

Chloride Assessment Near Textile Industries Water Sources: Deteriorating Livelihood

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Abstract

This research was to estimate the level of chloride in different water samples of Barnala region. Samples were collected from three different sites. Samples from five different water sources were taken under study such as drain water, surface, Tap water, Ground water and canal. Maximum value of chloride was found in Site C in drain water which is 4500mg/l. Chloride is determined in natural or slightly alkaline solution by titration with silver nitrate (AgNO₃) using potassium chromate as an indicator. Brown colour indicating end point. Adverse effects related to high chloride concentration are increased number of polymorphonuclear leukocyte, Kidney failure, Liver failure etc.

Keywords-water sources, human health effects, Physico-parameters, Chloride

Introduction-

The degradation of the environment due to the discharge of polluting wastewater from industrial sources is a real problem in several countries. This situation is even worse in developing countries like India where little or no treatment is carried out before the discharge [6],[8]. In spite of many

steps taken to maintain and improve the quality of surface and ground water, the quantities of wastewater generated by these industries continue to increase and municipalities and industries are confronted with an urgent need to develop safe and feasible alternative practices for wastewater management. The textile industries use large volume of water in their operations and therefore discharge large volume of wastewater into the environment, most of which is untreated. The waste water contains a variety of chemicals from the various stages of process operations which include desizing, scouring, bleaching and dyeing [9],[10]. The industries consists of various World Health Organisation (WHO), each of which carried out different operations and produce one type of specific wastewater. The wastewater contains acid used in desizing, dyeing bases like caustic soda used in souring and mercerization [12]. It also contains inorganic chlorine compounds and oxidants eg.; hypochlorite of sodium, hydrogen peroxide and peracetic acid for bleaching and other oxidative applications. Organic compounds are also present, eg., dyestuff, optical bleachers, finishing chemicals, starch and related synthetic

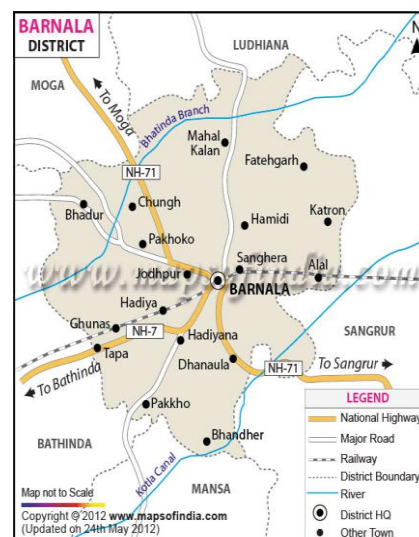
polymers for sizing and thickening, surface active chemicals are used as wetting and dispersing agents and enzymes for desizing and degumming. Salts of heavy metals are also present, eg., of copper and zinc, and iron (iii) Chloride used as printing ingredients. All these wastes are passed into a effluent tank and then drained into a drainage system. Chloride is one of the most common anions found in tap water. It generally combines with calcium, magnesium, or sodium to form various salts: for example sodium chloride (NaCl) is formed when chloride and sodium combine. Chloride occurs naturally in ground water, but is found in greater concentrations where seawater and run-off from road salts (salts used to de-ice icy roads) can make their way into water sources. As such, well owners near snowy roads or road salting storage facilities are especially at risk for high levels of sodium chloride. This study involves the determinations of levels of chlorides and their harmful effects on living beings.

MATERIALS AND METHODS

Sites A, B and C were selected for this study in Barnala region. Site A is Yarn factory, Site B is Gatta factory and Site C is Trident Company. Barnala is situated between 30° 23' North and 75° 33' East. It is located on the Bathinda-Chandigarh highway (no-7) and Jalander-Rewari national highway (no-13) passes through it. It is 65 Kilometers from Bathinda and 85 Km from Ludhiana. According to 2011 census, the total population of Barnala district were 595527. It was 526931 in 2001. Water samples were

collected from different water sources (Drain water, Surface water, tap water, canal, ground water) near the selected sites. 1st site is Yarn factory which is located at Mansa Road, Dhaula, District Barnala, 148107 Punjab. 2nd site is Gatta factory which is located at Cheema village in District Barnala, 148103, Punjab. 3rd site is Trident Company which is located at Raikot Road, Barnala Punjab, 148101. The sampling were taken in the month of March, 2016. Plastic bottles were used to collect water samples. Within 48 hours samples were carried to laboratory for testing in order to prevent the deterioration of water samples. Testing was done in Environ Tech Laboratories (NABL Accredited Laboratory) Department of Science and technology, India S.A.S nagar (Mohali), Punjab.

MAP OF BARNALA DISTRICT-



DETERMINATION OF CHLORIDE

By Argento metric Method

Chloride was determined in natural or slightly alkaline solution by titration was silver nitrate (AgNO_3) using potassium chromate as an indicator. Silver chloride is precipitated before red silver chromate is formed (Brown colour indicating end point).

Interferences- Substances present in potable water will not interfere in the analysis. Bromide, iodide and cyanide are measured as equivalent chloride concentrations and thus interfere positively. Sulphites, thiosulphate and sulphide ions interfere but can be removed by treatment the sample with hydrogen peroxide. Orthophosphates in excess of 25 mg/l interfere. Iron in excess of 10mg/l also interferes by masking the end point.

Apparatus used

1. Erlenmeyer flasks 250 ml capacity
2. Burette 50 ml
3. Conical flasks 100 ml

Reagents

1. Potassium chromate indicator solution- Dissolved 50 gram of potassium chromate (K_2CrO_4) in distilled water . Added AgNO_3 solution until a definite red precipitate was formed. Let it was stand for 12 hour, filter and diluted to 1 liter with distilled water.
2. Standard sodium chloride solution (0.014)-Dissolved 824.0 mg of CMR/AR grade sodium chloride dried at 140°C in distilled water and diluted to 1 liter 1.0 ml=500 μg of Cl.

3. Warmed standard sulphuric acid (0.02)- Dilute 200 ml N H_2SO_4 to one liter with distilled water.

4. Standard silver nitrate solution (0.0141N)-Dissolved 2.395 gm of silver nitrate in distilled water and dilute to one liter.

5. Special reagent for removal of interferences-

a) Aluminium hydroxide suspension- Dissolved 1.25 gm of aluminium potassium sulphate or aluminium ammonium sulphate $\text{Al.K.}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ with one liter of distilled water. Warmed at 60°C and add 55 ml of concentrated NH_4OH slowly with stirring. Let it stand for 1 hour, transferred to large bottle and wash precipitated by successive additions, with thorough mixing and decanting with distilled water, until free from chloride. When freshly prepared, the suspension occupies a volume of 1 liter.

b) Phenolphthalein indicator solution

c) Sodium hydroxide (1N)- Dissolved 40 gm NaOH in distilled water and dilute to 1 liter.

d) Sulphuric acid (1N)-Prepared 1:36 concentrated sulphuric acid.

e) Hydrogen peroxide- 30%

6. Removal of interferences

a) In case sample is highly coloured, add to 100 ml sample, 3 ml of aluminium hydroxide suspension, mix well, let to settle and filter.

c) Adjusted the sample pH 7-10 with sulphuric acid or sodium hydroxide.

Procedure-

1. Standardized AgNO_3 against 0.0141 N NaCl solution. Pipette 10 ml NaCl (0.0141) and add 40 ml distilled water to it. Added 1

ml indicator and titrated with AgNO_3 .
Calculated Normality of AgNO_3
2. Taken 50 ml well mixed (pH adjusted 7.0-8.0) sample in Erlenmeyer flask and added 1 mml K_2CrO_4 . Titrated sample with standard AgNO_3 solution until it turns yellow to brick red which persists for few seconds. Recorded the burette reading.
3. A blank was run taking 50 ml distilled water and titrated it with standard AgNO_3 using K_2CrO_4 indicator. Recorded the burette reading.

RESULTS AND DISCUSSION

The physico-chemical parameters of different water samples are presented in following Tables

Table 1 of Site A

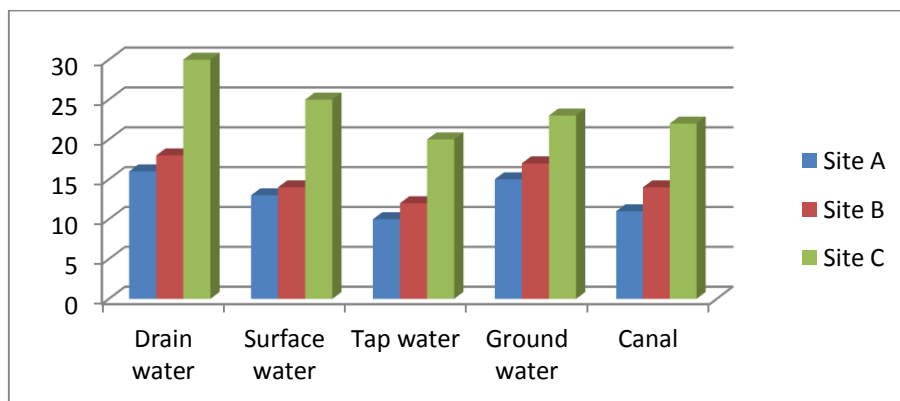
Water Samples	Conc. Of Chloride(mg/l)
Drain Water	1027
Surface Water	1019
Tap Water	1017
Ground Water	1022
Canal	1020
Mean±S.D	1021±3.807

Table 2 of Site B

Water Samples	Conc. Of Chloride(mg/l)
Drain Water	121
Surface Water	115
Tap Water	114
Ground Water	120
Canal	115
Mean±S.D	117±3.24

Table 3 of Site C

Water Samples	Conc. Of Chloride(mg/l)
Drain Water	4500
Surface Water	4100
Tap Water	4000
Ground Water	4300
Canal	4200
Mean±S.D	4220±192.35



In case of site A, the values of chloride of the water samples ranged from 1017 mg/l to 1027 mg/l with an average value of 1021 mg/l (S.D = 3.807, N=5). The highest value of chloride was found in Drain water and lowest value of chloride was found in water sample taken from Tap water. In case of Site B, the values of chloride of the water samples ranged from 114 mg/l to 121 mg/l with an average value of 117 mg/l (S.D=3.24, N=5). In case of Site C, the values of chloride of the water samples ranged from 4000 mg/l to 4500 mg/l with an average value of 4220 mg/l (S.D=192.35, N=5).

Harmful effects of Chloride-

Chloride is one of the most common anions found in Tap water. It generally combines with calcium, Magnesium, or sodium to form various salts standard for chlorides in drinking water, though the EPA recommends levels no higher than 250 mg/l to avoid salty tastes and undesirable odours. Chloride is an electrolyte that helps keep a proper fluid and acid-base balance in your body. The chloride blood test, or serum chloride level, is often a part of a comprehensive metabolic panel or a basic metabolic panel. A metabolic panel also measures the levels of other electrolytes, including carbon dioxide, potassium, and sodium. The proper balance of these electrolytes is critical for the normal functioning of the muscles, heart, and nerves. It's also essential for normal fluid absorption and excretion.

Abnormal blood chloride levels in blood of human may lead to alkalosis, which happens when human blood is either too alkaline or basic, and acidosis, which happens when blood is too acidic.

Imbalance Chloride conditions can cause an electrolyte imbalance, which may cause excessive fatigue, muscle weakness, breathing problems, frequent vomiting, prolonged diarrhea, excessive thirst, high blood pressure

CONCLUSION

From the above result and discussion it is concluded that values of chloride are higher than standard values in barnala region. People living near the Site C that is near the Trident company are suffering from various diseases such as Kidney and liver disorders etc. Due to high value of chloride, people may also experience hypertension and congestive heart failure.

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