International Journal of Current Research and Modern Education (IJCRME)
ISSN (Online): 2455 - 5428
(www.rdmodernresearch.com) Volume I, Issue II, 2016

EFFECT OF FLY ASH ON THE PROPERTIES OF GROUND WATER

Navinderdeep Singh*, Harpreet Singh & Gurprit Singh Bath****
* Assistant Professor, Department of Civil Engineering, Chandigarh University, NH 95 Gharuan, Mohali, Punjab
** Assistant Professor, Department of Civil Engineering, PTUGZS Campus Bathinda, Dabwali Road, Bathinda, Punjab

Abstract:

Water is considered as a basic necessity. All living beings are dependent on water for their survival. Water is consumed by human beings, animals as well as plants. Due to the increase in the population we are facing the problem of scarcity of water. Therefore in order to preserve water we should keep a regular watch on each and every activity that is leading to the pollution or exploitation of water resources. Hence we have carried out a study in order to test the water samples from underground near the fly ash disposal site. This paper represents the literature review, various values attained during tests as well as conclusions obtained after testing of the water samples. We took 10 samples from different locations of the same site and thereafter we tested those samples for various physio-chemical parameters and at last derived results and conclusions.

Key Words: Physio-Chemical Properties, Ground Water, Fly Ash, Water Pollution, pH, Electrical Conductivity, TDS, BOD & COD

Introduction:

Fly Ash Ponding:

It is a method of disposal of flash which is obtained from thermal power plants. In this method the fly ash residue is disposed of in landfills which are known as the ash ponds. [1]

Effect of Fly Ash on Underground Water:

As the fly ash is disposed off in the ash ponds it percolates deep into the ground due to rain or moisture which ultimately leads to the pollution of underground water.

Motivation for Research:

After having an overview of the impact of fly ash in the underground water we decided to examine the actual effects of fly ash ponding on water. Consequently we finalized a location in Bathinda region.

Location of the Site:

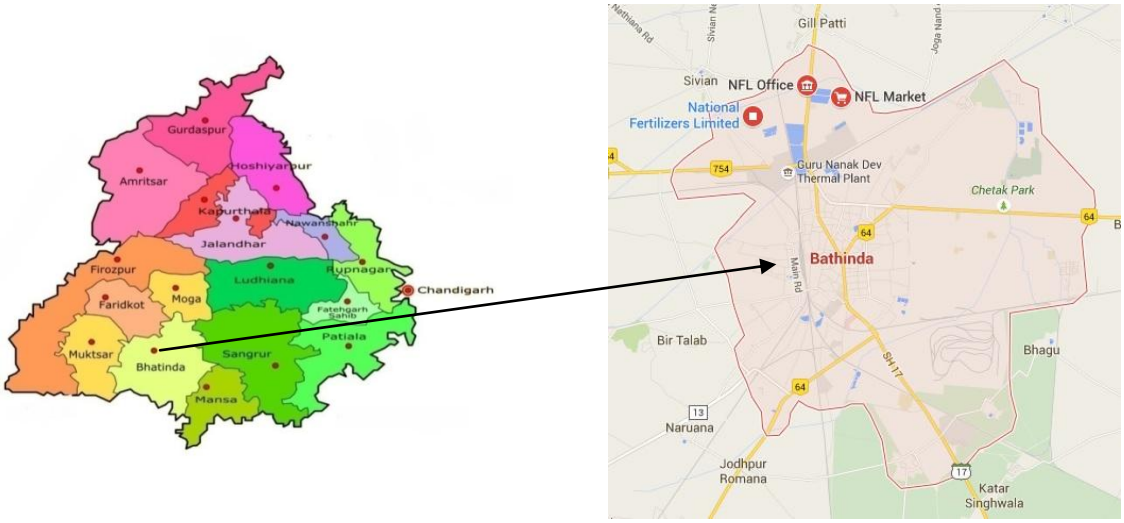
National fertilizers limited plant situated in is situated in the southern part of Punjab the location is described by the latitudes, north latitude 29º - 33' and 30º - 50' and between east longitude 74º - 28' and 75º - 46'.The National Fertilizers limited uses indigenous coal which has high calorific value. Ash pond is quite similar to lake consisting water, there are three such Ash ponds in the vicinity of NFL industry in Bathinda. The bottom ash is mixed with water to form slurry and is then pumped into these ash ponds through vacuum pumps. Over the time during rains the fly ash percolated into the ground water through the pores and the properties of ground water gets altered.

Table 1: List of Sample Collection Sites around NFL in Bathinda Region

Sample	Location	Source
S1	Near Railway Crossing	Bore Well
S2	Near Gate No. 2	Bore Well
S3	Coal Handling Yard	Open Well
S4	Near SBI Bank	Bore Well
S5	Punjab Carbonics	Bore Well

S6	GNDTP Railway Gate	Open Well
S7	Railway Crossing	Bore Well
S8	Hardev Nagar Kothe	Bore Well
S9	Ash Pond No. 3A	Hand Pump
S10	Near Gate No 1	Bore Well

Location of Study Area- Industrial Area of Bathinda City:



Materials and Methods:

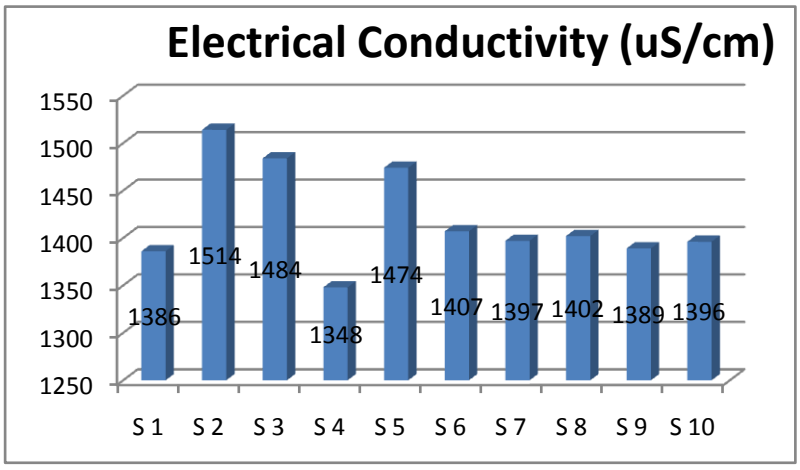
The Parameters which we tested for checking out quality of ground water are pH, Electrical Conductivity, Chemical Oxygen Demand, Biochemical Oxygen Demand, and Hardness – Calcium & Magnesium Hardness. The tests were conducted according to the guidelines issued by Indian Standards and all experiments were performed according to IS 10500 – 2012.

pH: pH defines the acidity or alkalinity of water. The water samples collected were having pH values well within the permissible limits of WHO and BIS.

Sample No.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
pH	6.92	6.93	6.92	7.01	6.95	6.95	7.01	7.05	6.95	6.96

Electrical Conductivity: Electrical Conductivity is dependent on the amount of dissolved solids present. The values of Electrical conductivity were also well within the limits specified by WHO and BIS.

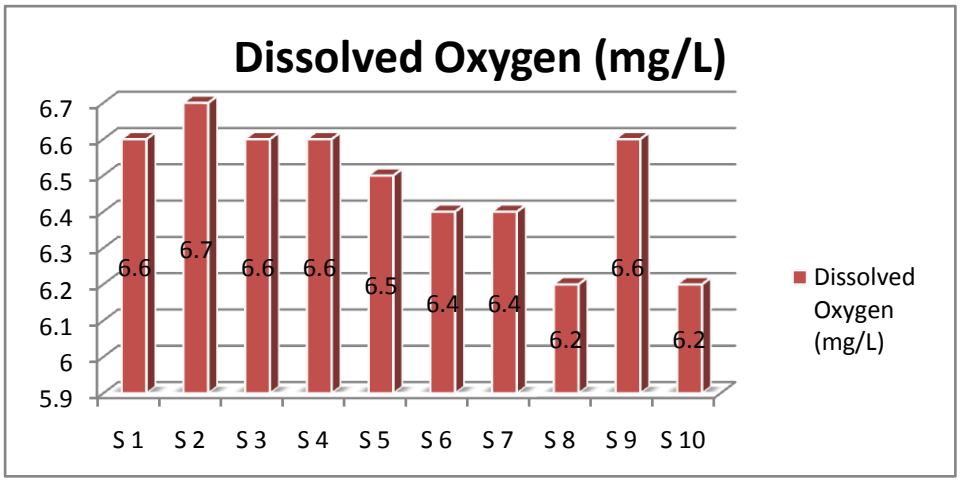
Sample No.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
EC (uS/cm)	1386	1514	1484	1348	1474	1407	1397	1402	1389	1396



Biochemical Oxygen Demand & Chemical Oxygen Demand:

BOD refers to the amount of oxygen that is consumed by aquatic organisms for breakdown of organic matter in water, where as COD is the amount of organic compounds present in water. Both are expressed in mg/L.

Sample No.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
DO(mg/L)	6.6	6.7	6.6	6.6	6.5	6.4	6.4	6.2	6.6	6.2
BOD(mg/L)	7.6	7.2	7.8	8.2	8.6	9.0	9.4	8.6	8.2	7.8



The values of BOD and COD are well within the permissible limits, the specified limits for BOD must be below 30 mg/L and COD is 250 mg/L.

Sample No.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
COD (mg/L)	27.8	26.2	28.4	30.2	32.8	38.6	43.4	41.8	37.4	33.5

Hardness –Calcium and Magnesium: Test to calculate the hardness of the water sample was conducted and the values which were derived are:

Sample No.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
CaH (mg/L)	116	84	106	110	90	84	108	88	92	136
MgH (mg/L)	82	57	64	78	62	60	76	58	64	96
TH (mg/L)	198	141	170	188	152	144	184	146	156	232

The desirable limits for Total hardness are 300 mg/L and maximum limits for the same is 600 mg/L. All the samples have total hardness well within the desirable limits. Calcium hardness must be between 75 to 200 mg/L. All the samples have calcium hardness that is beyond the desirable limits but not exceeding permissible limits. Similarly, the desirable limit for magnesium hardness is 30 and permissible limit is 100 mg/L. All the samples have magnesium hardness above the desirable limits.

Result:

- ✓ In our study area the pH value lies within the permissible limits, as the permissible limits of ph value prescribed for public supplies are from 6.60 to 8.20.
- ✓ The values of EC of the water samples also lie within the permissible limits of the Indian standard
- ✓ We are having DO level between 6.2 – 6.8 mg/L. The range for BOD level in our study lies in between 7.2 – 9.4 mg/L. The CPCB prescribes the BOD level to be lesser than 30 mg/L. Hence, our study areas have BOD and DO levels well in the prescribed range.

- ✓ Our study area has total hardness of the range 141 – 232 mg/L. Therefore it can be said that the water varies from being Hard to Very Hard in the site.

Conclusion:

It can be concluded that water is the basic requirement of all the living beings. But human activities are making it scarce resource. Ultimately a day will come when we will be dying to get even a single drop of water for a survival .Hence a regular watch should be kept on all the human activities in order to deal with this problem of scarcity of water. Consequently we tried to find out the impact of ash ponding on the underground water quality of a thermal power plant. It was found that during various tests all the values such as ph value, electrical conductivity as well as BOD level lies within the permissible limit but the hardness of water is greater than the permissible limit, which means that flyash ponding has lead to slight change in the properties of water, in fact regular tests should be done in order to keep a regular watch on the effect of flyash on the underground water so that preventive measures could be taken in order to preserve our water resources.[5]

References:

1. https://www.fhwa.dot.gov/publications/research/infrastructure/structures/97148/cfa54.cfm
2. http://www.smart-fertilizer.com/articles/electrical-conductivity
3. Dugan, PR (1972).Biochemical Ecology of Water pollution. Plemm Press London 159.
4. Fly Ash Disposal and Utilization: The Indian Scenario from Technology journal Volume 2, 1999
5. Patel, RK (1999). Assessment of water quality pf Pitamahal Dam. Indian journal of Environmental Protection, 19(6): 440-441.
6. Herzog, DJ (1996).Evaluating the potential impacts of mine wastes on ground and surface waters. Fuel and Energy Abstracts, 37 (2): 139.
7. AJ Dobbs & DTE Hunt – Sampling and Analysis Of Water to Asses Exposure