ASSESSMENT OF MINE EFFLUENTS ON WATER QUALITY AT DHANPURI AND AMLAI OCM REGION, SHAHDOL MADHYA PRADESH

MAMTA PRAJAPATI, SMITA VERMA

Introduction: As pollution word is used for contamination of air, water and soil. Water pollution means the addition of any foreign material inorganic, biological or radioactive or any physical, chemical and biological change in the natural water, which may harmfully affect the living beings directly or indirectly, immediately, after sometime or after a very long time.Besides ground water, surface water is an eminent and most dynamic resource of the earth's ecosystem. Surface water comes in direct contact with the atmosphere, seasonal streams and surface drains. In polluted surface water, the ions like Na^+, K^+, Mg^{+2}, SO_4 , H_2SO_4 interacts to form a variety of complexes and deteriorate the quality of surface water. Chemical processes like ion exchange, chelation, precipitation, coagulation, aggregation, oxidation, dissolution and reduction are operating simultaneously, making the surface water, an extremely complex system.

Introduction: District Shahdol lies between 2315' N Latitude to 24 N Latitude and 81 E Longitude to 81 45' Longitude. The expanse of the district is 110 km N – S and 30 km E - W thus comprising an area of about 5642 sq km which is 1.83% of the total area of the M.P. It is situated 489mts above the sea surface. District Shahdol lies in the heart of the country. Shahdol district of Sohagpur area is surrounded by a number of coal mines. These mining practices affect the air quality, water quality, soil quality of the surroundings. In the past monitoring has been done for surface and ground water quality, soil quality, effluent characteristics survey in an area of 10 kms radius, surrounding the project [1], Dhanpuri O.C.M [2]. Topography of these areas are generally undulating and sloping towards north and west direction [3]. The climate of these areas can be defined as a sub-tropical type with summer from April to June, Monsoon season from July to September, Post-monsoon from October to December and Winter from January to March. Of all the utilizable sources of energy, such as solar heat wind, tidal waves, atomic energy, hydel power, natural gas, petroleum and coal, coal easily out ranks the rest. Coal India Limited is a major industrial organization in the field of coal in India.This organization has several branches spread throughout in India. The coalfield of Madhya Pradesh can be broadly classified into two groups viz.

- Sone- Mahanadi Valley,
- Satpura region comprising the Pench Kanhan Tawa valley.

The Sone valley includes Sohagpur, Jharkhand, Johilla, Umaria, Korar, Singrauli coal fields. Water is a prime natural resource for basic need of human. It is a precious national asset. Millions of people all over the world, particularly in the developing countries, like India, are losing their lives every year from water borne diseases. India accounts for 2.2% of the global land and 6% of world water resources, but has to support 16% of world population [4]. The approximate consumption of water by man is - 30% for irrigation, 7% for domestic use, 12% for industries and 50% for electrical utilities [5]. Besides ground water, surface water is an eminent and most dynamic resource of the earth's ecosystem. Surface water comes in direct contact with the atmosphere, seasonal streams and surface drains. Surface water of river transports a large quantity of water. Good quality of water is inadequate even for the normal living and is getting polluted due to numerous discharges. Industrial effluent, has the most dangerous impact on the biosphere due to toxic pollutants. It causes fish kill, destruction of aquatic habitat and contamination of human food chain [6], [7].

In Sohagpur geological block of Shahdol district of Madhya Pradesh, a large number of mining project are being carried out on catchment areas of important streams, which ultimately meets the river Sone. These important streams like Baisaha Nallah, Nargara Nallah and Bagaya Nallah have been exposed to continuous contamination. Surface and ground water pollution is a common feature of mining and associated activities.

Methodology: Different types of water analysis have been discussed in this section. We have taken two big regions namely- Dhanpuri OCM area, Amlai OCM area to assess the pollution level in water bodies. Different sites have been chosen and samples were analysed. The various physico-chemical parameters used to assess the water quality of Dhanpuri area are pH, TSS, COD,O&G,BOD etc. Different sampling sites selected for Dhanpuri OCM area were

- Workshop discharge before grease trap (W_1)
- Workshop Discharge after grease trap (W_2)
- Bagaiya Nallah U/S (W_3)
- Bagaiya Nallah D/S (W_4)
- Mine Discharge (W_5)
- D/S of diverted Nallah (W_6)
- DETP of Sanjay Nagar colony (W_7)

These samples were analysed by the Standard

methods Prescribed in APHA (1999). Sampling has been done according to the prescribed methods and a representative sample has been selected for different sites for physico-chemical analysis. Results have been shown in Table No. 1.

For Amlai area different sampling sites selected are- 1. Mine Discharge

2. Belha Nallah (U/S) 3. Belha Nallah (D/S) and following water parameters has been analyzed pH, TSS, COD, O&G, DS, Zn, Na, SO_4^{-2},Cl^-, NO_3^- etc. and shown in Table No.2.

Results & discussion: Analysis of mine effluent quality of Dhanpuri OCM has been done for various sampling sites. Results of analysis has been shown in Table No. 1.

Table No. 1 Water Analysis of Dhanpuri OCM area

S. No.	Parameters	pH		TSS		COD		O&G		BOD 3 days 27°C	
1.	W_1	8.24	8.22	88	143	160	140	14.8	16.8	-	-
2.	W_2	8.12	7.97	53	91	85	90	8.2	8.8	-	-
3.	W_3	7.49	7.21	29	24	80	30	-	-	-	-
4.	W_4	7.09	7.52	88	42	60	65	-	-	6.0	6.0
5.	W_5	6.97	7.61	51	47	150	95	-	-	-	-
6.	W_6	7.01	7.66	38	69	75	55	-	-	-	-
7.	W_7	7.24	7.21	19	25	65	40	-	-	12.0	10.6

It was observed during the analysis of mine water effluent that acid mine drainage of various coal mines have altered the pH values of water around them. Total suspended solids showed a gradual increase in their concentration. The value of TSS for Dhanpuri OCM has the highest value of 143 mg/litre. Oil and grease discharge from Dhanpuri OCM has the highest value of 16.8 mg/lit and has reached to a dangerous condition. Beside this the amount of Dissolved Solids has shown a gradual increase.

Results of analysis for different physico-chemical parameters of Amlai OCM has been shown in Table No.2

Table No. 2 Water Analysis of Amlai OCM area

Parameters	Mine Discharge			Belha Nallah (U/S)			Belha Nallah (D/S)		
	March 2006	Oct. 2007	June 2008	March 2006	Oct. 2007	June 2008	March 2006	Oct. 2007	June 2008
pH	5.81	6.19	6.41	5.59	7.34	7.26	5.98	7.29	7.09
TSS	51	51	52	49	33	42	41	48	21
COD	85	65	60	70	40	45	75	55	65
O&G	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DS	600	625	650	613	659	648	610	615	623
Zn	0.58	0.59	0.60	0.41	0.43	0.49	0.40	0.46	0.50
Na	0.41	0.42	0.50	0.51	0.61	0.53	0.09	0.11	0.16
SO_4^{-2}	78	81	79	75	82	85	60	65	66
Cl^-	49	55	61	47	48	43	40	49	50
NO_3^-	0.18	0.20	0.22	0.17	0.19	0.23	0.12	0.16	0.17

It was observed during the analysis of mine water effluent that acid mine drainage of various coal mines have altered the pH values of water bodies. Mine discharge increases acidity in summer. Belha nalha U/S and D/S shows fluctuation in pH in different seasons slightly acidic in summer and slightly basic in monsoon season. Total suspended solids showed a gradual increase in their concentration from monsoon to summer. Total suspended solids concentration around mine discharge is 51mg/lit. COD around mine discharge has a maximum value of 85 mg/lit. O&G concentration has a constant concentration of <1.0mg/lit . DS concentration range has a value of 600-659mg/lit. The highest value of DS is 659mg/lit in winter season of Amlai OCM. The concentration of Zn, Na, SO_4^{-2}, Cl^- and NO_3^- are within limit as prescribed by CPCB.

References:

1. Environmental Data Generation Report, (2005); Rajendra Underground Mine. Post mansoon season, SECL Ltd. Sohagpur area.
2. Environmental Data Generation Report, (2006); Navgaon Underground Mine. Summer Season SECL Ltd. Sohagpur area (2006).
3. Environment Data Generation Report, (2007); Dhanpuri area. Winter season, SECL Ltd. Aeroenviro Consultants Hyderabad.
4. Singh G, (1999); Water Pollution Issues and Control Strategies in Mining Areas, Minetech, 20 (1), 45.
5. Frank H S, (1970);The structure of Ordinary Water, Science, 169, 635.
6. Hallowell J B, Shea J F, Smithson G R, Triplor A B and Ganser B W, (1973) ; Water Pollution Control in the Primary Non-Ferrous-Metal Industry, EPA, Washington DC, US Govt. Printing Office,168.
7. Chandwick M J, Highton N H and Lindman N, (1987) ; Environmental Impacts of Coal Mining and Utilization, Publication Pergamon Press, Oxford, 41.

***

Mamta Prajapati/Smita Verma
Pt. S.N.S.Govt/ P.G.college/ Shahdol(M.P.)