Decreasing of oxygen level may be due to high organic load in industrial waste. The organic and inorganic salt, heavy metal might have interfered normal concentration of oxygen level. It was

results were also supported by Dhanapal, *et. al.*, (1990).

The BOD of Inlet effluent of CETPs of Mandia road varies from 120 mg/lit. (September, 2010, Tabel-1) to 825 mg/lit. (March, 2010, Tabel-1).The Average Inlet value of BOD is 366.60 mg/lit. Observed. The BOD of Outlet effluent of CETPs of Mandia road 20 mg/lit. (September, October, November, 2010, March and April 2011, Tabel-1) to 110 mg/lit. (January, 2010, Tabel-1).The Average Outlet value of BOD is 44.7 mg/lit. Observed. The BOD of Inlet effluent of CETPs of Punayta road varies from 90 mg/lit. (April, 2011, Tabel-2) to 990 mg/lit. (April, 2010, Tabel-1).The Average Inlet value of BOD is 398.20 mg/lit. Observed. The BOD of Outlet effluent of CETPs of Punayta road 25 mg/lit. (October, 2010, Tabel-2) to 320 mg/lit. (January, 2010, Tabel-2).The Average Outlet value of BOD is 78.50 mg/lit. Observed. This result showing the increasing of the BOD load in Effluent is due to decreasing of DO . Similar results were also observed by Sawyer, *et. al.*, (1946), that hydrosulphide, sulphide and Sulphur dyes causes depletion of dissolve oxygen and increasing the BOD which causing adversely effect on aquatic life. That was also supported by Manivasakam, *et. al.*, (1987), Ruchhaft, *et. al.*, (1990) observed variation in BOD velocity constant, of sewage dilution.

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