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HYDROCHEMICAL CHARACTERISTICS OF OPEN CAST COALMINE KANHAN WATER, NAGPUR DISTRICT, MAHARASHTRA

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Abstract: Open cast coal mine Kanhan located in Nagpur district Maharashtra. The chemical characteristics of open cast coalmine Kanhan water ,Nagpur district, Maharashtra state has been studied to evaluate the suitability of water for agricultural purpose. Water samples were collected and analyzed for Temperature, , EC, TS, TDS, Turbidity, Total hardness, pH Total alkalinity, Ca, Mg, DO, BOD, Chloride, Sulphate .The results indicate that open coal mines water samples are of good quality and within the permissible limit prescribed by for pH, Turbidity, TS, Total hardness, Ca, Mg, Total alkalinity, Chloride, Sulphate

Keywords- Chemical characteristics, Total hardness, Total alkalinity.

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INTRODUCTION

Water is one of the abundantly available substances in nature. It is essential constitute of all animal and vegetable matter & plant life. Water is distributed in nature in different forms such as rain water river water, spring water & mineral water. Water is mostly used for industrial and municipal purposes. In order to ensure the right quality and quantity of water, it is extremely important to monitor water supply throughout taking all the aspects into consideration. But coal mine is one field which sediments its own pumped out water. The coalmines water which is collected in sedimentation tank which can be then released into rivers, lakes and other water resources Coalmine water contain most of the removable contaminants & heavy metals. If these contaminants except heavy metals remove from mine water, this water could be utilized for different proposes like domestic, irrigation etc. It is essential to analyze the coalmine discharge water by quality parameters. Based on physic-chemical parameters water quality can be increased. In the present study coalmines in Nagpur nearby Kanhan & Kamptee region are located. Only after examination and testing of different physic-chemical parameters (using who and Indian standard Coalmine water contains most of the removable contaminants & heavy metals. If these contaminants except heavy metals remove from mine water, this water could be utilized for different proposes like domestic, irrigation etc. The present study is an attempt to understand the effects of various parameter like pH, conductivity Alkalinity, Hardness, Turbidity, BOD, Total dissolved solid, Na, K, Ca, Mg etc on quality of samples

Experimental Section

The Water Samples from open cast coa mines were collected from the month of August

to January (Process is continued)in sterilized Polyethene Bottle Regularly for Every Month. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Water Temperature DO, TDS, Free CO2, Hardness, Chlorides, Alkalinity, Phosphate and Nitrate were Estimated in the Laboratory By using Standard Methods as Prescribed By APHA, AWWA,

Table 1 indicate methods used for check the parameters

Sr.No	Parameters	Methds used
1	. Ph	Systronic-361 pH meter
2	Colour	
3	Electrical conductivity (EC	CONDUCTIVITY CELL POTENTIOMETRIC
4	Turbidity	Nephlometric Method
5	Total solids (TS) and total dissolved solids (TDS	Evaporation method
6	Total hardness	)EDTA Titration
7	Total alkalinity	Neutralization with standard HCl
8	Calcium hardness	EDTA titration
9	Magnesium hardness	CALCULATION FROM TOTAL HARDNESS AND CALCIUM
10	Dissolved oxygen (DO	Winkler's method
11	Biological oxygen demand (BOD	Bottle incubation for 3 days at 27^0c
12	Sulphate	NEPHELOMETRY
13	Chloride	ARGENTOMETRIC TITRATION
14	BOD	BOTTLE INCUBATION FOR 3-DAYS AT 27ºC)
15	COD	OPEN REFLUX

RESULTS AND DISCUSSION:-

The Monthly Variation in Physico-chemical Parameters is Presented in Table. Table 2: Physical parameters of opencast coal mine Kanhan district, Maharashtra DO, TDS, , Hardness, Chlorides, Alkalinity, Phosphate and Nitrate were Estimated in the Laboratory By using Standard Methods as Prescribed By APHA, AWWA,

Biostatistical Analysis of Physical Parameters of open cast coal mine Kanhan Nagpur , Maharashtra :-

Table 2 indicate result of the following parameters

Sr N	Month	colour	Temp	PH	EC	TDS	Tubidity	Hadness	Akainity	BoD	coD	chloride	sulphate	fluoride
1	August	8	29	7, 8	1050	660	140	410	340	4	50	56	32	1,18
2	Septmber	3	30	7 ,5	1096	644	28 6	456	320	4 ,1	14	54	50,4	0,84
3	ctbrt	2	28	7,9	934	582	9	330	260	4,6	18	46	42	,76
4	Nvember	2	27	7.8	887	558	28.8	350	284	3.8	13	48	32.1	1.08
5	ecember	2	26	7.8	925	563	29.5	340	290	3.9	13	46	31-2	0.86
6	January	1	28	8.1	963	570	8.2	310	304	4.1	15	40	38	0.84

The Maximum (26°C) Temperature was recorded in the Month of March (summer) and minimum (22.5°C) in the month of December (winter). It showed that Higher Temperature in summer and relatively lowers in winter.

The turbidity of water fluctuates from 8.2 NTU to 140 NTU. The maximum values (140 NTU) was recorded in the month of August (Rainy) It might be due to rainy season, decrease in the water level and presence of suspended particulate matter, and minimum value (98.2NTU) in the month of January due to increasing temperature,

Total dissolved solids- The total dissolved solids fluctuate from 558mg/l to 660mg/l. the maximum value (660mg/l) was recorded in the month of August. It is due to heavy rainfall and minimum value 558mg/l) in the month of November.

pH- The pH was alkaline values ranges from 7.5 to 8.1. The maximum pH value (8.1) was recorded in the month of January and minimum (7.5) in the month of September. The factors like air temperature bring about changes the pH of water.

Hardness – The value of hardness fluctuates from 310 mg/l to 456mg/l. The maximum value (456mg/l) was recorded in the month of September and minimum value (310mg/l) in the month of January. Mine water was reported total hardness was high in the month September due to rainy season Low value of hardness during January can be attributed to decrease in water volume and increase of rate of evaporation of water. Similar results were obtained in the present study.

Chlorides- The values of chlorides range from 40 mg/l to 56. mg/l. The maximum value (56. mg/l) was recorded in the month of August (rainy) and minimum value (40. mg/l) in the month

of January In the present study maximum value of chloride reaches in rainy season . Similar results were reported .

Alkalinity – Total alkalinity ranges from 260 mg/l to 340mg/l. the maximum value (340 mg/l) was recorded in the month of August (rainy) and minimum value (260mg/l)

Phosphate – The value of phosphate fluctuates from 0.12mg/l to 12.38 mg/l. the maximum value (12.38mg/l) was recorded in the month of August (monsoon) and minimum value in the month of October (winter). The high values of phosphate in August (monsoon) months are mainly due to rain, surface water runoff, agriculture run off; washer man activity could have also contributed to the inorganic phosphate content.

Nitrates – The values of nitrate ranges from 4.40mg/l to 37.5 mg/l. the maximum value (37.5mg/l) was observed in the month of July (monsoon) and minimum (4.40mg/l) in the month of November (winter).

Electrical conductivity: Electrical conductivity of water is proportional to temperature and dissolved mineral content. In the present study, the values of electrical conductivity range from 887 to 106 µ mho/cm for the given mnth. Increase in electrical conductivity indicates that this area contains ions like Ca+2, Mg+2, SO4-2, Cl- etc. Electrical Conductivity is directly proportional to temperature and therefore its values are higher. The slight increase in electrical conductivity may be attributed to the higher temperature and also increase in total dissolved solids, thereby increasing the number of ions in the water.

Biochemical oxygen demand: Biochemical oxygen demand is the measure of the degradable organic material present in water sample and can be defined as the amount of oxygen required by micro-organisms in stabilizing the biologically degradable organic matter under aerobic condition. During present investigation the values of BOD season varied from 3,8 to 4.67 mg/l

Chemical oxygen demand: Chemical oxygen demand determines the oxygen required for chemical oxidation of organic matter present in water with the help of strong oxidant. It is used to measure pollution level of domestic and industrial waste water. The values of chemical oxygen demand were found to be 13 to 50 mg/L.

Table 3 Water quality standards as per IS10500

Sr.No		IS10500 standards	
	parameters	Desirable	Maximum
1	color	5	15
2	Temperature		
3	PH	6.5 to 8.5	No relaxation
4	EC		
5	TDS	500	2000
6	Turbidity	1	5
7	Hardness	200	600
8	Alkalinity	200	600
9	BOD	--	---
10	COD	---	10
11	Chlorides	250	1000
12	sulphates	200	400
13	Fluorides	0,5	1,5

All parameters are in mg/L except pH, temparature (oC) and electrical conductivity (micro mho/cm)

Table 4 Classification of water for irrigation used based on TDS (ppm) & %Na

Classification	TDS (ppm)	%NA
Excellen	< 200	<20
Fair	500 - 1500	40-60
Undesirable	Greater than 1500	Greater than 60

From above Table 4 indicates that parameters like TDS and %Na within permissible limit hence water can be used for irrigation purpose.

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