Physico-chemical parameters associated with water in water treatment plant by coagulation based process

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Abstract- Human population in the earth is increasing at a high rate day by day, there is large demand of food, so to fulfil the demand humans are developing many agricultural fields for cultivation of different food grains and developing many industries to generate many food items in many varieties for large population. India is second most populated countries in the world and also a developing country. India is having many food industries and large agricultural areas to fulfil the demand of people. Food industry requires incredible measures of water, since it is utilized all through a large portion of plant tasks, for example, creation, cleaning, disinfecting, cooling and materials transport, among others. Water being the essential fixing is generally utilized as a cleaning specialist in food handling industry. Hindustan Coca-Cola Beverages Private Limited is located at the East & South eastern coastal plain. Coca Cola industry is situated between the latitude 20°10'28.3" N to 20°10'31.2" N and longitude 85°38'46.9" E to 85°38'55.2"E. Water samples were collected from both raw water tank and treated water tank at regular period of time up to 50 days. Distinctive physico-chemical parameters (pH, TDS, Turbidity, Chloride, Iron, Chlorine, Alkalinity, Hardness and Aluminium) are read for both raw water and treated water tank. Treated water tank is providing waters to make various products. The study was going up to 50 days in the month of January and February of 2020. The processes involved in Water treatment plant to reduce the concentration of pollutant from raw water are Coagulation, PSF (Pressure Sand Filter), ACF (Activated Carbon Filter), Lead and Log ACF filter and Micron filters. The results of all the physico-chemical parameters are below the prescribed standard level, by this we can conclude that the water coming out from the water treatment plant (WTP) situated in the Coca Cola industry is safe for preparation of products.

Keywords – Hindustan Coca-Cola; Water treatment plant (WTP); Waste water treatment; Coagulation; Physico-chemical parameters

I. Introduction

The universe was created before 15 billion years ago and earth around 4.54 billion years ago. Different species are surviving on different spheres of earth. The requirements for survival of an organism on earth are like food, shelter, water to drink, air to breath and sun as ultimate source of energy for plants (Anjali et al., 2019). Due to increase of human population on earth at a high rate there is large demand of food, so to fulfil the demand humans are developing many agricultural fields for cultivation of different food grains and developing many industries to generate many food items in many varieties for large population (Dehghani et al., 2018). India is second most populated nations on the planet and furthermore a creating nation. It has numerous food businesses and enormous horticultural regions to satisfy the interest of individuals (Manisha and Haritash 2020).

Food industry requires extraordinary measures of water, since it is utilized all through the majority of plant tasks, for example, creation, cleaning, purifying, cooling and materials transport, among others. Practically half of the water used in food handling industry is for washing and flushing purposes. Water being the essential fixing is generally utilized as a cleaning specialist in food handling industry (Vijayaraghavan et al., 2011). Compared to other industrial sectors, the food industry uses a much greater amount of water for each ton of product (Mavrov et al., 2000). Water is basic to continue life, and a palatable (sufficient, protected and open) flexibly should be accessible to all. Improving

access to safe drinking water can bring about unmistakable advantages to wellbeing. Each exertion ought to be made to accomplish drinking water that is as protected as practicable (Yoon 2018).

Coca-Cola in India is among the biggest local purchasers of certain farming items. Hindustan Coca Cola Beverages Private Limited, Khurda,Odisha;is the super plant of the eastern India. It has got lines of production like Tetrapak juice line: 400PPM, RGB-CSD LINE :600BPM, KINLEY WATER:100BPM, MAAZA RGB-600BPM, KRONES-CSD LINE:600BPM, PET-CSD LINE:140BPM, HOT FILL-600BPMetc. Beverage manufactures necessity to protect their products, consumers and their own employees. Health and safety in manufacturing and final product are vital. As we probably aware "Water" is indispensable for all types of life and is the most essential necessity of a drink industry (Moghaddam et al., 2010). That is the reason particular water is helpful in multi-crease purposes. Water treatment plant or WTP treats water by multiple barrier approach. It embraces Coagulation process, Sand separation, activated carbon filtration, Lead, lag ACF, Micron filtration, Reverse osmosis, Ultra Violet treatment, Ultra filtration (Jang and Lee 2018).

At Hindustan Coca-Cola Beverages Pvt. Ltd., Khurda,Odisha; Water treatment framework includes three primary procedures like; Rewarded Water Framework, Delicate Water Age and Recuperation Water Framework. Water treatment plant located at Hindustan Coca-Cola Beverages Private Limited, Khurda,Odisha. Water treatment plant is utilizing the coagulation arrangement of water treatment. In this plant, two types of water are produced and are treated water and soft water (Maeng et al., 2017).

Raw Water: The raw water is procured from Mahanadi which are transported to the plant and Stored in the raw after storage tank. In the tank chlorine dosing is done at 3 to 5 ppm so as to render it free from microbial load (Raymond et al., 2017).

Treated Water**:** Raw water is pumped from bore well or received from IDCO water body which is chlorinated and stored in raw water tank. The chlorinated raw water is then pumped through solid contact clarifier (SCC) in which coagulation and flocculation of the suspended organic matter takes place with the addition of lime, chlorine and ferrous sulphate (Mauclaire et al., 2004). Chemical dosing is done to facilitate flocculation and coagulation there by reducing alkalinity and suspended solids. The flocs formed settle at the bottom of the clarifier and clear water is stored in clarifier water tank (Tiaiba et al., 2018).

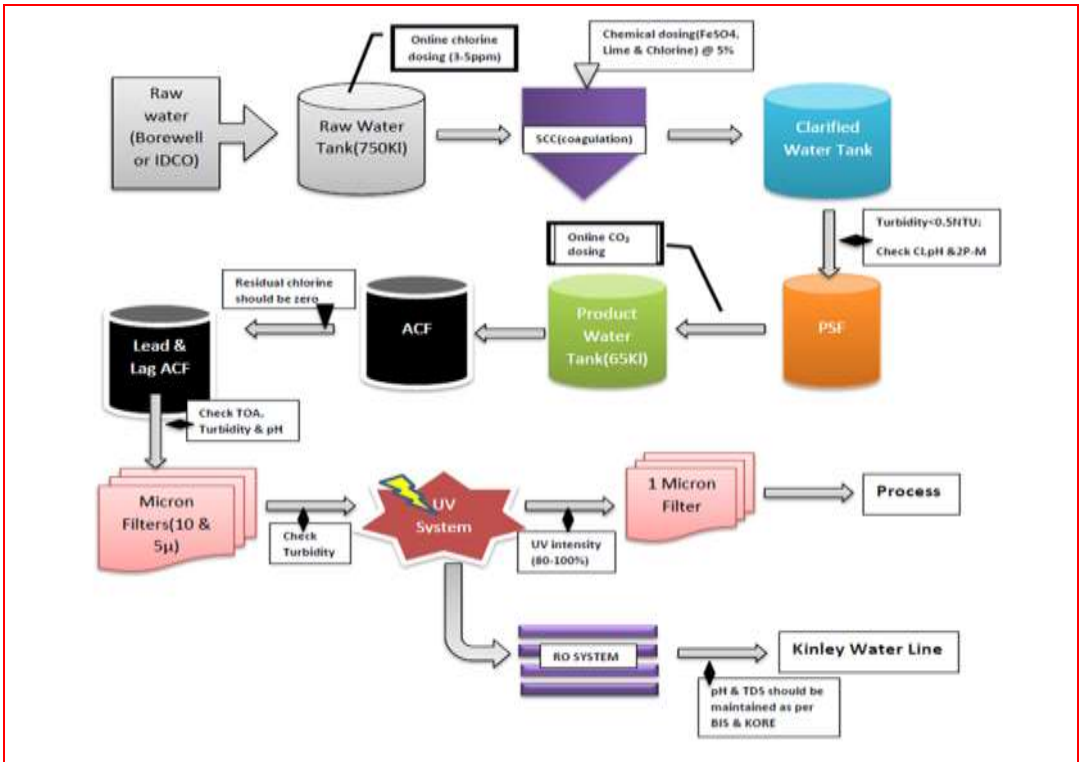

Fig. 1 Flow chart of water treatment plant

The reasonable water from the clarifier water tank is then siphoned through Weight quartz channel comprises of evaluated stones, rock and beat with fine silex quartz (Stembal et al., 2005). The turbidity and suspended solids present in the water are removed in this filter. Filtered water is chlorinated and stored in product water tank and then passed through Activated carbon filter which ensures that no residual chlorine is passed on to process. This water is passed through 10 micron and 5-micron cartridge filter in series, in order to ensure complete removal of suspended solids. This water is then used for bottle filling (Baki and Aras 2018).

Soft Water**:** The chlorinated raw water is pumped from raw water tank through Pressure quartz filter which removes turbidity and suspended solids present in the water. Sifted water at that point goes through Activated carbon filter (ACF) guarantees expulsion of remaining chlorine. The sifted water at that point went through conditioner having solid acidic cation trade gum where calcium and magnesium particles mainly as bicarbonates, chlorides and sulphates which structure hardness in water are traded for sodium particles which gives form hardness in water are exchanged for sodium ions which gives softened water (Wuana et al., 2017). Soft water then splits into two streams. One stream goes to unchlorinated soft water tank. Unchlorinated soft water is used for boiler and utilitiesIn the other stream, chlorine is infused in delicate water before going into chlorinated delicate water tank. Chlorinated soft water is used for bottle washing. The cationic exchange resin is regenerated by passing solution of sodium chloride (Yeong et al., 2017).

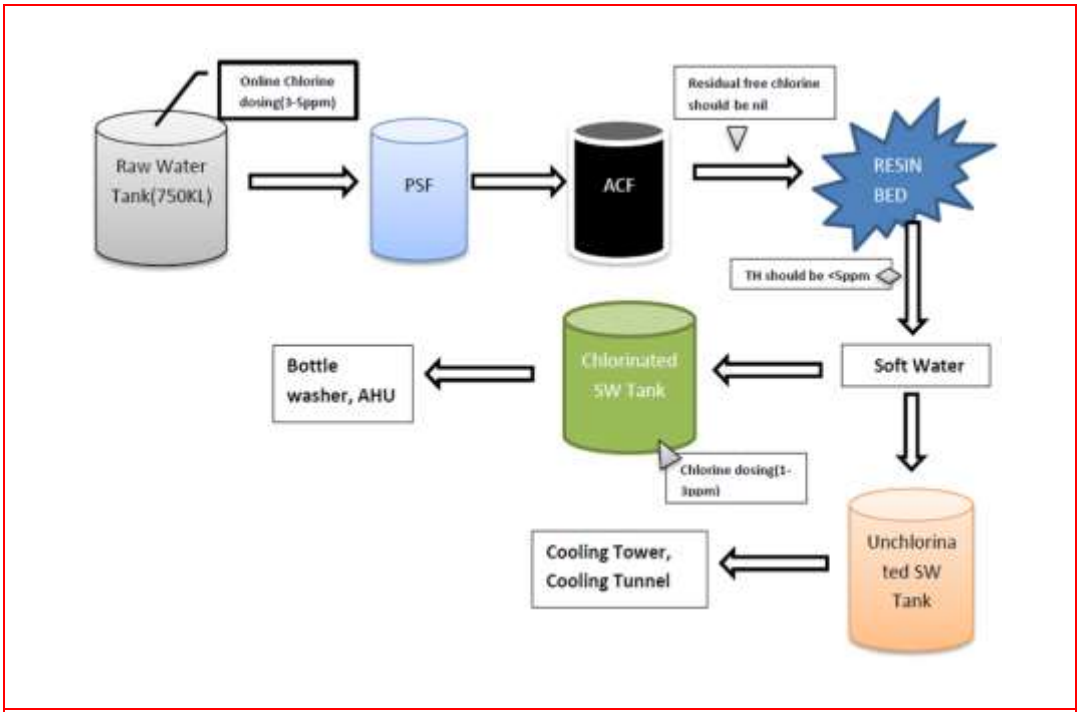

Fig. 2 Flow chart of soft water treatment process

Objectives of the Study: The specific objective of this study is to assessment of different physico-chemical parameters associated with preparation of drinks in Hindustan Coca Cola Beverages Private Limited, Khurda; and also, to discuss upon the removal efficiency of different parameters in Water treatment plant.

2. Materials and methods

2.1 Study area: Hindustan Coca-Cola Beverages Private Limited is located at the Southeastern coastal plain and the agro-climatic zone blessed with sandy-loam, Lome, clay-lome and clayey soil in varied agro-eco system. This region is known for industrial estate of odisha because many industrial estates functioning in this District, like

mancheswar Industrial Estate and Khurda Industrial Estate., near Orissa's capital Bhubaneswar. Its bioclimatology is much influenced for the short radial distance from the Bay of Bengal and presences of a huge water body like the Chilika Lake. Coca Cola industry is situated between the latitude 20°10'28.3"N to 20°10'31.2"N and longitude 85°38'46.9"E to 85°38'55.2"E. Fig. 3 Shows the sampling sites.

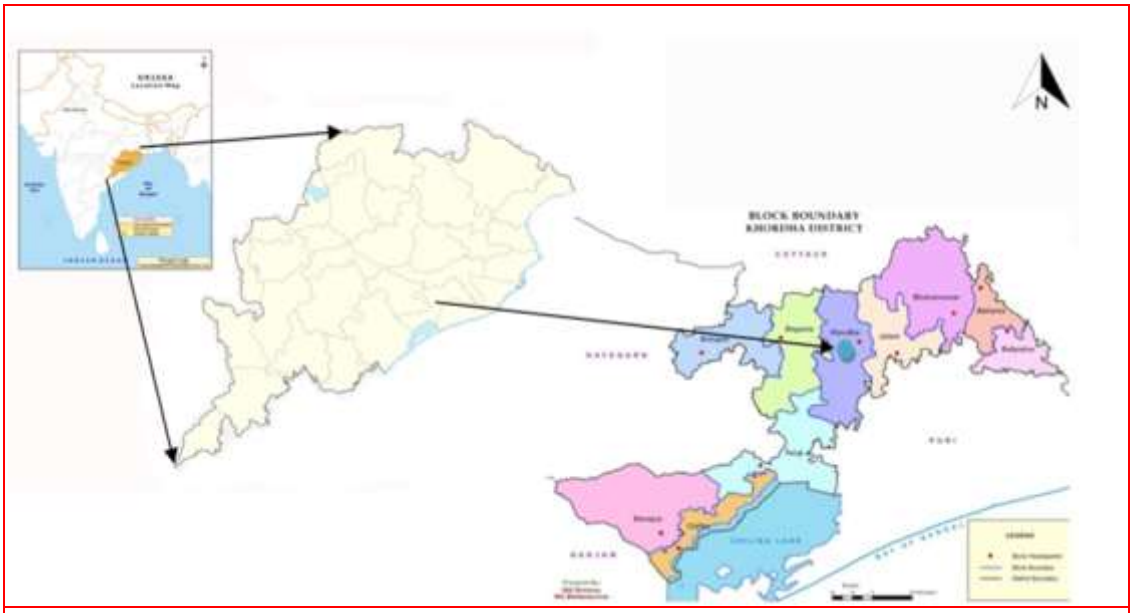

Fig. 3 Map of sampling sites

2.2 Sample collection: Water samples were collected from both raw water tank and treated water tank at regular period of time. About 500ml of water samples from each tank were collected in beaker and taken to laboratory for further analysis.

2.3 Different parameters and their testing procedure:

2.3.1 P-Alkalinity test (Phenolphthalein alkalinity test):

P-alkalinity measures the amount of carbon and hydroxyl alkalinity present in terms of ppm as calcium carbonate. P-alkalinity is measured down to a pH of 8.3 to 8.5. For determination of p-alkalinity, 100ml of water sample is taken in an Erlenmeyer flask. To this about 2 to 4 drops of phenolphthalein indicator was added, which turns the water to pink colour. This is titrated against 0.02N sulphuric acid until colourless appears.

2.3.2 M-Alkalinity test (Methyl purple alkalinity test):

M-alkalinity or total alkalinity test is measuring the amount of carbonate, bicarbonate and hydroxide present in terms of PPM as calcium carbonate .M-alkalinity is measured down to a PH of 4.3 to 4.5.For determination of M-Alkalinity, 100ml of water sample is taken in an Erlenmeyer flask. To this about 2 to 4 drops of sodium thiosulphate solution (0.1 N) was added followed by 3-5 drops of methyl purple indicator, which turns the water to green colour. Sodium thiosulphate clears all the free chlorine present in sample water. This is titrated against 0.02N sulphuric acid (H_2SO_4) until blue colour appears. Endpoint is indicated by change in colour. Standard reading is it should be less than 85.

2.3.3 Total alkalinity test (2P-M Test):

2P-M test is nothing but, p-alkalinity test followed by M-alkalinity test with the same sample. Via this test, the mixing and balancing of all chemical components is determined.

2.3.4 Total hardness test:

Total hardness test determines the chlorides, Sulphates and Nitrates of calcium and magnesium present in water. For determination of total hardness, 100ml of water sample is taken in an Erlenmeyer flask. To this about 2 to 4 drops of ammonia buffer solution was added followed by one hardness indicator tablet, which turns the water to dark pink or purple. This is titrated against 0.02N EDTA (Ethylene Damien Tetra Acetic Acid) until dark blue colour appears. Endpoint is indicated by colour change. The standard is it should be below 100.

2.3.5 Calcium hardness test:

Taking 100ml of treated water. Then sodium hydroxide buffer 8-10 drops and calcium hardness tablet are added and mixed well. After that titration takes place against 0.02N EDTA. End point is indicated by change in colour from light purple to light blue. The standard is it should be below 100.

2.3.6 Turbidity:

Turbidity is related to the suspended solids present in water. So turbid water looks hazy. Turbidity is the main test that determines the quality of water. The test is performed in an instrument called as nephelometer or turbidity meter. The unit of turbidity is measured as NTU (Nephelometric Turbidity Unit). In general, the turbidity of water should not exceed 0. 5NTU.Turbidity is measured by using NTU meter. It should be below 0.3NTU.

2.3.7 Total dissolved solid (TDS):

Total dissolved solid is the combination of all inorganic and organic substances present in water. TDS is measured by conductivity meter and expressed in terms of PPM (Parts per Million). The TDS (Total dissolved solid) is measured by dipping the electrode into water. It should be below 500.

2.3.8 Hydrogen potential (pH):

pH determines whether the water is acidic or alkaline. The pH meter determines the PH 7 is determined as neutral. Water with PH less than 7 is said to be acidic and with PH more than 7 is said to be basic. The pH is measured by using Ph meter. It should be remaining in between 6.5 to 8.5.

2.3.9 Iron test:

Iron test determines the amount of free iron (Ferrous or Ferric ion) present in water. The BIS follows the following test. Then taking 5ml of sample and 3 drops of Fe_1 reagent is added. After that leave the sample for 2-3 minutes. Then analyses the sample using spectrophotometer with set programme. It should be less than 0.1.

2.3.10 Chloride Testing:

100ml of sample is taken. Then 1ml of 1% potassium chromate as an indicator is added in it. After that titration takes place against 0.02N H2SO4.Endpoint indicated as colour change from yellow to bricks colour. Chloride content is,

$$\frac{(\text{Sample reading} - \text{blanck reading}) \times \text{normality of solution} \times \text{Molecular weight of silver nitrate}}{\text{Volume of sample}}$$

It should be less than 250.

2.3.11 Aluminium testing:

Add 1micro spoon of Al_1, 1.2ml of Al_2, 0.25ml of Al_3 in 5ml of sample. After 2-3 minutes concentration is measured using spectrophotometer at the specified wave length. It should be less than 0.2.

2.3.12 Sulphate testing:

This test can be performed using only Merc-spectrophotometer present in ETP lab. First addition of SO_4 tablet in 25ml of sample is takes place. Then measurement of the concentration taking place using spectrophotometer, which should be less than 250.

2.3.13 Total chlorine test:

This test can be performed in each WTP respectively, there are kits present in each one of them to perform the test timely. 25ml of sample in the cuvette is taken and total chlorine powder add in it. Then using the colour measuring kit identifies the concentration of chlorine in the water tested. It should be 3-5ppm.

3. Results and discussion

3.1 Results:

Different physico-chemical parameters were analyzed using following methods and instruments as described in pre pages. Seven parameters were estimated for raw water and Eleven for Treated water. The following table 1 and 2 shows the concentration results (maximum values, maximum values, average values and standard values) of different physico-chemical parameters of both raw and treated water samples, which were analyzed once up to 50 days in the month of January and february,2020.

Table-1: Max, Min and Average concentration values 0f different physico-chemical Parameters of treated water

Parameters	Maximum	Minimum	Average	Standard
pH	7.51	6.45	6.91	6.5 to 8.5
TDS (mg/L)	96	54	77.8	<500mg/L
Turbidity (NTU)	0.2	0.03	0.06	<0.3 NTU
M-Alkalinity (mg/L)	48	15	33.86	<85 mg/L
T-Hardness (mg/L)	96	37	62.7	<100 mg/L
Ca-Hardness (mg/L)	78	30	47.7	<100 mg/L
Cl_2 (mg/L)	0	0	0	0 mg/L
Cl^- (mg/L)	35.45	10.68	20.52	<250 mg/L
Fe (mg/L)	0	0	0	<0.1 mg/L
Al (mg/L)	0	0	0	<0.2 mg/L
SO_4 (mg/L)	28	1	6.5	<250 mg/L

Table-2: Max, Min and Average concentration values 0f different physico-chemical Parameters of raw water

Parameters	Maximum	Minimum	Average	Standard
pH	7.65	7.17	7.44	7.5
TDS (mg/L)	133	109	119.43	<158mg/L
Turbidity (NTU)	3.08	1.63	2.28	<3.01 NTU
M-Alkalinity (mg/L)	95	78	84.9	<85 mg/L
T-Hardness (mg/L)	108	85	94.92	<100 mg/L
Ca-Hardness (mg/L)	91	60	73.9	<100 mg/L
Cl_2 (mg/L)	6	3	4.82	<3-5 mg/L

The pH value of a food is a direct function of the free hydrogen ions present in that food. Acids present in foods release these hydrogen ions, which give acid foods their distinct sour flavour. Thus, pH may be defined as a measure of free acidity. pH in raw water is found varies from 7.17 to 7.65 and in treated water is found varies from 6.45 to 7.51. Average is found to be 7.44 in raw water and 6.91 in the treated water tank. The following two figures (fig.4 and

fig.5) shows the results of pH for both raw and treated water samples of 50 days (month of January and February;2020).

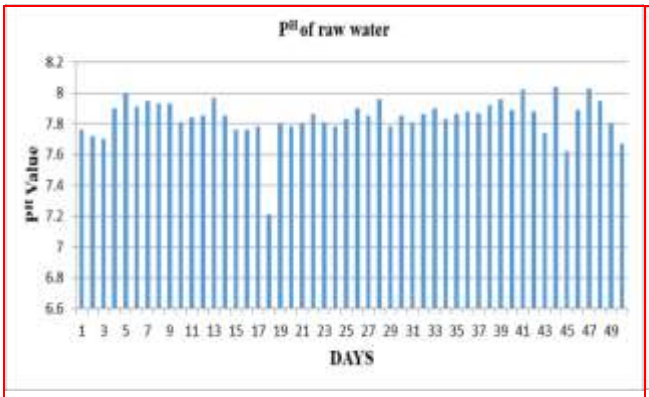

Fig. 4 The concentration of pH for raw water samples of 50 days

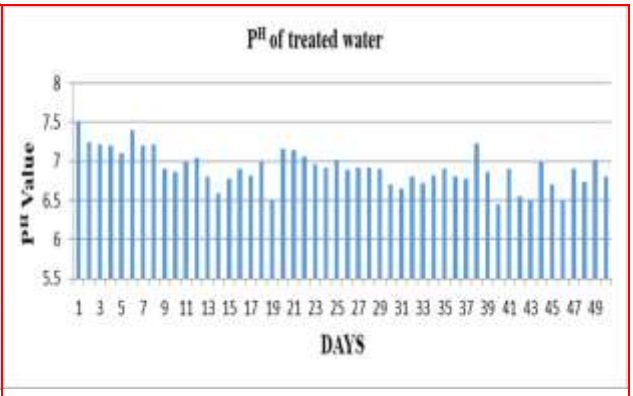

Fig. 5 The concentration of pH for treated water samples of 50 days

Total Dissolved Solids (TDS) in water are some organic and inorganic materials, which include minerals and ions that are dissolved in a particular quantity in water. The main contaminant present in water is total dissolved solids (TDS) that are left in the water after the normal filtration process. TDS in raw water varies from 109 mg/L to 133 mg/L and in treated water 54 mg/L to 96 mg/L. Average is found to be 119.43 mg/L in raw water and 77.8 mg/L in treated water. The following two figures (fig.6 and fig.7) shows the results of TDS for both raw and treated water samples of 50 days (month of January and February;2020).

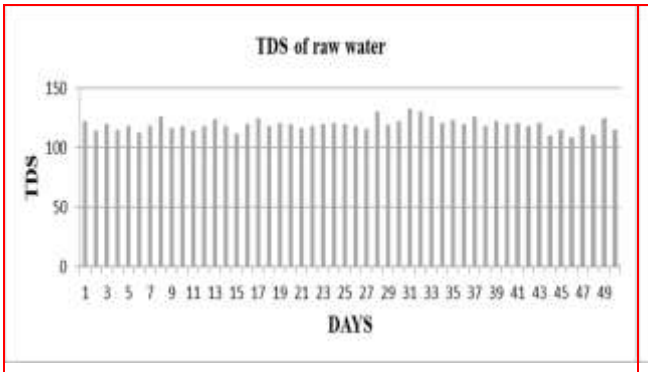

Fig.6 The concentration of TDS for raw water samples of 50 days

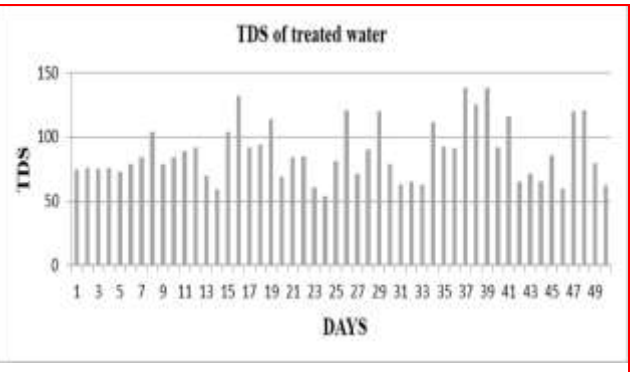

Fig.7 The concentration of TDS for treated water samples of 50 days

Turbidity is the measure of relative clarity of a liquid. Turbidity in drinking water is aesthetically unappealing, and may also represent a health concern. Turbidity can provide food and shelter for pathogens. If not removed, the causes of high turbidity can promote re growth of pathogens in the water, leading to waterborne disease outbreaks. Turbidity is obtained ranges from 1.63 NTU to 3.08 NTU in raw water and 0.03 NTU to 0.2 NTU in treated water. Average is found about 2.28NTU in raw water and 0.06 NTU in treated water. The following two figures (fig.8 and fig.9) shows the results of Turbidity for both raw and treated water samples of 50 days (month of January and February;2020).

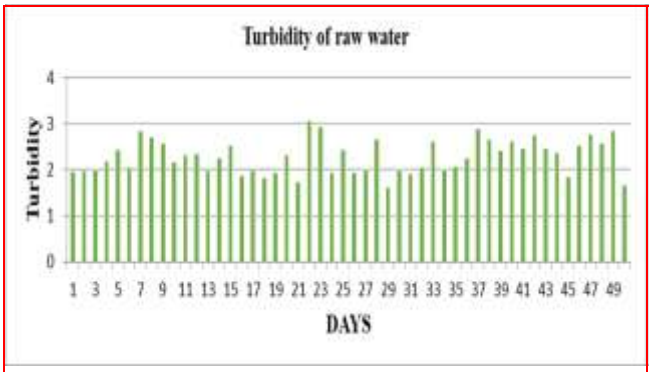

Fig.8 The concentration of Turbidity for raw water samples of 50 days

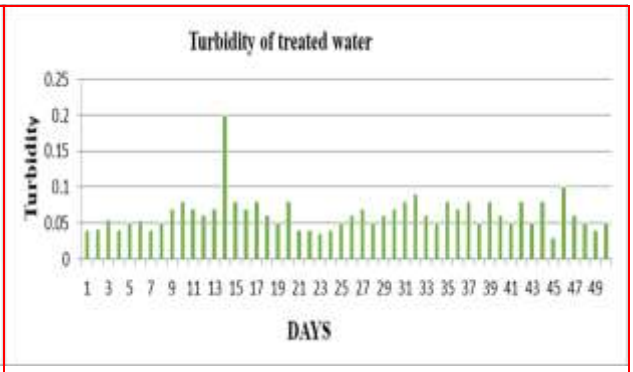

Fig.9 The concentration of Turbidity for treated water samples of 50 days

Alkalinity is the strength of a buffer solution composed of weak acids and their conjugate bases. It is important to note that an ingredient's acid or alkaline forming tendency in the body has nothing to do with the actual pH of the food itself. Citrus fruits are acidic in nature, but citric acid actually has an alkalizing effect in our body. Alkaline foods are important so as to bring about a balance. M-alkalinity in raw water is found to be varies from 78 mg/L to 95 mg/L and in treated water found varies from 15 mg/L to 48 mg/L. Average is found to be 84.9 mg/L in raw water and 33.86 mg/L in treated water. The following two figures (fig.10 and fig.11) shows the results of M-Alkalinity for both raw and treated water samples of 50 days (month of January and February;2020).

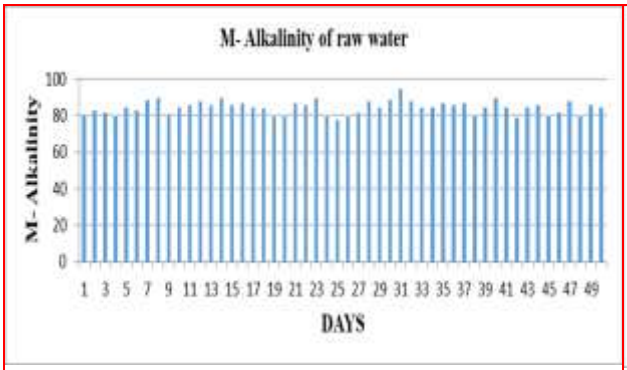

Fig.10 The concentration of M-alkalinity for raw water samples of 50 days

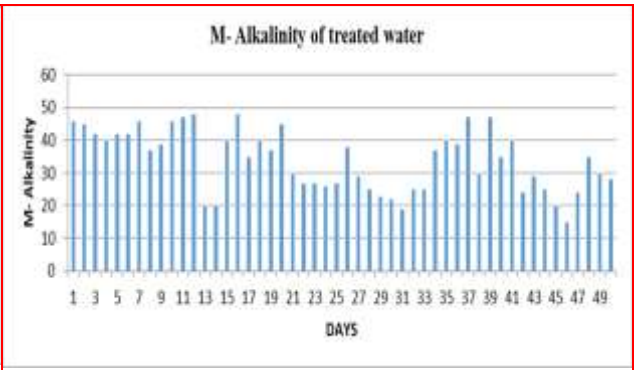

Fig.11 The concentration of M-alkalinity for treated water samples of 50 days

Hardness is the resistance of a material to localized deformation. The term can apply to deformation from indentation, scratching, cutting or bending. The hardness of food plays an important role in the selection and ingestion of food and that the hardness of food could be a conditioned stimulus for conditioned food aversion. Total Hardness in raw water is found to be varies from 85 mg/L to 108 mg/L in raw water and 37 mg/L to 96 mg/L in treated water. Average is found to be 94.92 mg/L in raw water and 62.70 mg/L in treated water. Ca-Hardness in raw water is ranges from 60 mg/L to 91 mg/L and 30 mg/L to 78 mg/L in treated water. Average of Ca-Hardness is found to be 73.90 mg/L in raw water and 47.70 mg/L in treated water. The following four figures (fig.12, fig.13, fig.14 and fig.15) shows the results of T-Hardness and Ca-Hardness for both raw and treated water samples of 50 days (month of January and February;2020) respectively.

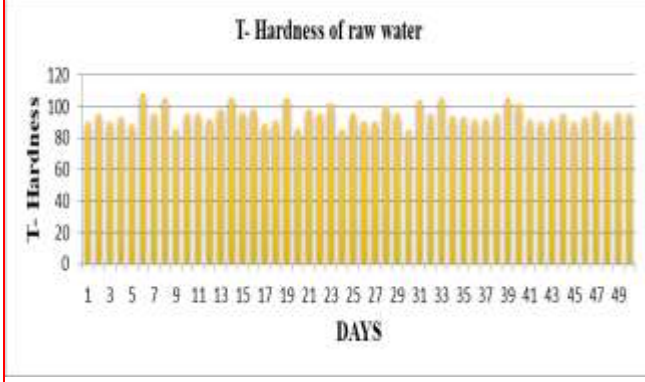

Fig.12 The concentration of T-Hardnessfor raw water samples of 50 days

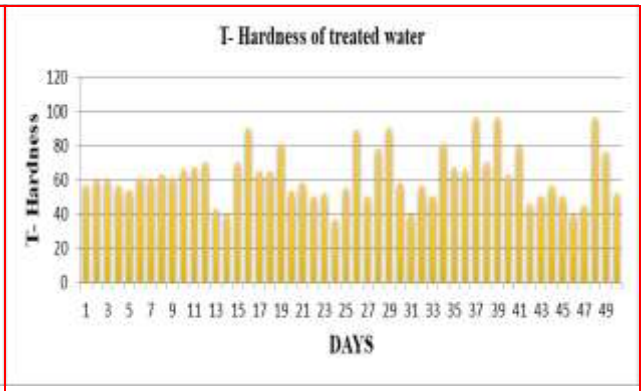

Fig. 13 The concentration of T-Hardness for treated water samples of 50 days

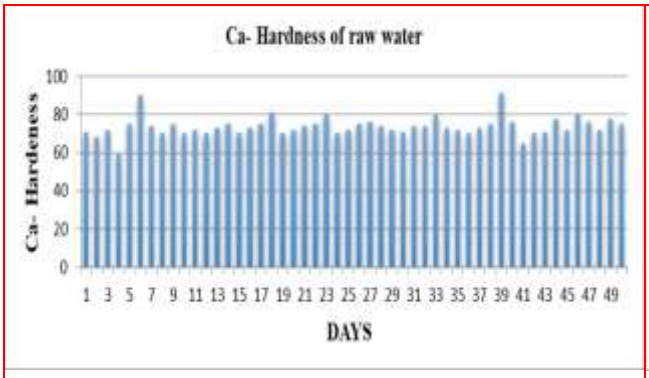

Fig. 14 The concentration of Ca-Hardness for raw water samples of 50 days

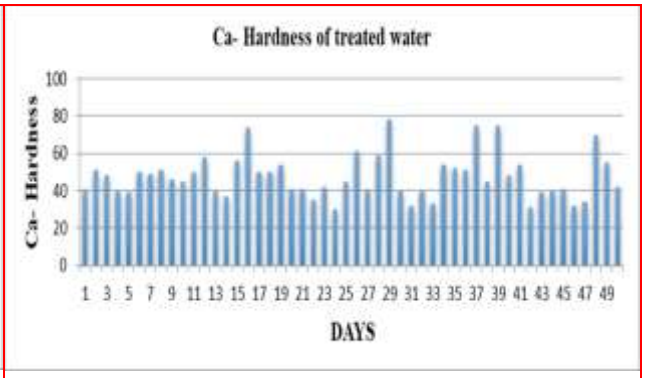

Fig. 15 The concentration of Ca-Hardness for treated water samples of 50 days

Chlorine (Cl_2) compounds are widely used in the food industry to kill bacteria and disinfect. Examples include treating pasteurizer cooling water, washing fruit and vegetables and disinfecting food contact surfaces. Chlorine plays a vital role in the safe production, processing, transport and preparation of foods of all varieties. Cl_2 in raw water ranges from 3 mg/L to 6 mg/L and 0 mg/L in treated water. Average of Cl_2 in raw water found to be 4.82 mg/L. The following two figures (fig.16 and fig.17) shows the results of Chlorine (Cl_2) compounds for both raw and treated water samples of 50 days (month of January and February;2020).

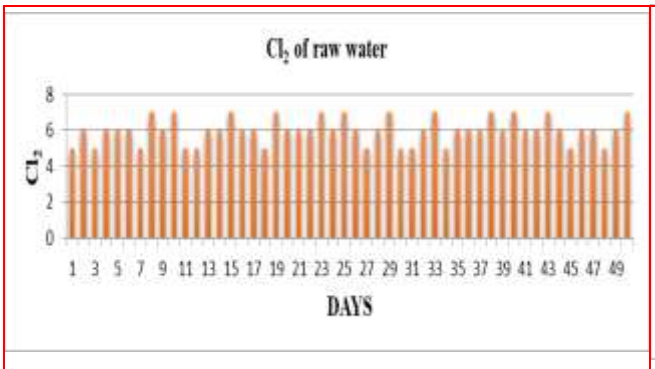

Fig.16 The concentration of Chlorine compounds for raw water samples of 50 days

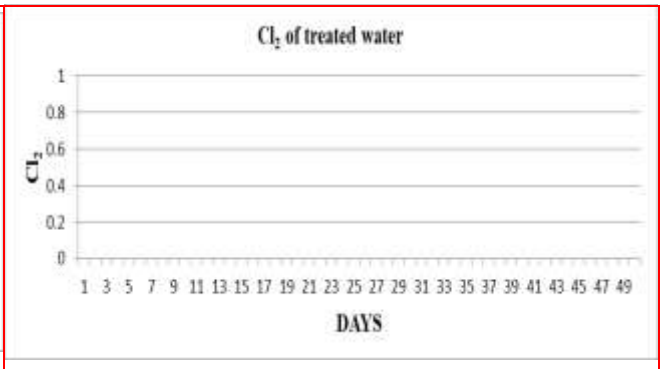

Fig.17 The concentration of Chlorine compounds for treated water samples of 50 days

Chloride (Cl^-) is important in maintaining water balance, and is an essential component of gastric juice. We get our supplies of chlorine from food mainly in the form of sodium chloride (salt). Dietary deficiency of chlorine is rare and is only likely to occur if you have excessive losses from your body. Cl^- concentration ranges from 10.68 mg/L to 35.45 mg/L in treated water and average is found to be 20.52 mg/L. The following fig.18 shows the results of Chloride (Cl^-) compounds for treated water samples of 50 days (month of January and February;2020).

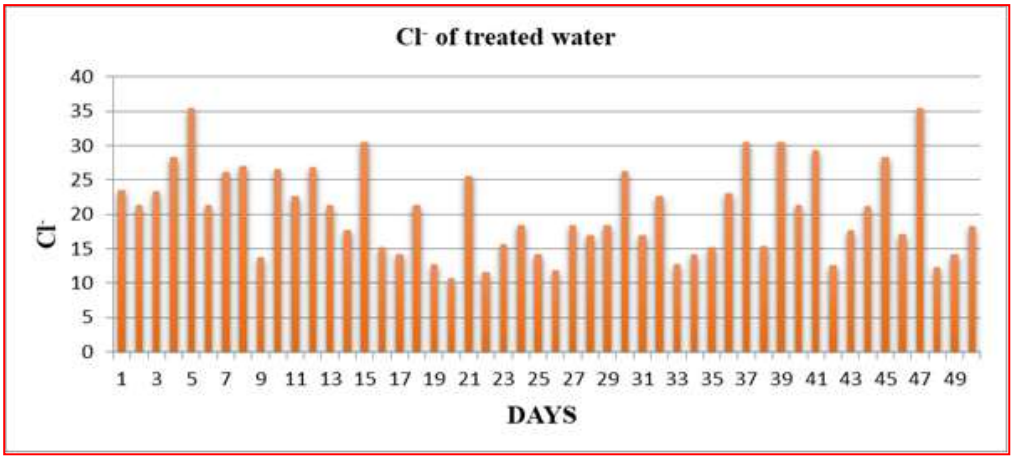

Fig. 18 The concentration of Chloride (Cl^-) for treated water samples of 50 days.

Iron (Fe) is a mineral vital to the proper function of hemoglobin, a protein needed to transport oxygen in the blood. Iron also has a role in a variety of other important processes in the body. A shortage of iron in the blood can lead to a range of serious health problems, including iron deficiency anemia. Iron concentration in treated water is found to be 0 mg/L.

Aluminum (Al) is a nonessential metal to which humans are frequently exposed. Aluminum in the food supply comes from natural sources, water used in food preparation, food ingredients, and utensils used during food preparations. The amount of aluminum in the diet is small, compared with the amount of aluminum in antacids and some buffered analgesics. Al concentration in treated water is found to be 0 mg/L.

Sulfates (SO_4) are mineral salts containing sulfur. Mines, tanneries, steel mills, pulp mills, and textile plants also release sulfates into the environment. Understanding the difference between sulfates and sulfites: Sulfites are different sulfur-containing chemicals used as food preservatives. SO_4 concentration in treated water is found to be varies from 1 mg/L to 28 mg/L and average is 6.50mg/L. The following fig.19 shows the results of Sulfates (SO_4) are mineral for treated water samples of 50 days (month of January and February;2020).

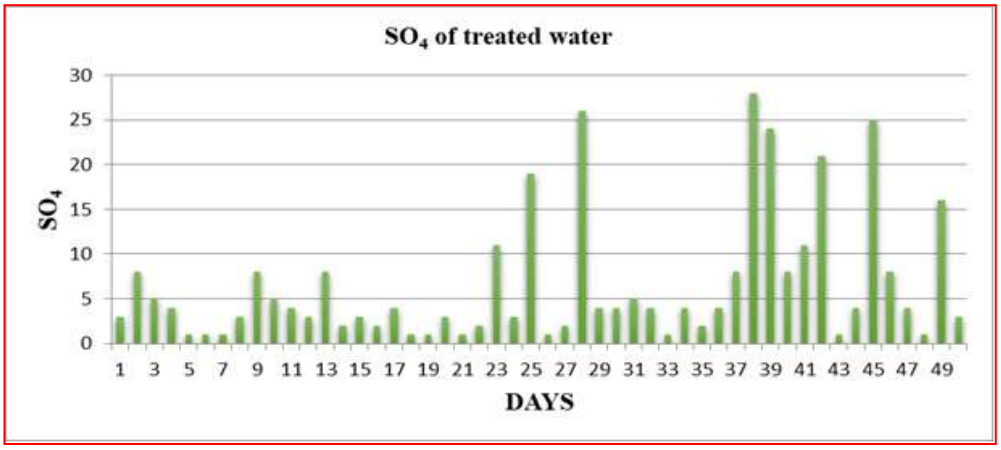

Fig. 19 The concentration of Sulfates (SO_4) material for treated water samples of 50 days.

3.2 DIscussion:

As per the presented data in chapter 4, we found that pH in raw water is 7.44±0.01 and 6.91±0.04 in the treated water. We have seen that after the treatment with various processes in several steps the treated water is come to accepted level which we can easily use for making various products. According to treated water standard use by Coca Cola Company, pH should be remaining in between 6.5 to 8.5 but my pH level is always within the prescribed limit. TDS in raw water varies from 109 mg/L to 133 mg/L and in treated water 54 mg/L to 96 mg/L. Average is found to be 119.43 mg/L in raw water and 77.8 mg/L in treated water. As per the prescribed standard the TDS should be remain below 500mg/L but all the presented result is remaining below the standard, so this water is good for use to make many products. Turbidity is obtained ranges from 1.63 NTU to 3.08 NTU in raw water and 0.03 NTU to 0.2 NTU in treated water. Average is found about 2.28NTU in raw water and 0.06 NTU in treated water. Here all the presented result are remains below the prescribed standard which is 0.3NTU, so this water is good for making different products. M-Alkalinity in raw water is found to be varies from 78 mg/L to 95 mg/L and in treated water found varies from 15 mg/L to 48 mg/L. Average is found to be 84.9 mg/L in raw water and 33.86 mg/L in treated water. The result given in the standard is 85mg/L. All my results are remains below the standard, so the water is safe for making various products. T-Hardness in raw water is found to be varies from 85 mg/L to 108 mg/L in raw water and 37 mg/L to 96 mg/L in treated water. Average is found to be 94.92 mg/L in raw water and 62.70 mg/L in treated water. CA Hardness in raw water is ranges from 60 mg/L to 91 mg/L and 30 mg/L to 78 mg/L in treated water. Average of Ca-Hardness is found to be 73.90 mg/L in raw water and 47.70 mg/L in treated water. In the standard the prescribed value is 100mg/L for both T-Hardness and Ca-Hardness. All my results are remains below the prescribed standard. Hardness is important parameter which can alter the process of mixing in to various substances. Here all the results presented are remains below the prescribed standard. Chlorine (Cl_2) in raw water ranges from 3 mg/L to 6 mg/L and 0 mg/L in treated water. Average of Cl_2 in raw water found to be 4.82 mg/L. Prescribed standard of treated water for is 0mg/L. All the results are remains below the prescribed standard, so the water can easily use for making products. Chloride (Cl^-) concentration ranges from 10.68 mg/L to 35.45 mg/L in treated water and average is found to be 20.52 mg/L. Here all the results are below the prescribed standard. The given standard for treated water is 250mg/L. Iron concentration in treated water is found to be 0 mg/L. Prescribed standard of treated water for is <0.1 mg/L. All the results are remains below the prescribed standard. Aluminum (Al) concentration in treated water is found to be 0 mg/L. Prescribed standard of treated water for is <0.2 mg/L. All the results are remains below the prescribed standard. SO_4 concentration in treated water is found to be varies from 1 mg/L to 28 mg/L and average is 6.50mg/L. Prescribed standard of treated water for is <250 mg/L. All the results are remains below the prescribed standard, So the water coming out as treated water from the water treatment plant (WTP) is safe to use in coca-cola non-alcoholic beverages industry.

4. Summery

The raw water as it enters the raw water tank is chlorinated therefore killing all the microbes. It is then passed to solid contact clarifier in which coagulation and flocculation of the suspended organic matter takes place with the addition of lime, chlorine and ferrous sulphate. chemical dosing is done to facilitate flocculation and coagulation there by reducing alkalinity and suspended solids. the flocs formed settle at the bottom of the clarifier and clear water is stored in clarifier water tank. the clear water from clarified water tank is then pumped through pressure quartz filter consists of graded pebbles, gravels and topped with fine silex quartz. The turbidity and suspended solids present in the water are removed in this filter. filtered water is chlorinated and stored in product water tank and then passed through activated carbon filter which ensures that no residual chlorine is passed on to process. This water is passed through 10 micron and 5-micron cartridge filter in series, in order to ensure complete removal of suspended solids and UV is the last point of the water treatment process, here all the microbes are killed because of the UV- rays. hence the outcome is purified water which is then supplied to the production lines.

5. Conclusions

In this investigation I have evaluated various physico chemical parameters (pH, TDS, Turbidity, Chloride, Iron, Chlorine, Alkalinity, Hardness and Aluminium) of both raw water and treated water. Treated water is being provided for making different items. This study is continuing up to 60 days in the month of January to March of 2020. Solid Contact Clarifier, PSF (Pressure Sand Filter), ACF (Activated Carbon Filter), Lead and Lage ACF filter and Micron filters and UV (Ultra Violet) are the processes involved in Water treatment plant to reduce the concentration of impurity from raw water to Treated water. The results of all the physico-chemical parameters are underneath the

endorsed standard level, by this we can presume that the water coming out from the water treatment plant (WTP) is safe for the Coca-Cola Beverages industry for planning of products.

Acknowledgments

The research described in this paper was supported by the authorities of "Hindustan coca cola beverages private limited;Khurda". Especially we are very much thankful to Ms.Aishwariya Pattanayak, Manager HR; Mr. Sudipta Roy and Mr.Manas Adhikari, Quality Manager, Hindustan Coca-Cola Beverages Private Limited- Khurdha. Without their support, kind encouragement and input, the validation survey could not have been successfully conducted.

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