



## Research Article

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### Impact of Kanoi Paper Mills effluent in GW and SW of Bilaspur district (C.G.)

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#### Abstract

Kanoi paper mills are the major industrial unit located on the bank of Arpa river of Bilaspur districts. The raw materials consumed in this mill are crushed straw, gunny and chemical components. The untreated effluents are discharged in river and reservoir. So the water sources become contaminated by undesired materials. We have taken a minor research project for the assessment of water sources; Four GW and Four SW in and around paper mill. Some selected physical and chemical parameters; chlorine, phenol and metallic elements viz. Fe, Zn, Cu, Mn were analyzed for collected water samples. The results showed, EC 1881 ( $\mu\text{S}/\text{cm}$ ), TDS (1641 mg/L), Cl (661 mg/L), Phenol (75ppb) and Iron (14.55mg/L) were found up to an alarming level. We have suggested plant management for prior purification of paper mill effluent.

**Keywords:** Paper mill effluent, phenol, chlorine, EC

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### 1. Introduction

Water is essential and fundamental compound for all kinds of life, because of 70% weight of the biosystem is water. The 80% earth surface is covered by water and remaining part in terrestrial area. 97% earth's water is brackish in nature, only 2.14% water is fresh, which is trapped in the giant glaciers and polar ice-caps [1]. Only 1% water is available for drinking, agriculture, domestic and industrial consumption. Owing to increasing population, industrialization, advanced agriculture, also increase the demand of fresh water. But domestic sewage, commercial effluents, agricultural runoff and other anthropogenic inputs also increase the undesirable elements in water sources, as resulting fresh and potable water became scarce commodities.

#### Profile of the study Area:

Bilaspur city is district head quarter, which is best known for its cultural heritage and judicial hub of the state. The Bilaspur district area is surrounded by Mungeli, Korba, Durg and Janjgir-Champa district, SECR zone main head

office is also located in the Bilaspur, which is connected to metro cities like Kolkata and Mumbai by train track. The study field had average temperature and rainfall is 45°C and 1220mm respectively. Kanoi paper mills are the major industrial unit located on the bank of river Arpa, which flows from the middle portion of the city. The annual production of paper mill per day is 50 tonnes. The major inputs of this mill are crushed straw, gunny, HCl, H<sub>2</sub>SO<sub>4</sub> caustic soda and alum etc. Unpurified effluents are discharged into the river Arpa and kept in effluents reservoir. As a resulting the water sources are continuously getting foreign chemicals in excess amount. So we have under taken minor research project for assessment the different pollutants in SW and GW in and around the Kanoi paper mill. In this paper we have an attempt to explore the undesirable materials in water sources in premonsoon session of 2012.

## 2. Materials and Methods

Eight sampling sites: four for GW and SW each were selected respectively. Water samples were collected in precleaned polythene bottles in the month of March (Premonsoon) 2012 session. The collected water samples were subjected for physical analysis; temperature, pH, EC and turbidity, chemical analysis ; TDS, total alkalinity, total hardness, chloride, phenol and metallic elements; Fe, Zn, Cu, Mn as per using standard method described in APHA [2-4], and the results were compared with the standard value suggested by WHO, BIS and ICMR [5-7].

## 3. Results and Discussion

The analytical results are given in table 1, which are compared with standard value stipulated by ICMR, WHO and BIS are depicted in table 2. The Graphic presentations are shown in Fig.1-3.

### Physical Parameters:

Temperature was measured by analyzer kit, and the finding results are 23.7°C as min. at the sampling site KH (GW) to 25.1°C as max at the sampling site KA and KB (SW). These recorded temperatures were within the standard value as set by ISI. pH is important tool for decide the acidic and alkaline nature of water, the desirable ranges of pH is 6.5 to 8.5 as per WHO [5]. The low pH does not cause any harmful effect. In our study field the pH ranges were found as min 6.95 (spot - KG, GW) to 8.40 (spot - KD, SW) indicating the nature of water is slightly acidic to slightly alkaline in nature. Electrical conductivity is measure the dissolved inorganic and organic ions, when the value of EC exceeds the 3000  $\mu\text{mhos cm}^{-1}$ , the germination of almost all the grain would be affected and it may results in much reduced yield [8]. In our study period the max conc. was found at the sampling site KD (SW) ; 1881  $\mu\text{s/cm}$  while min. conc. was detected at the sampling point KH (GW) ; 1014  $\mu\text{s/cm}$ . Turbidity is reflex the presence of partial dissolved and suspended substances in water sources. In our study field the observed datas were fluctuated between 6 NTU (spot - KH, GW) to 74 NTU (spot-KA, SW), which in beyond the desirable to max. Acceptable ranges; 5 NTU to 25 NTU.

### Chemical Parameters:

The upper limit of TDS recommended for drinking water in 1000  $\text{mgL}^{-1}$  by WHO[5]. TDS are composed of ions and organic matter salts and other particles [9]. In this investigation the min. value; 301  $\text{mgL}^{-1}$  was found at the sampling site KF (GW) and max. conc.; 1641  $\text{mgL}^{-1}$  was detected at the water sample collected from site KA (SW). Four water samples were showed higher values of TDS concentration more than excessive permissible limit; 1000  $\text{mgL}^{-1}$ . Total alkalinity is a measure of the capacity of water to neutralize acids. It is only due to the presence of carbonate, bicarbonate and hydroxide ions [10]. During the analysis period the min. conc. was found at the sampling site KE (GW); 298  $\text{mgL}^{-1}$  while max. Conc. was measure at the sampling site KB (SW); 651  $\text{mgL}^{-1}$ . All sampling waters showed more conc. of total alkalinity than prescribe value; 200  $\text{mgL}^{-1}$  as set by WHO [5]. The hardness of water is not pollution parameter but indicates the water quality mainly in terms of Ca<sup>++</sup> and Mg<sup>++</sup> expressed as CaCO<sub>3</sub>. It is property of which prevent the lather formation with soap [11]. In study field the conc. of total hardness was found from 236  $\text{mgL}^{-1}$  (spot - KG (GW)) as min. value to 398  $\text{mgL}^{-1}$  (spot - KA, SW) as max. value. Only three water samples were exceed the excessive permissible limit 300 $\text{mgL}^{-1}$ . High conc. of Chlorides may show deleterious effect on metallic pipes. The standard value of Chloride for potable water in 250  $\text{mgL}^{-1}$  as per BIS [6]. The min. conc. was found at the sampling site KB (SW) 139  $\text{mgL}^{-1}$  and max. conc. was found at the site KA (SW); 661 $\text{mgL}^{-1}$ . Phenol is aromatic compound and mostly release as by product in paper mills effluent. In our investigation the min. conc. was found at the sampling site KH (GW); 3.74 ppb. While max. conc. was found at the sampling site KA (SW); 75 ppb, which is several folds greater than the standard value.

### Metallic Elements:

Heavy metals are a major source of pollution in India due to industrial waste disposal and considered highly toxic to aquatic organism. We have taken four metallic elements viz. Fe, Zn, Cu and Mn. In conc. of Fe, excepting sampling water KB (SW), 0.92  $\text{mgL}^{-1}$  was under desirable conc. all water sources contain the conc. of iron was varied from 1.01  $\text{mgL}^{-1}$  (spot - KF, GW) to 14.55  $\text{mgL}^{-1}$  (spot - KA (SW)). These conc. are above the upper limit of iron; 1.0  $\text{mgL}^{-1}$  as set by BIS. Zn. conc. was detected from 0.03  $\text{mgL}^{-1}$  (spot - KF, GW) to 0.31  $\text{mgL}^{-1}$  (spot - KA SW). These data showed the conc. of Zn in water samples under acceptable ranges. The conc. of Cu varied from 0.01  $\text{mgL}^{-1}$  (spot - KE, GW) to 0.15  $\text{mgL}^{-1}$  (spot - KH, GW). Which is not exceed the excessive permissible limit. The Mn conc. was found as min; 0.03  $\text{mgL}^{-1}$  (KE - GW) to max. conc.; 0.47 $\text{mgL}^{-1}$  (spot - KF SW).

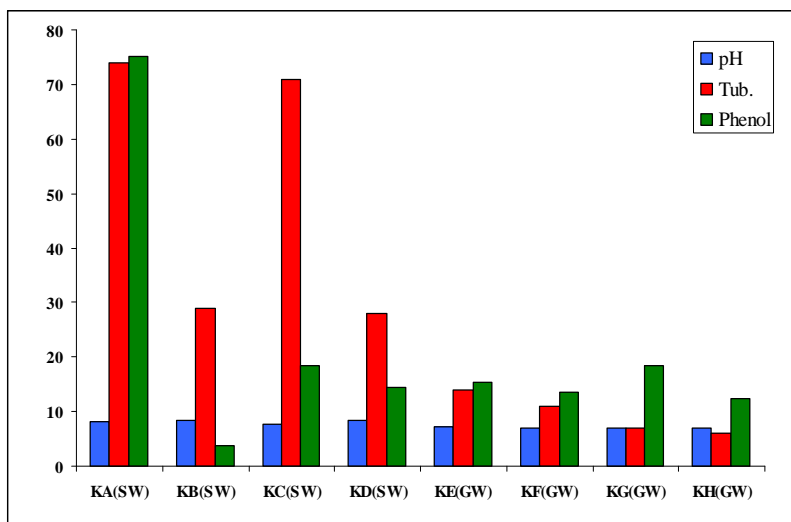


Figure 1. Variation of P<sup>H</sup>, Turbidity and Phenol at different sampling sites

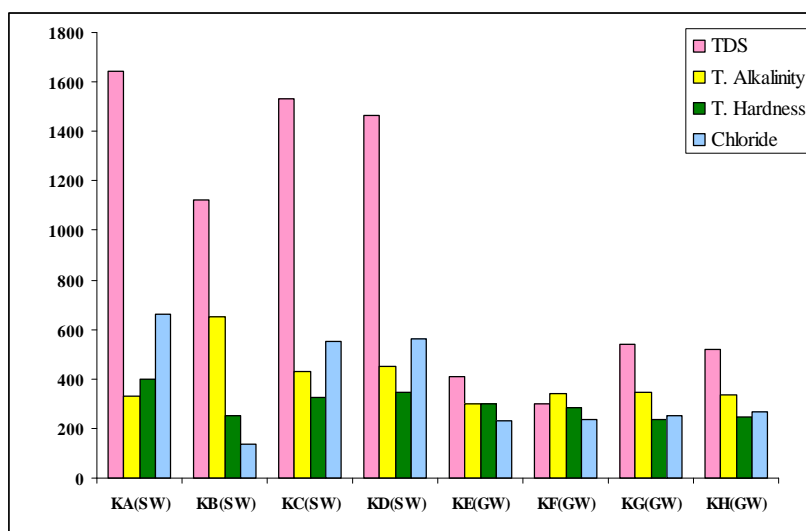


Figure 2. Variation of TDS, T. Alkalinity, T. Hardness and Chloride at different sampling sites

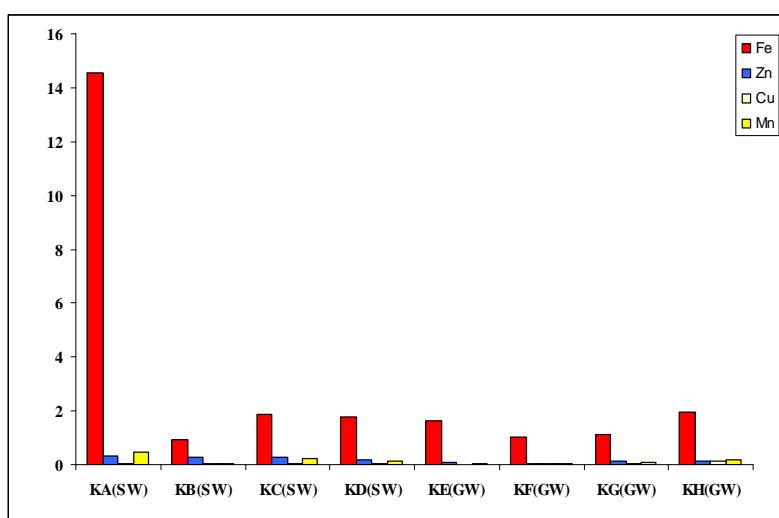


Figure 3. Variation of Fe, Zn, Cu and Mn at different sampling sites

**Table 1. Analytical results of selected parameter for GW and SW sources**

	KA(SW)	KB(SW)	KC(SW)	KD(SW)	KE(GW)	KF(GW)	KG(GW)	KH(GW)
Temp.	25.7	25.7	25.1	25.3	24.1	24.7	23.8	23.7
pH	8.1	8.3	7.79	8.4	7.2	7.10	6.95	7.01
EC	1490	1680	1341	1881	1091	1121	1213	1014
Turb.	74	29	71	28	14	11	07	06
TDS	1641	1121	1530	1466	409	301	541	518
T. Alkalinity	329	651	429	451	298	339	346	334
T. Hardness	398	251	324	345	297	283	236	247
Cl	661	139	551	563	233	236	254	267
Phenol	75	3.74	18.37	14.50	15.37	13.47	18.39	12.33
Fe	14.55	0.92	1.88	1.77	1.61	1.01	1.12	1.98
Zn	0.31	0.26	0.29	0.20	0.11	0.03	0.14	0.13
Cu	0.05	0.03	0.03	0.05	0.01	0.04	0.05	0.15
Mn	0.47	0.04	0.22	0.12	0.03	0.05	0.08	0.18

Excepting pH, EC ( $\mu\text{scm}^{-1}$ ), Phenol (ppb), Turbidity (NTU) all parameters have been measure in mg/L

**Table 2. Standard Value for different WQP by different monitoring Agency**

	BIS (1991)	WHO (2008)	ICNIR (1975)
pH	6.5 - 9.2	6.5 - 8.5	7.00 - 8.5
EC	750 - 2250	500 - 1500	-
Turbidity	5-25	5	5 - 25
TDS	500 - 1000	500 - 1500	-
T. Alkalinity	200 - 600	200 - 600	-
T. Hardness	300 - 600	200 - 600	300 - 600
Chloride	250 - 1000	200 - 600	250 - 1000
Phenol	0.001 - 0.002	-	0.002 - 0.201
Fe	0.3 - 1.0 $\text{mgL}^{-1}$	-	0.3 - 1.00 $\text{mgL}^{-1}$
Zn	5 - 15 $\text{mgL}^{-1}$	-	5 - 25
Cu	0.05 - 1.5	-	0.5 - 1.0
Mn	0.1 - 0.3	-	0.1 - 0.5

#### 4. Conclusion

We have taken extensive analysis of Kanoi paper mills effluents in Bilaspur (C.G.). The assessment was conducted in premonsoon (March) of session 2012. The observation results were indicated the sampling site KA (SW) had high value of pH (8.4), EC ( $1881\mu\text{S/cm}$ ), TDS ( $1641\text{ mgL}^{-1}$ ), Chloride ( $661\text{ mgL}^{-1}$ ), Phenol (75ppb) and iron ( $14.55\text{ mgL}^{-1}$ ). From these datas, conclusion has comes the water source was highly contaminated at the duration of study period by paper mills effluents. Prior treatment of water is mandatory for using the different purpose.

#### 5. Acknowledgement

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