



# STUDY OF TOTAL HARDNESS IN WATER AROUND AMBARNATH AREA.

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**Abstract:** Ambarnath area from Thane district of Maharashtra having 3 industrial zone. For the study purpose five ground water samples were selected. Groundwater samples collected from selected sites monthly from July 2013 to December 2013 and analyzed for Total Hardness parameter.

Total Hardness in study area was found between 150 to 218 to mg/l. Total Hardness at all sampling Stations were found below permissible limit of BIS. At sampling station S2, S3 and S4 (Vimko Naka Bore Well, Morivali naka bore well and Ladi naka respectively) Total Hardness were found more than acceptable limit by BIS i.e. above 200 mg/l during some month, indicates seasonal changes and nature of the geological properties of the area with which water have been in contact.

**Keyword:** Total Hardness, Industrial zone, Geological, permissible limit, BIS.

## Introduction:

Population on earth has been increasing in alarming rate, which demands safe drinking water. Groundwater is a major source of water all over the world. The physical and chemical properties of groundwater make it a reliable source throughout the world. Groundwater plays variety of roles in day-to-day life, which makes it an important resource for human beings.

Groundwater is generally invisible but very important in day-to-days life. 300 million Europeans acquire their daily drinking water from groundwater resources. Lakes, rivers and coastal waters in Europe are linked with groundwater; therefore, its quality depends to some extent. [1]

Pollution of groundwater is the natural, physical and chemical change due to human activity, so that water is no longer fit for use; for which it had previously been suited. Groundwater pollution problem now a day has become a severe threat to public health. [2]

Industries play a very important role in the economy of our country. With rapid industrialization, pressure on available resources also increases. Man is not only using natural resources, but he is also discharging the different types of solid, liquid waste material into the same resources, which day-by-day degrading the quality of this vital resources.

Hardness is one of the properties of water, which prevents the lather formation with soap and increases the boiling point of water. Calcium and magnesium cations mainly cause hardness. [3]

Ambarnath area is industrially developed town having number of industries; therefore, study had undertaken to find out the Total Hardness level in groundwater around Ambarnath industrial area. This area is surrounded by huge residential & slum area around it.

**Material and Methods:** For study purpose seven sites around Ambarnath industrial zone were selected. Water samples were collected monthly from selected sites during July 2013 to December 2013. Following sites were selected for study purpose.

Table No.1- Sampling Sites

Sr.No.	Sampling Area	Station No.
01	Forest Naka Bore Well	S1
02	Vimko Naka Bore Well	S2
03	Morivali Naka Bore Well (Buwapada area)	S3
04	Ladi Naka Hand pump (New bhendipada area)	S4
05	Morivali Gaon Open Well	S5

Samples were collected in clean glass bottles. The bottles were rinsed with the groundwater to be taken for analysis. Collected samples were analyzed using EDTA method for Total Hardness.

The EDTA method was used to measure the concentration of Calcium and Magnesium ions in water samples to determine their total hardness. This method is based on the principle that EDTA and its sodium salt forms a soluble complex when added in the solution of certain cations.



A small amount of Eriochrome Black-T indicator is added to an aqueous solution containing calcium and magnesium ions at pH -10.0. As a result, calcium and magnesium ions get complex and the solution becomes wine red. Since EDTA has strong affinity towards calcium and magnesium ions, on the addition of sufficient amount of the reagent, a new complex of blue color is formed at the end of titration.

50 ml sample was taken in conical flask. If sample was having higher calcium, a smaller volume was taken and diluted to 50 ml. 1 ml of buffer solution was added if the sample was having higher amount of heavy metals than 1 ml of Na<sub>2</sub>S solution was added 100-200 mg of Eriochrome black-T indicator was added, the solution turned wine red. The contents were titrated against EDTA solution. At the endpoint, the color changed from wine red to blue. [3]

#### Calculation

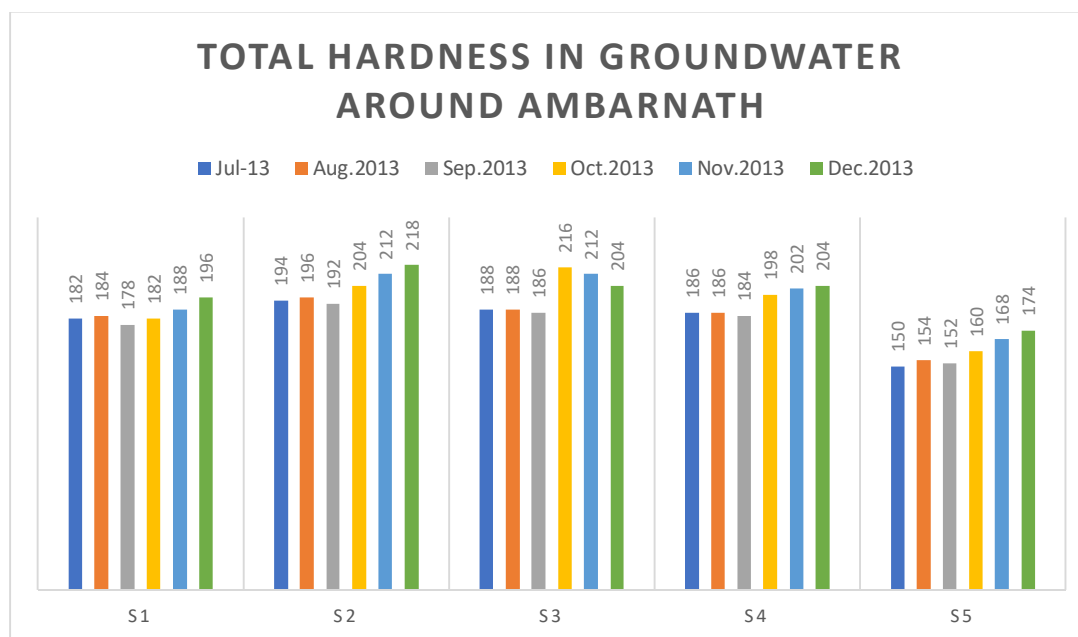
$$\text{Total Hardness as CaCO}_3, \text{ mg/l.} = \frac{\text{ml of EDTA used} \times 1000}{\text{ml of sample}}$$

Obtained results from different sites compared with the standards (Table No.3) given by BIS [4] for Total Hardness parameter.

**Results and Discussion:** After analysis obtained results were shown in table no.2.

Table.No.2-Obtained results of Total Hardness (mg/l) during July 2013 to December 2013

Sampling Site	July13	Aug.13	Sept.13	Oct.13	Nov.13	Dec.13
S1	182	184	178	182	188	196
S2	194	196	192	204	212	218
S3	188	188	186	216	212	204
S4	186	186	184	198	202	204
S5	150	154	152	160	168	174



Graphical presentation – of obtained results of Total Hardness (mg/l) from sampling sites from Jan.2013 to June 2013.

Table No.3- Water standard for Total Hardness

Parameter	CPCB	BIS( IS 10500 : 2012)		WHO
		Acceptable limit	Permissible limit	
TH(mg/l)	-	200	600	-

Total Hardness varied from 218 to 150 mg/l during study period. Standards for Total Hardness has not been set by CPCB and WHO. Total Hardness at all sampling Stations were found below permissible limit of BIS i.e.600 mg/l (IS 10500: 2012).

At sampling station S2, S3 and S4(Vimko Naka Bore Well, Morivali naka bore well and Ladi naka respectively) Total Hardness were found more than acceptable limit by BIS i.e. above 200 mg/l. Hardness is the result of geological formations of the water sources [5]. The Hardness of water varies from place to place and it reflects the nature of the geological properties of the area, with which water have been in contact.

Highest Total Hardness recorded at Sampling station S2 (Morivali naka bore well) during December 2013 i.e.218mg/l.

Lowest Total Hardness recorded at sampling station S5 (Morivali Gaon Open Well) i.e. 150 mg/l.in the month of July 2013. In general, surface waters are softer than ground waters although, this is not always the case [6,7] .Hardness in some condition may be beneficial; it prevents the corrosion in the pipes by forming a thin layer of scale and reduces the entry of heavy metals [8,9]

**Conclusion:**

Total Hardness at all sampling Stations were found below permissible limit of BIS i.e.600 mg/l. At three sampling sites S2,S3 and S4(Vimko Naka Bore Well, Morivali naka bore well and Ladi naka respectively) Total Hardness were found above acceptable limit i.e.200mg/l.which is an indication of geological properties of the area in which water have been in contact. The high concentration of Total Hardness in water Samples may be due to dissolution of polyvalent metallic ions from sedimentary rocks, seepage and run off from the soil. [10]

Lowest Total Hardness observed at sampling station S5 (Morivali Gaon Open Well) in the month of July 2013 and Highest Total Hardness recorded at Sampling station S2 (Vimko Naka Bore Well) in the month of December 2013. Hardness in water has no known adverse effects; still such water is not fit for domestic use. A hardness of more than about 200 mg/l causes scale deposits in the piping system. [11] [12]

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