REPUBLIC OF TURKEY
BİNGÖL UNIVERSITY
INSTITUTE OF SCIENCE

CHEMICAL ANALYSIS OF TREATED WATER USED FOR BATCHING AND FILLING OF CARBONATED DRINKS

MASTER'S THESIS

QUMRI RAHMAN BAYZ

CHEMISTRY

THESIS ADVISOR
Prof. Dr. İBRAHİM Y. ERDOĞAN

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This dissertation was accepted by the following committee on 02.11.2018 with the vote unity.

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PREFACE

This postulation would not have been conceivable without the help of the accompanying individuals. On account of that I might want to offer my thanks to:

Most importantly, I might want to thank my God (Allah), for giving this chance of beginning and finishing my lord degree proposition, sound and effectively.

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Qumri Rahman BAYZ

Bingöl 2018

CONTENTS

LIST OF SYMBOLS AND ABBREVIATIONS

BOD	: Biochemical oxygen demand
CCPP	: Calcium carbonate perception potential
COD	: Chemical oxygen demand
DPD	: N, N-Diethyl phnylenldemine
DO	: Dissolved oxygen
EC	: Electric conductivity
EDTA	: Ethylene demines tetra acetic acid
ETC	: Extra
L	: Litter
N	: Number of electrons
NTU	: Nephelometric turbidity units
PCI	: Pepsi Company International
PPB	: Part per billion
RO	: Reverse osmosis
S	: Second
T	: Temperature
t	: Time
T. ALK:	: Total alkalinity
TC	: Technical committee
TDS	: Total dissolve solids
TH	: Total headrace
TUR	: Turbidity
UF	: Ultra filtration
UV	: Ultra violet
V	: Volume
WHO	: World Health Organization

LIST OF FIGURES

LIST OF TABLES

KARBONATLI İÇECEKLERİN HARMANLANMASI VE DOLDURULMASI İÇİN KULLANILAN ARITILMIŞ SUYUN KİMYASAL ANALİZİ

ÖZET

Bu tez çalışması, karbonatlı içeceklerin harmanlanması ve doldurulması için su arıtımının sentetik olarak incelenmesi üzerinde durmaktadır. Araştırmanın amacı, özellikle su arıtma proseslerindeki ilerlemeye odaklanmak ve bu gerçekleştiği takdirde karbonatlı (yumuşak) içeceklerde bir gelişme olup olmadığını görmektir. Nihai ürün kalitesini değerlendirilmesi noktasında, uygun olmayan içme suyu gelişmekte olan ülkelerdeki başlıca sorunlardan biridir. Soruna dikkat çekmek için belirli bir nihai hedefle, su örnekleri gazlı içeceklerin dağıtımı için kuruluştan alındı. Örnekler ve stratejiler, bozulma sorunlarının farkına varmak ve makul çözüm önerileri getirmek için fiziksel-sentetik kaliteleri açısından analiz edildi.

Tüm bunların birlikte uygulanabilir olması için gazlı içecek kullanımında çok büyük faktörler ortaya koyan bir araştırma yapıldı. Ayrıca pH, Cl, TDS, TURB, TH, T, Alk, Mn, SO_4 gibi çeşitli bileşenler de dikkate alınarak incelenmiştir. Ekonomik iyileşmeyi gerçekleştirecek farklı stratejiler, yöntemler ve araçlar incelenmiş ve materyal etkinliğini gerçekleştirmeye yönelik tavsiyeler, sodada süregelen sorunları anlamaya yönelik önerilerle gelinen son noktayı akılda tutarak kullanılmıştır.

Anahtar Kelimeler: H_2O, su arıtımı, karbonatlı içecekler, otomatikleştirme (stratejiler).

CHEMICAL ANALYSIS OF TREATED WATER USED FOR BATCHING AND FILLING OF CARBONATED DRINKS

ABSTRACT

This thesis work depicts on synthetic examination of water treatment for batching and filling utilized of carbonated drinks. The point of the exploration is focus especially around advancement in water treatment processes and to see if there is a development in the way carbonated (delicate) drinks provided that this is true, to what degree. With the point of assessing completed item quality, in light of the fact that unsuitable water is essential in advancing nations. With a specific end goal to take care of the issue, water supplies were taken from the organization for delivering soda pops. The examples and strategies were dissected as a mix of physical-synthetic quality to recognize the tainting issues and recommend reasonable arrangements.

All together the examination to be viable, a research was performed which recognized huge determinants for soda pop utilization. Additionally considering different concoction segments like pH, Cl, TDS, TURB, TH, T, Alk, Mn, SO_4 have been investigated. The different strategies, procedures and apparatuses to accomplish economic improvement were explored and the philosophies to accomplish materials effectiveness were used keeping in mind the end goal to give suggestions to fathom the pro fluent issue at the soda.

Keywords: H_2O, water treatment, carbonated drinks, automation (strategies).

1. INTRODUCTION

Water is the essence of life as found on earth, and totally dominates the chemical composition of all organisms (Wetzel et al. 1975). Modern studies in many countries, has shown with a high accuracy that the rate of development of a country can be measured by the utility of water per inhabitant (Khadam et al. 1977).

Water is the substance of life as found on earth, and absolutely overwhelms the concoction organization everything being equal (Wetzel et al. 1975). Current investigations in numerous nations, has appeared with a high precision that the rate of advancement of a nation can be estimated by the utility of water per tenant (Khadam et al. 1977). Condition impact human wellbeing incorporates shortage of drinking water and deficient sanitation. It is evaluated that in excess of 1 billion individuals don't approach sufficient supplies of clean water. It has been explored that around 80% of the considerable number of illnesses on the planet are ascribed somehow to deficient clean water supply (Wittington and Guariso 1983).

This proposition does not intend to talk about all or almost all perspectives that influence drinking-water quality in creating nations. Today, quantities of individuals without access to safe drinking-water sources overall range from in excess of 660 million people (WHO/UNICEF 2015) to in excess of 780 million individuals (WHO/UNICEF 2012). Around 2.4 billion individuals don't approach appropriate sanitation offices (WHO/UNICEF 2015).

The research center tests were additionally used to increase promote information of microbial cleaning efficiencies (identified with E. Coli, add up to coli frames and heterotrophic plate tallies) of the micro filtration units. Likewise the impacts of micro filtration identified with physical-concoction parameters (turbidity, pH, electrical conductivity (EC), magnesium, calcium, sodium and potassium) were inquired about. A

portion of the lab test techniques ought to likewise evaluate the impacts of micro filtration on agreeableness parameters: taste, smell and appearance (Luu 2016). Standard soda pops contain sugar, while light sodas contain (calorie free) fake sweeteners (Bellisle and Drewnowski 2007).

Water is both the most bounteous and the most imperative substance which nature gives to support life to plants and creatures. Its accessibility is restricted while its general request per capital has expanded significantly because of populace blast and the expanding complexity of individuals (Akinbile 2004a). Commented that water is irreplaceable regular assets and that there is not a viable alternative for it and its employments. Surface water specifically has been terribly lacking and expanding unwavering quality is being set on water from aquifers. It was additionally affirmed that water assumes a noteworthy part in the general improvement of networks (Akinbile 2004b).

Water treatment includes process that changes the synthetic structure or characteristic "conduct of water". Essential water accessibility incorporates surface or ground water. Most civil or open water originates from surface water while private water supplies typically comprises of ground water pumped from wells or boreholes (URL 1).

Water is one of the principles vital a biotic parts of nature. Around, 97% of the aggregate water is found in seas, which isn't proper for drinking, and just 3% is considered as new water, out of which 2.97% is found as icy masses and ice tops. Just the staying little segment, 0.03%, is realistic as surface and ground water for human utilize (Muhammad et al. 2013). Safe drinking water is an essential requirement for good wellbeing and it is a simple right of people (WHO 2001). Furthermore, it is difficult to envision perfect and sterile condition without water.

Water quality is the proportion of how great the water is, regarding supporting valuable uses or meeting its ecological measures. Consumable water is the water which is appropriate for drinking and cooking purposes. Convey ability considers both the wellbeing of water regarding wellbeing, and its worthiness to the shopper, as a rule as far as taste, smell, shading and other sensible characteristics (Benignos 2012).

It is essential that the plan of any treatment procedure depends on a full examination of site conditions, including synthetic and microbiological investigation of the water to be dealt with, a hazard appraisal and the aftereffects of research facility or pilot scale tests to decide the viability of the procedure and the concoction dosing prerequisites.

Where water is utilized for any household purposes it must be healthy. Necessity for treatment may shift through precipitation, catchments movement or different reasons. In spite of the fact that checking may demonstrate that the water is bacteriologic partner safe a portion of the time, it is greatly likely that there will be a bacteriological test at different occasions.

In this way, purchasers of water treatment plant and supplies should: guarantee that potential providers know about the size and nature of the water supply confirm that potential providers can supply and introduce (if required) gear reasonable and affirmed for use with private water supplies set up whether providers can give references identifying with comparable tasks ensure that guidelines for utilize and progressing administration and support necessities of the hardware are given (URL 2).

The nature of the world's water is imperative to our reality. We require sufficient clean water to extinguish our thirst, flood our fields, and manage all life shapes in the earth. We should have clean water in our homes, networks, organizations, enterprises, and in nature. We require clean water today and we will require it tomorrow. We depend on clean water in relatively every part of our lives. We depend on it for drinking, washing, cooking, swimming, angling and sailing. We rely on it for developing and preparing our sustenance and supporting the plants and creatures. We rely on the stylish characteristics of clean water to support our spirits (Kenneth et al. 2003).

Lamentably, we have no certification that spotless water, depended on so intensely, will dependably be accessible. The supply of clean water on the earth is limited, and it is being undermined by water contamination (Kenneth et al. 2003).

Nature comprises of physical, concoction, and organic substances, which collaborate with the goal that the initial two substances bolster the last substances and enable them to encounter practical development. At the present level of human headway, humankind can contrarily and decidedly impact the adjust of these substances, in this manner influencing the soundness of the earth (Roberts 2007).

Three general zones have composed water treatment advances which are: physical methods, chemical methods, and energy intensive methods. Physical strategies for wastewater treatment speak to a collection of advancements that we allude to a great extent to as strong fluid divisions methods, of which filtration assumes a prevailing part. Filtration innovation can be broken into two general classifications regular and non-traditional. To comprehend the part of filtration, it is fundamental to make qualifications not just with alternate innovations utilized in the cleaning and decontamination of mechanical and city waters, yet additionally with the objectives of various unit forms. Substance strategies for treatment depend upon the synthetic communications of the contaminants we wish to expel from water and the utilization of synthetic compounds that either help in the division of contaminants from water or aid the annihilation or balance of destructive impacts related with contaminants (Nicholas et al. 2002).

Synthetic treatment strategies are connected both as remain solitary advances and as a basic piece of the treatment procedure with physical techniques. Among the vitality serious innovations, warm techniques have a double part in water treatment applications. They can be connected as methods for disinfection, in this manner giving great drinking water, or potentially these innovations can be connected to the handling of the strong squanders or ooze, produced from water treatment applications

As a different unit process, its goal is very clear: in particular, to expel suspended solids. When we join this innovation with compound strategy sand apply sedimentation and elucidation (other physical detachment techniques), we can stretch out the innovation to expelling disintegrated particulate issue too. Therefore, the innovation choices for water treatment are incredible, and regularly the test lies with the determination of the most practical blends of unit procedures and activities (Nicholas et al. 2002).

Water is a central constituent of life and is basic to an extensive variety of monetary exercises. It is likewise a constrained asset, as we are every now and again helped by the lamentable impacts to remember dry spell in specific parts of the world. Quality estimations are basic to exhibit the similarity of information acquired worldwide and they shape the reason for remedy choices identified with administration of water assets, observing issues, organic quality, and so on. Other than the vital quality control devices created for different kinds of physical, synthetic and organic estimations, there is a solid requirement for instruction and preparing identified with water quality estimations (Philippe et al. 2006).

The expression “water quality” depicts the physical, concoction and microbiological attributes of water. These properties on the whole decide the general water quality and the wellness of the water for a particular utilize. These properties are either characteristic for the water or are the consequence of substances that are disintegrated or suspended in the water (Frik 2006). Water quality is just important when assessed in connection to the utilization of the water. The reason is that water of a specific quality might be fit for a particular utilize, yet totally unfit for another utilization. For instance, water that is fit for human utilization may not be fit as kettle feed water in light of the fact that the broke down in natural salts that are adequate in drinking water, are not endured in heater feed water, since they may encourage and cause blockages in the evaporator gear (Frik 2006).

2. LITERATURE SUMMARIES

This section manages the audit of writing important to the examination theme soda pop utilization among young people. The survey of writing is examined under various segments which are soda and water treatment and it is history additionally process, material strategies for water treatment has been specified.

The well-being of any network completely relies upon the availability of sufficient and safe water. Thus, water is transcendentally fundamental forever, well-being and for human sense of pride. In this way, notwithstanding network medical advantages, all individuals have the privilege to protect and sufficient water recovered in evenhanded way to drink, cooking, individual and residential cleanliness. For this situation, both suppleness and security of drinking water are similarly imperative to diminish the frequency of water-related and water borne medical issues particularly sicknesses like diarrhea (Bharti et al. 2011).

A soda pop is non-mixed refreshment that normally contains water, a sweetener, corrosive and an enhancing operator (Ashurst 2008). Different fixings may incorporate organic product or natural product juice, carbon dioxide, additive and colorants. Albeit little measures of liquor might be recognized in a soda, this liquor substance ought not to surpass 0.5% of the aggregate volume generally the drink will be viewed as alcoholic. The name “delicate” is because of the low measures of liquor not at all like hard beverages which allude to mixed drinks. Soda pops might be charged or non-jazzed; might be served chilled or at room temperature and are once in a while warmed. These refreshments can be ordered as water drinks; carbonates; editable, still and squeeze drinks and practical beverages. Not all refreshments are soda pops. Cases of refreshments that are not thought to be soda pops are: unadulterated juices, hot chocolate, fermented tea and espresso, drain, and milkshakes (Ashurst 2008).

A regular procedure flowchart for the produce of carbonated soda pops is appeared in Figure 2.1. There is a slight variety in the procedures from plant to plant however the real procedure steps are essentially the same, and are examined in this segment.

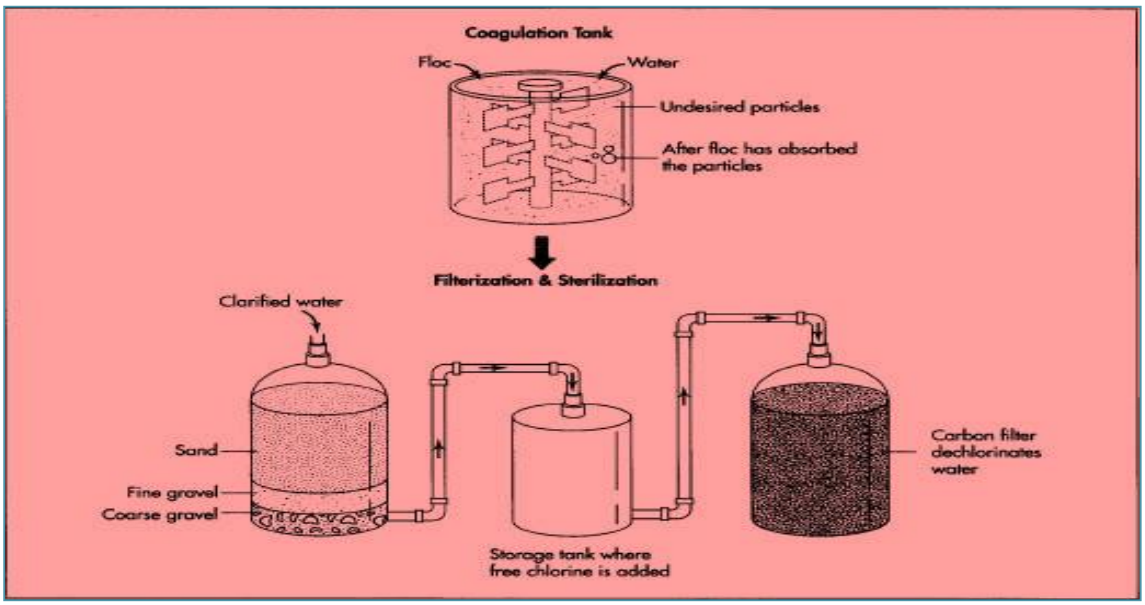


Figure 2.1. Typical process of carbonated soft drinks (URL 3)

The history soft beverages back to the mineral waters found in common springs. Antiquated social orders trusted that washing in normal springs as well as drinking mineral waters could fix numerous maladies. The most punctual sodas were sherbets created by Arabic physicists and initially served in the medieval Near East. These were squeezed soda pops made of pounded natural product, herbs, or blossoms (Rossant 2005). From around 1265, a prevalent drink known as Dandelion and Burdock showed up in England, produced using matured dandelion (Taraxacum officinal) and burdock (Actium lappa) roots, it was normally carbonated. The drink (like Sarsaparilla) is as yet accessible today however made with flavorings and carbonated water since the Carole in the first formula was observed to be cancer-causing (Milliken 2007).

The historical backdrop of carbonated sodas goes back to the late 1700s, when seltzer, pop, and different waters were first economically created. The early carbonated beverages were accepted to be powerful against specific ailments, for example, rotten fevers, loose bowels, and bilious regurgitating. Specifically, quinine tonic water was utilized in the

1850s to shield British powers abroad from jungle fever. The greatest leap forward was with Coca-Cola, which was sent to American powers wherever they were posted amid World War II. The propensity for drinking Coca-Cola remained with them even after they returned home. Elements for the drink included coca extricated from the leaves of the Bolivian Coca bush and cola from the nuts and leaves of the African cola tree (Ashurst 2005). The principal Coca-Cola drink was created in 1886. From that point forward, the soda pop industry has seen its noteworthy development. Organic product juices and sodas (Figure 2.2) are accessible in basically a similar frame anyplace on the planet. From polar bases to the tropics, and from the biggest created countries to little and less created nations, soda pops and natural product juices are accessible in bottles, jars, overlaid paper packs, pockets, glasses and relatively every other type of bundling known (Ashurst 2005).

Figure 2.2. Soft drinks (URL 3)

It is by and large acknowledged that the depiction of soda pops prohibits tea, espresso, drain drinks and, as of not long ago, liquor. Be that as it may, in numerous nations, the creation of 'delicate' beverages containing liquor is developing. Many consider this to be an unfortunate pattern on the grounds that customarily the essence of mixed drinks has been related to adulthood. The obscuring of the edges between the business sectors and tastes for mixed beverages and soda pops seems to encourage a simple progress for youngsters and youngsters to the utilization of liquor. There are two fundamental kinds of soda pops: the supposed prepared to-drink (RTD) items that rule the world market and the concentrated or weaken to-taste items that are as yet vital in a few markets. These incorporate syrups thus called squashes and cordials. Regardless of whether RTD or dilatable, sodas naturally contain water, a sweetener (more often than not a sugar, albeit

counterfeit sweeteners are progressively critical), a corrosive (citrus or malice are the most common (Ashurst 2005).

The enactment is vital from an authentic point of view. For instance, in the United Kingdom the Soft Drinks Regulations 1964 (as changed) classified the items as per the manner by which the business was then sorted out and set into law definitions of “soda pops” as well as of a considerable lot of the item composes, for example, smashes, squashes, and cordials, that thusly wound up nonspecific commonly recognized names in the United Kingdom and numerous parts of the English-talking world. These directions were presumably among the most proscriptive compositional statutes that existed for any sustenance items in the United Kingdom, and for drinks anyplace on the planet. And in addition characterizing sodas, they set out the prerequisite for least levels of sugars in certain item composes, the greatest levels of saccharin (the main counterfeit sweetener at that point allowed) and the base levels of comminuted leafy foods squeezes that characterized the best-known item classifications. These controls were in the long run renounced in 1995. The present pattern is to move far from compositional enactment to a considerably more liberated approach in which sugars and other wholesome segments can be utilized freely and added substances are taken from “positive” arrangements of useful parts. Different fixings are often controlled by negative utilization (i.e. they should not be available or must not surpass firmly characterized limits). This move to evacuate controls on details is upheld by educated naming that contains relatively every conceivable sort of data for the purchaser. This approach is currently utilized all through the world with just moderately Minor varieties from nation to nation. At the season of composing, in an European nation a soda pop name must contain the accompanying data spellbinding name of the item (proper assignment); rundown of fixings announcement of substance name and address of packer or shipper in the European Union nourishing information (mandatory in specific conditions). The statement of the quantity of key fixings (natural product or organic product squeeze in sodas) has moved toward becoming law through quantitative fixing announcement controls in Europe, and where counterfeit sweeteners and starches are utilized together, a fitting articulation is vital. A notice about the item being a wellspring of phenylalanine must be fused when aspartame is utilized as a sweetener. Since enactment is in many nations a quickly evolving circle, it is fundamental

for those planning, creating and advertising soda pops to refresh themselves frequently in connection to the enactment of purchaser nations (Ashurst 2005).

Crude water is normally gotten from two primary sources, in particular, the district or a private well proprietor, who renders the water consumable and fit for human utilization. This water may, notwithstanding, have segments or attributes that could adversely influence the nature of the refreshment, and along these lines, it is fundamental to either expel or kill their impact. Conceivable unfriendly factors of crude water incorporate however are not constrained to a suspended issue, concoction piece, microorganism substance and source water quality varieties. Moreover, city water treatment plants can experience activity issues and defilement could happen before achieving the end client. The producer can't stand to utilize water of a substandard quality even in a solitary cluster delivered. Along these lines, crude water should dependably be dealt with to meet the particular set up by the soda pop maker (Shachman 2004; Ashurst 2008).

Water treatment is the key procedure in the assembling of soda pops as water is the essential segment of sodas, contributing from 87% to 92% of every a run of the mill soda pop (Shachman 2004). In this way, the nature of the water utilized must meet exceptionally stringent principles as it seriously affects the taste and appearance of the drink and additionally its physical and microbiological steadiness on the racks in stores (Figure 2.3). These models guarantee predictable taste and nature of the soda and take out the hazard to the customer and the producer (Ashurst 2008).

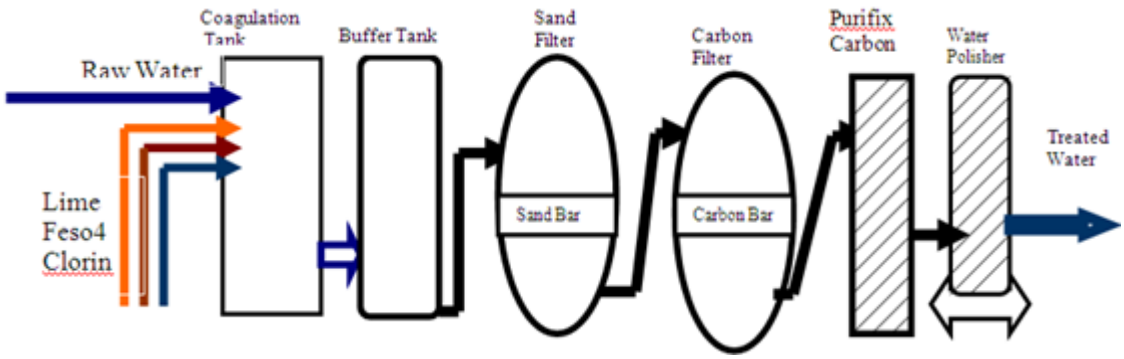


Figure 2.3. Water treatment (URL 4)

Amid the late nineteenth and mid twentieth century's, concerns in regards to drinking water quality kept on concentrating for the most part on ailment causing organisms (pathogens) out in the open water supplies. Researchers found that turbidity was not just a stylish issue; particles in source water, for example, fecal issue could harbor pathogens. Thus, the plan of most drinking water treatment frameworks worked amid the mid-1900s was driven by the need to lessen turbidity, along these lines evacuating microbial contaminants that were causing typhoid, looseness of the bowels and cholera plagues (URL 3). While filtration was a genuinely powerful treatment technique for diminishing turbidity, it was disinfectants like chlorine that assumed the biggest part in lessening the quantity of waterborne sickness flare-ups in the mid-1900s. In 1908, chlorine was utilized out of the blue as an essential disinfectant of savoring water Jersey City, New Jersey. Since the entry of the first safe drinking water act of 1974, the quantity of water frameworks applying some sort of medications has expanded. Filtration and chlorination stay compelling treatment strategies for shielding water supplies from destructive microorganisms (URL 3).

Water treatment includes a procedure that modifies the compound arrangement or characteristic "conduct of water". Essential water accessibility incorporates surface or groundwater. Most city or open water originates from surface water while private water supplies more often than not comprise of groundwater pumped from wells or boreholes (URL 4).

Water treatment initially centered around enhancing the tasteful characteristics of drinking water. Strategies to enhance the taste and scent of drinking water were recorded as ahead of schedule as 4000 B.C. Old Sanskrit and Greek compositions suggested water treatment techniques, for example, sifting through charcoal, presenting to daylight, bubbling and stressing. Obvious shadiness (later named turbidity) was the main impetus behind the most punctual water treatment, the same number of source glasses of water contained particles that had a shocking taste and appearance (URL 3).

Water that is fit for household utilize (drinking water) must conform to particular prerequisites. The most essential necessity is that it must be sheltered to drink. Numerous crude water sources contain destructive microorganisms or different substances in

focuses that make the water hazardous to drink or on different routes unfit for household utilize. These living beings and substances must be expelled from the water by methods for treatment procedures to make the water fit for household utilize. Notwithstanding the prerequisite that water must be sheltered to drink, water for household utilize should likewise be tastefully pleasing (have a spotless appearance, taste, and odor) and it should moreover be artificially stable (i.e. it must not cause consumption or frame stores in channels or installations, for example, fountains) (Frik 2006).

Water clear up water, the Egyptians apparently utilized the concoction alum as ahead of schedule as 1500 B.C. to make suspended particles settle out of the water. Amid the 1700s, filtration was built up as a powerful method for expelling particles from water, in spite of the fact that the level of clearness accomplished was not quantifiable around then. Amid the late nineteenth and mid-twentieth century's, concerns with respect to drinking water quality kept on concentrating for the most part on illness-causing microorganisms (pathogens) in broad daylight water supplies. Researchers found that turbidity was not just a tasteful issue; particles in source water, for example, the fecal issue could harbor pathogens. Therefore, the plan of most drinking water treatment frameworks worked amid the mid-1900s was driven by the need to lessen turbidity, in this way expelling microbial contaminants that were causing typhoid, looseness of the bowels and cholera plagues (URL 3).

Water is the wellspring of life. It is the most vital fluid on the planet for keeping up plant and creature life. It fills lakes, streams, and immense seas, and streams under the ground. The circulation of water on earth is 97.23% in the seas, 2.14% in ice tops and ice sheets, 0.61% in groundwater, 0.01% in freshwater lakes and 0.01% in different arrangements. The majority of the freshwater is solidified at the North and South Posts and about 33% of the freshwater is in aquifers, waterways, streams, and springs. It has been accounted for that 99% of all water (seas, seas, ice, most saline water, and climatic water) isn't accessible for our employment. What's more, even a significant part of the rest of the division of 1% is distant. Based on the aggregate water accessible, it is assessed that surface water sources, (for example, streams) constitute just around 0.0067% of the tall water, yet waterways are the wellspring of the majority of the water that individuals utilize. Unadulterated water (H_2O) is dismal, scentless, and boring. It is made out of

hydrogen and oxygen. Since water ends up tainted by the substances with which it comes into getting in touch with, it isn't accessible for use in its unadulterated state. To some degree, water can break down each normally happening substance on the earth. In light of this property, water has been named as the “single most dissolvable”. Albeit advantageous to humankind, the dissolvability intensity of water can represent a risk to mechanical equipment’s. In basically all residential and modern procedures in which untreated water is warmed, the fouling of gear is the absolute most significant issue experienced. The influenced application regions incorporate clothing, dairy, dishwashing, cooling, boilers, geothermal, control age, semiconductor fabricating, and numerous other generation forms (Malkov and Tocio 2008).

A mineral scale is characterized as a store of certain sparingly so lube salts, for example, calcium carbonates, calcium phosphates, and calcium sulfates, from the procedure liquids after precipitation onto the tubing and different process surfaces. A store, for the most part, incorporates different foul ants, i.e., consumption items and microbiological, colloidal, or suspended issue. The fouling of warmth exchangers and RO films is an unpredictable wonder including the affidavit of a few extraordinary, yet related kinds of foul ants. This part tends to the nature of feed water accessible for modern applications and the effect of water science on framework execution. Moreover, the causes and kinds of different mineral scales and stores normally experienced in seas water frameworks are looked into (Zahid 2010).

Drinking water goes to the framework from nature, where it has been in contact with soil, shakes, and air. Synthetics from those media break up into the water or progress toward becoming entrained as a particulate issue. Microorganisms, which are wherever in our condition, are additionally exchanged to the water alongside supplements for their development. Water treatment, when performed, does not really evacuate the majority of the compound and microbiological parts in the water. Extra synthetic concoctions may likewise be incorporated into the treatment (Cantor 2017).

3. PROCESS AND METHODS

3.1. Process

Treatment plants have been arranged by crude water quality to help counseling Specialists, administrative organizations and others worried about water treatment. One of the basic kinds which are known as quicksand filtration plants is being utilized in this introduction to show water treatment process course of action. The accompanying is the essential meaning of procedures included in the cutting edge regular water treatment plant.

3.1.1. Air Circulation

As connected to water treatment, air circulation (Figure 3.1) might be characterized as the procedure by which a vaporous stage, normally air, and water are carried into implied contact with each other to transfer unpredictable substances which may incorporate oxygen, carbon dioxide, nitrogen, hydrogen sulfide, methane, and different unidentified natural mixes in charge of taste and smell (Frik 2006).

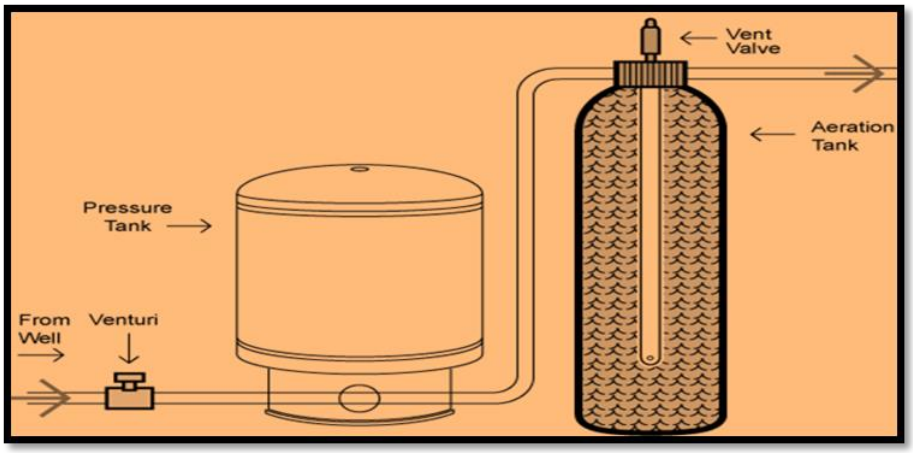


Figure 3.1. Aeration (URL 3)

3.1.2. Coagulation

Is the procedure by methods for which the colloidal particles in water are destabilized (i.e. the idea of the colloidal particles is changed) with the goal that they shape rushes through the procedure of flocculation that can be promptly isolated from the water. Destabilization is accomplished through the expansion of synthetic compounds (called coagulants) to the water (Frik 2006).

3.1.3. Flocculation

The term flocculation alludes to water treatment forms that collector join or "coagulate" little particles (Society particles) which settle out of the water as residue. Settling or sedimentation happens normally as flocculated particles settle out of the water. Is a successful procedure for expulsion of generally light kinds of herds? Buoyancy includes the arrangement of little air rises in water that must be flocculated. The air pockets join to the herds making them ascend to the surface where they are gathered as foam that is expelled from the highest point of the buoyancy unit (Frick 2006).

Coagulation and flocculation are the strategies utilized for conglomerating suspended solids into bigger and maybe denser particles that will settle all the more eccentrically or turn out to be more filterable. For the motivations behind this talk, coagulation is the expansion of synthetic substances to water to demolish or lessen frightful powers and prompt molecule agglomeration. Flocculation is the physical procedure of elevating molecule contact to encourage the agglomeration to bigger settle able flock. Practically speaking, these procedures are typically refined utilizing two unique tanks in the arrangement. The principal tank is a quick blend tank, into which the coagulant measurements are included and the particles move toward becoming destabilized. The second tank is the flocculation tank, which is an ease back blend tank to advance molecule crash and collection. The reason for flocculation is to unite particles to frame well-settling particles. The rate of total is needy upon the rate of antiparticle impacts. At the point when particles total, hydrodynamic shear powers in the water can make the collections separation. Accumulation and separation can happen at the same time (Alley 2007).

3.1.4. Sedimentation

Is a physical procedure that isolates settle able solids from influent by gravitational activity? These solids incorporate particulate issue, synthetic flock, hastens in suspension and different solids (Drinan 2001). Sedimentation and buoyancy are the most essential and by and large the most attainable of wastewater treatment forms. This area will focus on sedimentation as a technique for isolating solids from fluids. A portion of the hypothesis and reasonable proposals talked about will likewise apply to the settling of a thick fluid from a less thick fluid. Terms utilized synonymously with sedimentation are elucidation and settling (Alley 2007).

3.1.5. Filtration

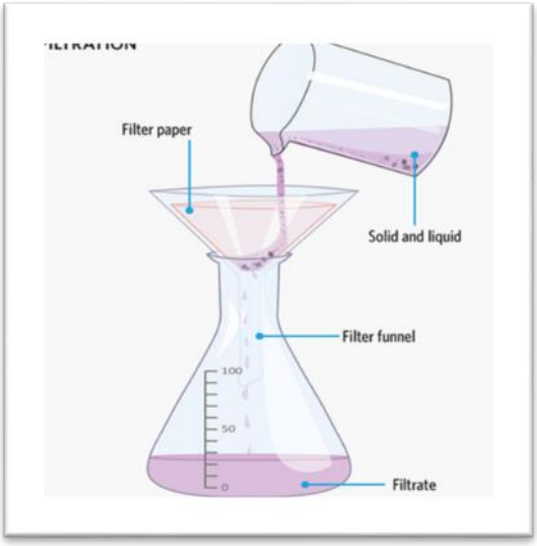


Figure 3.2. Filtration (URL 3)

Water filtration is a physical and synthetic process for isolating suspended and colloidal polluting influences from water by entry through a permeable medium, for the most part, a bed of sand or other granular material (Figure 3.2). Water fills the pores of the medium and the polluting influences are abandoned in the openings or upon the medium itself (Alley 2007) states that Filtration is a procedure that utilizations voids in paper, texture or between granular solids, to strain settles capable solids from a wastewater.

Filtration is additionally a physical procedure, one that happens normally for groundwater sources. Surface waters permeate through permeable layers of soil where they, in the long run, energize groundwater, diminishing suspended issue and microorganisms to a level that guarantees groundwater as a rule needs no treatment other than cleansing. Filtration of surface water is the last physical advance during the time spent creating consumable water that meets the Sheltered Drinking Water Act turbidity prerequisite of 0.5 NTU (Drinan 2001).

3.1.6. Chlorination and Disinfection

Purification is the way toward expelling all microscopic organisms from wastewater. Sanitization is the way toward expelling all life forms. The motivation behind sterilizing wastewater containing residential sewage is to decrease to a protected level the perils of irresistible infection in getting waters. The act of purification has extraordinarily decreased waterborne ailment episodes since 1980 in numerous regions of the globe. Purification can hypothetically be proficient by physically expelling microorganisms, but since of their minuscule size, ordinarily microscopic organisms are annihilated physically or artificially (Alley 2007)

Cleansing does not include sanitization, which is the obliteration of all microbial life. The level of purification required for cleansing would be restrictively costly, and the final result would contain large amounts of sanitization side-effects (mixes framed by the response of a disinfectant, for example, chlorine with the natural material in the water supply) and a solid synthetic taste. Introduce treatment rehearses sanitize to the point that enough known sickness causing specialists are disposed of to secure general wellbeing. While chlorine purification is the best-known and most normally utilized sterilization strategy, different strategies are accessible. The three general kinds of sanitization incorporate warmth treatment (bubbling water, normally utilized in crisis circumstances), radiation treatment (UV radiation treatment), and substance treatment (oxidizing operators including chlorine, ozone, bromine, iodine, and potassium permanganate, and also metal particles, for example, silver, copper, mercury, or potentially acids and salts) (Drinan 2001).

In the Unified States, the disinfectant of decision has been chlorine. As a rule, chlorination is successful, moderately modest, and gives compelling levels of disinfectant remaining for safe appropriation. Connected as a gas (basic chlorine, Cl_2), fluid (sodium chloride), or strong (calcium hypochlorite), every one of these structures has points of interest and inconveniences. In water, chlorine responds with different substances or polluting influences display (natural materials, sulfides, ferrous iron, and nitrites, for instance). The nearness of these materials makes a chlorine request, a proportion of the measure of chlorine expected to take out these contaminations by consolidating with them. That measure of chlorine can't clean; it is as of now artificially exhausted. Chlorine additionally consolidates promptly with smelling salts or other nitrogen mixes, framing chlorine mixes. These chlorine mixes have some disinfectant properties and are known as the consolidated accessible chlorine lingering. Chlorine in this shape goes about as a disinfectant. The synthetically unaltered chlorine staying in the water after consolidated lingering is shaped is free accessible chlorine leftover. Free chlorine is considerably more powerful than joined chlorine in purification. For fruitful chlorination, a few variables must be tended to the centralization of free chlorine, contact time, temperature, pH, and turbidity. How successfully chlorine sterilizes is specifically identified with contact time with the water and in addition the free accessible chlorine fixation. Lower chlorine focuses require expanded contact times. Lower pH levels likewise help cleansing viability. Chlorine sanitizes all the more rapidly at higher temperatures. Turbidity influences chlorine's viability also, as it does any disinfectant (Drinan 2001).

3.2. Instruments

- Chlorine Tests,
- Digital Titration,
- DPD Free & Total Chlorine Reagent,
- Turbidity meter,
- TDS meter,
- Thermo pH meter (Figure 3.3).

Figure 3.3. Instruments used in works: (a) Chlorine Tests, (b) Digital Titration, (c) DPD Free & Total Chlorine Reagent, (d) Turbidity meter, (e) TDS meter, (f) Thermo pH meter

3.3. Methods

Water treatment includes not just cleaning and expulsion of different undesirable and hurtful contaminations yet in addition change on the common properties of water by including certain inadequate fixings. All strategies for water treatment can be partitioned into the accompanying primary gathering:

(a) Those went for enhancing the organoleptic properties of water (elucidation, deceleration, freshening up),

(b) Those which guarantee epidemiological wellbeing (chlorination, ionization, bright illumination).

(c) Those by which the mineral structure of water is adapted (fluorination and DE fluorination, derealization, demanganization, softening, desalination).

A specific strategy for water treatment is picked upon starter examination of the arrangement and properties of the water source to be utilized and correlation of this information with the buyer's necessities.

3.3.1. Purpose: Water Treatment

Treatment for drinking water expels from crude water those contaminants. In crude water treatment, the objectives are to expel contaminations that influence water quality and to guarantee that water ok for utilization is conveyed to the customer (Drinan 2001).

3.3.2. Process Water Treatment for Industry

The regularly growing modern scene and supporting new advancements have expanded the interest for an assortment of water filtration gear and systems. R prerequisites can be as straightforward as a water conditioner or as mind-boggling as a high virtue water framework, for example, those serving the gadgets business. Metito's items cover the entire range of water filtration gear with exceptional accentuation on high virtue water frameworks for the oil and petrochemical industry, power industry, pharmaceuticals, and nourishment ventures (Metito 2011).

3.3.3. Water Disinfection

Decades of water disinfection experience and thousands of gas chlorination's and hypo-chlorinators, ozone generators and Radiators installed, established Metito as a leader in this field. Metito supplies disinfection equipment and plants for drinking water, sewage,

and industrial wastewater treatment, among others. The scope of disinfection processes and equipment supplied includes (Metito 2011).

3.3.3.1. Chlorination

Gas Chlorine: Vacuum-type gas chlorinators, chlorine analyzers, barrels and drums, gear for programmed control, remain by offices, wellbeing and security assurance and concoction taking care of.

Hypochlorite: Synthetic metering pumps and stream controls for sodium and calcium hypochlorite feed, hypochlorite tanks and instigators and security embellishments (Metito 2011). A turn around osmosis framework comprises of four noteworthy segments/forms: pretreatment, pressurization, film division and post-treatment adjustment.

3.3.3.2. Pretreatment

The approaching feed water is pretreated to be perfect with the films by evacuating suspended solids, altering the pH and adding a limit inhibitor to control scaling caused by constituents, for example, calcium sulfate (Metito 2011).

3.3.3.3. Pressurization

A high-weight pump raises the weight of the pretreated feed water to a working weight suitable for the layer and the saltiness of the water (Metito 2011).

3.3.3.4. Part partition

The porous films repress the section of broke down salts while allowing the desalinated item water to go through. Applying feed water to the layer get together outcomes in a freshwater item stream and focused saline solution dismiss stream. Since no film is immaculate in its dismissal of broke down salts, a little level of salt goes through the layer and stays in the item water (Metito 2011).

3.3.3.5. Adjustment

Item water from the film get together generally requires pH change and cleansing before being exchanged to the circulation framework for use as drinking water. The item is infused with a harsh answer to raise the pH from an estimation of around 5 to esteem near 7 L is likewise dosed with a hypochlorite for cleansing purposes (Metito 2011).

Water treatment unit procedures: Physical and compound give the establishing in the basic standards of every unit procedure that understudies require to connect hypothesis to hone (Hendricks 2006).

3.4. Water Chemistry

Water, being a general dissolvable, regularly contains numerous contaminations that it grabs from its environment. These contaminations can be characterized into five general classes:

(a) Broken up inorganic mixes, for example, bicarbonates, carbonates, sulfates, and fluorides of calcium, magnesium, barium, and strontium, and little measures of iron, manganese, aluminum, and different substances.
(b) Broken up natural mixes, for example, hemic corrosive, folic corrosive, and tannins; insoluble natural issue, for example, leaves dead microscopic organisms, and other organic items and mechanical squanders.
(c) Gases, for example, oxygen, nitrogen, carbon dioxide, sulfur dioxide, hydrogen sulfide, and Methane, consumed from the environment and subsurface sources.
(d) The suspended issue, for example, earth, residue, oil, fat, and oil.
(e) Microorganisms, for example, microbes, green growth, and parasites.

The sorts and amounts of polluting influences display decide the nature of water and the ensuing issues that can emerge from its utilization in industry (Zahid 2010).

3.4.1. Physical Attributes

The physical attributes of water incorporate (shading, detergency, scent, temperature, and turbidity) (Zahid 2010).

3.4.1.1. Shading

Broke up natural materials from rotting vegetation and certain disintegrated inorganic mixes can cause shading in the water. Despite the fact that shading itself isn't typically offensive, its essence because of certain disintegrated contaminations may meddle with water treatment program (Zahid 2010).

Shading is because of the nearness of hued substances in the arrangement, for example, vegetable issue and iron salt. It doesn't really effectively affect wellbeing. Shading force could be estimated through a visual correlation of the example to refined water. Shaded water isn't adequate for drinking (Tasteful and additionally poisonous quality reasons). Hence, drinking water ought to be dull. Expected for the motivations behind examination of open water supplies, it is valuable basically to take note of the nearness or absence of noticeable shading at the season of testing. Changes in the shade of water and the presence of new hues fill in as markers that extra examination is required (WHO 2001).

3.4.1.2. Detergency

Numerous characteristic and manufactured substances will cause froth when water is unsettled. The significant reason for frothing is surfactants, which are manufactured synthetic substances utilized in cleansers. Water with a high detergency ought to be broke down to figure out what treatment is required to find the root of tainting. Frothing substances may meddle with the execution of synthetic compounds utilized in water treatment definitions. Frothing substances can be expelled by a traditional treatment comprising of sedimentation, coagulation/flocculation, and filtration, or enacted carbon. (Zahid 2010).

3.4.1.3. Smell

The smell in water can be caused by outside issue, for example, natural mixes, inorganic salts, and broke up gases. These pollutions may originate from characteristic, rural, or modern sources. Water ought to be free from any offensive shading as it might meddle with the examination of synthetic compounds utilized in water treatment plans (Zahid 2010).

Scent: Ought to be missing or extremely frail for water to be palatable for drinking purposes. Unadulterated water is unscented; subsequently, the nearness of undesirable scent in drinking water is symptomatic of the presence of contaminants.

Tastes: Unadulterated water is boring; thus, the nearness of undesirable taste in water demonstrates the nearness of contaminants. Taste issues identifying with water could be markers of changes in the water source or in the treatment procedure. Inorganic mixes, for example, magnesium, calcium, sodium, copper, and iron are generally identified by the essence of water. Green growth, disintegrating natural issue, broke up gases, and phenolic material may cause tastes (Gaur 2008).

3.4.1.4. Temperature

Temperature is critical in deciding the rate at which scale-shaping salts will hasten on the warmth exchanger, RO film, and hardware surfaces, and, in this way, to the degree to which these salts could turn into a noteworthy fouling issue. In desalination by RO, the temperature is vital in deciding the weight drop through the layer at the expected transition rate (Zahid 2010).

3.4.1.5. Turbidity

Turbidity in water is because of the nearness of suspended solids scattered all through the water and is a proportion of the degree to which light is scattered by the suspended solids, for example, mud, sediment, and natural issue, and by tiny fish and other infinitesimal living beings that meddle with the section of light through water. Turbidity is firmly

identified with the aggregate suspended solids, yet in addition, incorporates microscopic fish and different living beings, and is estimated in nephelometric turbidity units (NTU). The turbidity of normal waters tends to increment amid overflows because of the expanded overland stream, stream, and disintegration. Turbidity more than 5 NTU is effortlessly recognized in a glass of water and is normally questionable for stylish reasons. Water containing suspended issue is an issue for a few reasons, including the accompanying:

(a) It shields the microorganisms from chlorine and different biocides.
(b) It meddles with the test for coliform microbes.
(c) It meddles with the support of lingering chlorine.
(d) It goes about as a sustenance hotspot for microorganisms, enabling them to survive and increase. Over the top turbidity must be evacuated by filtration (Zahid 2010).

Turbidity is a proportion of the level of shadiness or sloppiness of water. It is an articulation for an optical property that makes light be scattered and assimilated. It isn't conceivable to associate turbidity with the weight convergence of suspended issue since light dispersing properties of the suspended particulate issue rely on estimate, shape also, the refractive file of the particulates. It is caused by suspended issue, for example, dirt, sediments, finely partitioned natural and inorganic issue, dissolvable hued natural mixes, tiny fish, and other minuscule life forms. Turbidity is vital on the grounds that it contacts both the adequacy of water to shoppers, and the determination and fitness of treatment forms, especially the productivity of sanitization with chlorine since it utilizes a chlorine request, shields microorganisms and may animate the development of microbes. In all systems in which sanitization is utilized, the turbidity should dependably be low ideally lower than 1 NTU. It is prescribed that, for water to be cleaned, the turbidity ought to be dependably less than 5 NTU (Crittenden et al. 2012).

3.4.1.6. PH of the Unadulterated Water

The pH of unadulterated water alludes to conditions of corrosiveness and alkalinity of arrangements regarding hydrogen and hydroxide particles can be communicated by a progression of positive numbers between 0 to 14. When all is said in done, water with a

pH of 7 is viewed as impartial while lower than this alluded acidic and a pH more noteworthy than 7 known as essential. Ordinarily, water pH ranges from 6 to 8.5. It is seen that water with a low pH has a tendency to be dangerous and with a high level of pH, it is transformed into an unpleasant taste. As per the WHO gauges, pH of the water ought to be 6.5 to 8.5 It is critical to quantify pH at the comparative time as chlorine remaining since the adequacy of purification with chlorine is to a great degree pH subordinate: where the pH surpasses 8.0, sterilization is less powerful. To watch that the pH is in the ideal range for purification with chlorine (under 8.0), straightforward tests might be led in the field utilizing comparators, for example, that utilized for chlorine leftover. With some chlorine comparators, it is conceivable to gauge pH and chlorine leftover all the while (Muhammad et al. 2013).

3.4.1.7. Electric Conductivity

Used to gauge the capacity of a watery answer for convey an electric ebb and flow, for example, centralization of particles, portability, and valence and temperature clean water is definitely not a decent cathode of electric momentum rather a decent warmth sealing and increment in particles focus to enhance the electrical conductivity of water. By and large, the measure of disintegrated solids in water reasons that the electrical conductivity. Electrical conductivity (EC) truly measures the ionic procedure of an answer that enables it to transmit current. Thusly, as per WHO benchmarks EC estimation of drinking water quality ought not to surpass 400 μS/cm and the conductivity of consumable waters changes by and large from 50 to 1500 μ mhos/cm (Gaur 2008).

3.4.1.8. Hardness

The hardness of water is dictated by the grouping of divalent captions in the water, generally, calcium and magnesium and is communicated as mg/L $CaCO_3$. Hardness influences the foam shaping capacity of water with cleanser. Distinctive types of hardness can be recognized all communicated as mg/L $CaCO_3$: carbonate or impermanent hardness, which is caused by calcium and magnesium related with bicarbonate in the water non-carbonate or perpetual hardness, which is caused by calcium and magnesium related with particles other than bicarbonate, for example, chloride and sulfate, calcium

hardness, caused by all the calcium particles in arrangement, magnesium hardness, caused by all the magnesium particles in arrangement, and aggregate hardness, which is the total of calcium and magnesium hardness. The concoction dependability of water is an imperative trademark since it decides if water will be artificially steady, forceful destructive or scale shaping. This has critical cost suggestions for the support of dispersion frameworks. In the event that water is supersaturated as for calcium carbonate, the calcium carbonate will hasten and shape a layer of concoction scale on the surface of channels and apparatuses. A thin layer of calcium carbonate bears security against consumption, while over the top precipitation lessens the conveying limit of funnels and may even prompt hindering of channels in outrageous cases. Then again, if water is under saturated concerning calcium carbonate, any layer that may have hastened will break down leaving the metal or other pipelining material presented and subject to compound assault (e.g. consumption). It is in this way fitting to treat water to a slight super-immersion for security against consumption. There are distinctive strategies to express substance steadiness. The files that have been utilized for the most part are the Lang prior immersion files (LSI) and the Reynar solidness record (RI). Calcium carbonate precipitation potential (CCPP) is a parameter that gives the genuine mg/L of $CaCO_3$ that would hypothetically encourage from the water. A positive CCPP of around 4 mg/L has been appeared to give satisfactory assurance against erosion without over the top $CaCO_3$ Precipitation (Frik 2006).

3.4.2. Chemical Characteristics

The compound qualities of water incorporate broke down minerals 2010 by Taylor, natural substances, disintegrated gases, and microbiological contaminants. The meaning of ultrapure water contrasts from unadulterated water or deionized water. Ultrapure water alludes to water that is free of "all" pollutions. Power plants are the single biggest clients of high-immaculateness water. Other mechanical clients of high-immaculateness water incorporate drink enterprises; examine research facilities, microelectronics, and pharmaceuticals. Unadulterated water, then again, alludes to the water that meets the particular needs of a given procedure or item. For instance, in material washing, the expulsion of calcium, magnesium, iron, and manganese is basic, though, in

pharmaceuticals, the evacuation of living beings or pyrogenic substances is of most extreme significance (Zahid 2010).

Chemical impurity of drinking water supply sources may be causes due to natural sources such as; certain industries and agricultural exercises. While toxic chemicals are present in drinking water, there is the risk that they may cause either acute or chronic health effects. Chronic health effects are more common than acute effects because the levels of chemicals in drinking water are rarely high enough to cause acute health effects (Benignos 2012).

3.4.2.1. Aluminum

Aluminum-based mixes, for example, sodium aluminate and aluminum sulfate, have been utilized for quite a long time as coagulant helps to clear up mechanical and city waters. These flocculating specialists hydrolyze to frame insoluble hydroxides and kill the charge of turbidity particles in water. By and large, these expansive particles are evacuated through settling in a clarifier and are gathered as slop. Time-to-time variances in pH at the water treatment plant, in any case, cause unreasonable measures of aluminum to go into the appropriation framework, for the most part in the disintegrated shape. Under appropriate conditions, the aluminum hastens shaped in the water treatment plants are totally sifted through and accordingly are absent in the treated water. Aluminum is amphoteric, with Al introduces at low pH esteems and aluminate anion existing at higher pH esteems and shows the least solvency at about pH 6.6. Further, if pH alteration is required to control calcium carbonate scaling, aluminum hydroxide may encourage and store on the warmth exchanger and RO layer surfaces.

3.4.2.2. Barium

Barium is a divalent particle, which shapes insoluble salts with sulfate particles that is dissolvable to the level of under 1 mg/L. Like calcium particles, barium particles additionally shape insoluble salts with fluoride particles.

3.4.2.3. Calcium

Calcium is constantly present as divalent particles that shape insoluble salts with different anions, for example, carbonate, fluoride, oxalate, phosphate, and polyphosphate. Further, under specific conditions, calcium particles additionally frame insoluble salts with organ phosphate mixes and acrylic and maleic corrosive based polymers regularly used to keep the precipitation of calcium-based salts in modern water frameworks.

3.4.2.4. Copper

Copper is found in some characteristic waters, especially in regions where copper has been mined. The nearness of copper, particularly in recycling water, might be because of the erosion of copper and copper-based combinations utilized in funnels.

3.4.2.5. Chromium

Numerous chromium mixes are moderately water insoluble. The metal business, for the most part, releases trivalent chromium. Hexavalent chromium in mechanical wastewater fundamentally starts from tanning and painting. Chromium in seawater shifts unequivocally and is generally 0.2–0.5 sections for every billion (ppb). Waterways contain around 1 ppb of chromium, albeit firmly expanded focuses are conceivable.

3.4.2.6. Press

Among the different broke up polluting influences in common waters, press based mixes cause the most major issues in the effective activity of modern water frameworks. In the lessened state, press (II) or ferrous (Fe^{2+}) particles are exceptionally dissolvable and represent no significant issues, particularly at low pH esteems. Be that as it may, upon contact with air, Fe^{2+} ions are oxidized to a higher valence state (Fe^{3+}) and promptly experience hydrolysis to frame insoluble hydroxide. Further, press at low focuses shows a negative impact on the execution of scale inhibitors.

3.4.2.7. Magnesium

Magnesium shapes sparingly solvent salts, for example, magnesium silicate and, under high pH conditions, magnesium hydroxide. Both are regular in cooling and kettle frameworks.

3.4.2.8. Manganese

Manganese is generally present beneath 0.5 mg/L out in the open water supplies. Private water supplies regularly contain higher manganese levels, generally in a broke down frame that hastens as hydroxides on presentation to oxygen. Well water supply containing manganese ought to be pretreated for manganese evacuation, or steps ought to be taken to take out contact with air or oxidants to guarantee that the manganese stays solvent. Manganese water science is exceptionally mind-boggling. Manganese exists in a few oxidation states among which Mn^{2+} and Mn^{4+} are the most imperative as for water issues.

3.4.2.9. Sodium

Since a sodium particle is monovalent, it shapes generally dissolvable salts with most anions, including bicarbonate, carbonate, sulfate, and chloride, and, consequently, only occasionally shows a scaling issue in desalination and cooling water frameworks.

3.4.2.10. Potassium

Albeit synthetically like sodium, potassium isn't probably going to be available in apparent sums in a water supply. No working or scaling issues are caused by potassium particles in mechanical water frameworks.

3.4.2.11. Silica

Silica all as far as possible the degree to which water can be utilized in cooling and RO frameworks. In spite of the fact that the genuine dissolvability level of silica is influenced by different elements, for example, pH, temperature, and TDS, the greatest silica focus is

usually given as 150 mg/L. Be that as it may, silica in abundance of Mineral Scales and Deposits: An Overview 7180 mg/L shows a potential issue, particularly within the sight of polyvalent metal particles. Silica arrangement science is exceptionally minded boggling and hard to anticipate. In modern water frameworks, silica can exist in three distinct structures, to be specific, broken up or monomer silica, polymerized or colloidal silica, and particulate silica.

3.4.2.12. Selenium

Selenium is a metal found in common stores as minerals containing different components. The best utilization of selenium mixes is in electronic and scanner segments. The levels of selenium in surface water and groundwater fluctuate from 0.06 to 400 ppb and in drinking water supplies are normally 10 ppb.

3.4.2.13. Strontium

Strontium is a divalent particle found in some water supplies. Like calcium and barium, it additionally shapes insoluble salts with sulfate particles.

3.4.2.14. Zinc

Zinc is found in some regular waters, especially in zones where zinc has been mined. Zinc at low fixations (few ppms) may not represent any issues, but rather at higher focuses, it might postpone calcium phosphate, precipitation and may likewise shape insoluble salts with hydroxide particles.

3.4.2.15. Bicarbonate

Bicarbonate particles don't shape insoluble salts; notwithstanding, a segment of bicarbonate on presentation to a high pH and temperature, and understates of the high cycle of focuses can be changed over to carbonate particles, bringing about calcium carbonate. Such cases require the expansion of a corrosive or a scale inhibitor to keep the precipitation and testimony of calcium carbonate on hardware surfaces.

3.4.2.16. Carbonate

Carbonate shapes insoluble salts with calcium and iron particles, which, as examined above, can hasten and frame scale stores on RO layer and warmth exchanger surfaces. Carbonate-based stores are ordinarily controlled by decreasing the water pH or adding a scale inhibitor to the feed water.

3.4.2.17. Chloride

Most waters contain chloride. It very well may be caused by the filtering of marine sedimentary stores and by contamination from seawater, salt water, or mechanical squanders. An expansion in chloride substance may demonstrate conceivable contamination from sewage sources, especially if the ordinary chloride content is known to be low. Chloride is moderately protected that has neither any negative impact on the life of RO films nor does it produce insoluble salts.

3.4.2.18. Fluoride

Fluoride levels in water differ as indicated by the source, with seawater, groundwater, surface water. Fluoride particles don't specifically influence either an RO film or a warmth exchanger yet shape insoluble salts with barium, calcium, magnesium, and strontium. The precipitation of fluoride-based salts ought to be done by adding a scale inhibitor to the feed water.

3.4.2.19. Sulfate

Waters containing elevated amounts of sulfate caused by the filtering of common stores of magnesium sulfate or sodium sulfate may cause scaling issues because of the development of insoluble salts with calcium, barium, and strontium.

3.4.2.20. Carbon Dioxide

Carbon dioxide does not assume a noteworthy part in RO fouling. Be that as it may, it passes promptly through an RO layer, equilibrating on the two sides. Under a few conditions, it is the major broke up constituent of evade.

3.4.2.21. Hydrogen Sulfide

Hydrogen sulfide is a gas display in a few glasses of water. There is never any uncertainty with respect to when it is available because of its hostile "spoiled egg" scent. This trademark scent is some of the time clear in fixations underneath 1 mg/L. Periodically, the sum goes as high as 50–75 mg/L. Hydrogen sulfide is more typical too well waters than to surface water supplies. Under the correct conditions, hydrogen sulfide frames sulfur particles and ads to the fouling of particle trade pitch quaint little inns RO layers. Further, hydrogen sulfide elevates consumption because of its movement as a frail corrosive.

3.4.2.22. Oxygen

Waters bereft of oxygen is probably going to contain solvent iron, manganese, and hydrogen sulfide. The endless supply of these waters to oxygen accelerates are probably going to shape and may cause genuine operational issues.

3.4.2.23. Natural Chemicals

Natural synthetic concoctions incorporate pesticides, herbicides, trihalomethanes, and unstable manufactured organics. Most extreme contaminant levels for a few regular pesticides and herbicides have been set up (Zahid 2010).

3.5. Pepsi-Cola Company Production

Figure 3.4. Samples of soft drinks-Google image (URL 5)

Al Hayat Company-Pepsi built up in 2004 and gaining practical experience in the packaging and dissemination of sodas and mineral water. It has 20 areas all are in Kurdish region and Mosul. The organization is the restrictive PepsiCo International (PCI) establishment holder in Northern Iraq utilizing a group of around 500. Al Hayat Company-Pepsi has delighted inconsistent development and presently speaks to over 55% of the aggregate piece of the overall industry of its separate area; Carrying out generation more than 167,000 square meters, Al Hayat is a neighborhood industry pioneer, representing 40% for the aggregate soda pop industry. The Company-PEPSI was administered by global counseling organizations amid the development and dispatch periods of its activities in 2004, in order to ensure the office's adherence to the strict universal gauges of value. The industrial facility floor plan was intended to expand execution and proficiency in packaging forms and to suit different cost-slicing measures to help efficiency and productivity. Notwithstanding the brilliance of its industrial facility activities, Al Hayat Company-PEPSI claims and works one of the biggest armadas of conveyance vehicles in the district, guaranteeing the opportune conveyance of its items to ensure it's proceeded with progress.

Al Hayat has an expansive item portfolio, with Pepsi brands having real portrayal in the cola, season, and non-carbonated fragments (Figure 3.4). It's an "aggregate refreshment organization," including Pepsi brands, Aquafina water, Lipton teas. Our item contributions have a brand character in the geographic districts we serve, and we are consistently adding the brand's customers request to our item portfolio (URL 4).

4. RESULTS AND DISCUSSION

The nature of drinking water was assessed by the measures proposed by the WHO keeping in mind the end goal to ascertain the number of tests that did not conform to the rule esteems.

The consequences of the physical-substance examination as a base, greatest standard were utilized to investigate the information and to assess the scattering of the qualities for every parameter and for each source class. At that point, along these lines, measurable confirmation was utilized to give extra data on dissected water test results. As an outcome, low pH esteems in a roundabout way influence human well-being.

The specialist had completed a few tests for three months (September, October and November-2017). Tests in every month had picked between three to four days arbitrarily, examining water tests included (free chlorine, TDS, pH, TH, Tal, Taste, Odor, Appearance, Turbidity, Mn, and Iron). The examples have been tried inconsistently, days and week. Test water was tried inconsistently and the day just (Mn and Iron) were tried week after week. Moreover, the outcome in Tables (4.1-9) beneath demonstrate that the water was the most fulfilled that have utilized for carbonated beverages, the proportion was between (2-2.5 ppm) least was 2 and greatest 2.5 and the normal was 2.2 ppm). Notwithstanding that, the wellspring of water comprises a profound well in Erbil-Iraq.

As its unmistakable the centralization of free chlorine must accord the norms recommended by WHO which is (1.5-2.5) ppm color is utilized for cleansing and eliminating microscopic organisms.

Turbidity ought to in a perfect world be underneath 5 NTU since the presence of water with a turbidity of not as much as this esteem is generally worthy to shoppers. It doesn't have a wellbeing based rule; by and by, microorganisms (microscopic organisms,

infections, and protozoa) are normally appended to particulates. As a result, turbid waters can be microbiologically defiled and in a roundabout way constitute a medical problem. Moreover, abnormal amounts of turbidity can shield microorganisms from the impacts of sterilization, offering to ascend to a noteworthy chlorine request and diminishing the execution of some purification medications, in this way, turbidity could speak to. A key issue with respect to the microbiological quality and cleansing of water. The outcome fulfilled by WHO.

Concerning TDS the outcome is (250 ppm) fulfilled and as per stranded Iraq (500 ppm). Additionally pH most of the sources had a pH lower than the lack of bias. Low pH esteems were normal of boreholes and open burrowed wells, while channeled and surface waters were close to lack of bias. There is no wellbeing based rule for pH, in spite of the fact that a scope of 6.5–8.5 is recommended by WHO. At low pH, water can be destructive and cause harm to hardware, since it can build metal filtering from channels and installations, for example, copper and lead. As a result, low pH esteems in a roundabout way influence human well-being, since substantial metals discharged into the water from channels can have unfavorable outcomes on individuals. Harmed metal pipes because of acidic pH esteems can likewise prompt stylish issues, making water have a metallic or harsh taste. The base and greatest pH esteems (7.6 and 7.8) were watched individually.

The TH, Tal tried day by day which is 200 mg/L. Man, Iron tried week after week, the most extreme was 0.5 ppm and press least was 0.006 and greatest is 0.007; the outcome was standard which is under 0.1 mg/L. The physical investigations for (smell, taste, appearance) are fulfilled.

Table 4.1. Raw Water & Treated Water Report on 24-Sep. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	24- Sept. 2017	

	Raw Water						Treated Water (every 1 hour)						Treated Water (every 4 hour)				Back Wash (weekly)			
Test / Time	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\$^{cm-2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mul itme dia	Mul itme dia
	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine / B.RO (0)	TH & TAL Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
0:00	2.5	250	7.8	0	Time	2.5	0	ok	ok	ok	11.1	10	17.0	6.4	0.15	0.008				
1:00				0	7:20	2.5	0	ok	ok	ok	11.1									
2:00	2.0	250	7.6	0		2.5	0	ok	ok	ok	11.1	9								
3:00				0	TH 200 mg/l	2.5	0	ok	ok	ok	11.1									
4:00	2.0	250	7.8	0		2.0	0	ok	ok	ok	11.1	9.5	19	6.46	0.17					
5:00				0	218	2.0	0	ok	ok	ok	11.1									
6:00	2.0	250	7.7	0	TAL 170 mg/l	2.0	0	ok	ok	ok	11.1	9								
7:00				0		1.5	0	ok	ok	ok	11.1									
8:00	2.5	250	7.6	0	162	1.5	0	ok	ok	ok	11.1	9.5	18	6.4	0.16	0.007				
9:00				0	(Mn) every week Max (0.05) ppm	3.0	0	ok	ok	ok	11.1									
10:00	2.0	250	7.7	0		3.0	0	ok	ok	ok	11.1	9.0								
11:00				0		2.0	0	ok	ok	ok	11.1									
12:00	2.0	250	7.6	0		2.0	0	Ok	ok	Ok	11.1	9.5	17	6.3	0.14					
13:00				0		2.0	0	Ok	Ok	Ok	11.1									
14:00	2.0	250	7.8	0		2.0	0	Ok	Ok	Ok	11.1	10.0								
15:00				0		3.0	0	Ok	Ok	Ok	11.1									
16:00	2.5	250	7.7	0		3.0	0	Ok	Ok	Ok	11.1	9.	18	6.6	0.16	0.002				
17:00				0		3.0	0	Ok	Ok	Ok	11.1									
18:00	2.5	250	7.6	0	(Iron) every week Max (0.1) ppm	2.5	0	Ok	Ok	Ok	11.1	10.0				(Mn) Every week Max (0.05) ppm				
19:00				0		2.5	0	Ok	Ok	Ok	11.1									
20:00	2.00	250	7.8	0		2.5	0	Ok	Ok	Ok	11.1	9.5	17	6.4	0.15					
21:00																				
22:00																				
23:00																				

Table 4.2. Raw Water & Treated Water Report on 27-Sep. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	27-Sept. 2017	

	Raw Water						Treated Water (every 1 hour)						Treated Water(every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine	Taste & Appearance			Uv Lamp Intensity mu\$^{cm-2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mulitme dia	Mulitme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine B.RO (0)	TH & TAL Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
0:00	2.5	250	7.8	0	Time	3.0	0	ok	ok	ok	11.0	9.0	18.0	6.6	0.17	0.008				
1:00				0	7:20	2.5	0	ok	ok	ok	10.9									
2:00	2.5	250	7.6	0		2.5	0	ok	ok	ok	10.9	10.5								
3:00				0	TH 200 mg/l	2.5	0	ok	ok	ok	10.9									
4:00	2.0	250	7.7	0		2.5	0	ok	ok	ok	10.9	9.5	16	6.4	0.15					
5:00				0	218	2.5	0	ok	ok	ok	10.9									
6:00	2.0	250	7.6	0	TAL	2.0	0	ok	ok	ok	10.9	10.0								
7:00				0	170 mg/l	2.0	0	ok	ok	ok	10.9					0.006				
8:00	2.5	250	7.7	0	166	2.0	0	ok	ok	ok	10.9	9.5	17	6.3	0.14					
9:00				0	(Mn)	2.5	0	ok	ok	ok	10.9									
10:00	2.5	250	7.8	0	every week	2.5	0	ok	ok	ok	10.9	9.0								
11:00				0	Max	2.5	0	ok	ok	ok	10.9									
12:00	2.5	250	7.6	0	(0.05) ppm	2.5	0	Ok	ok	Ok	10.9	9.5	16	6.7	0.11					
13:00				0		2.0	0	Ok	Ok	Ok	10.9									
14:00	2.0	250	7.8	0		2.0	0	Ok	Ok	Ok	10.9	10.0								
15:00				0		2.0	0	Ok	Ok	Ok	10.9					0.007				
16:00	2.0	250	7.7	0		2.0	0	Ok	Ok	Ok	10.9	9.5	16.5	6.2	0.13					
17:00				0		2.0	0	Ok	Ok	Ok	10.9									
18:00	2.0	250	7.8	0	(Iron)	2.0	0	Ok	Ok	Ok	10.9	10.0				(Mn)				
19:00				0	every week	2.0	0	Ok	Ok	Ok	10.9					Every				
20:00	2.00	250	7.7	0	Max	2.0	0	Ok	Ok	Ok	10.9	9.5	17	6.3	0.14	week				
21:00				0	(0.1) ppm	2.0	0	Ok	Ok	Ok	10.9					Max (0.05) ppm				
22:00	2.0	250	7.8	0		2.0	0	Ok	Ok	Ok	10.9	10.0								
23:00				0		2.0	0	ok	Ok	ok	11.0									

Table 4.3. Raw Water & Treated Water Report on 18-Oct. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	18-Oct. 2017	

	Raw Water							Treated Water (every 1 hour)					Treated Water(every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\$^{cm2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mulitme dia	Mulitme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine / B.RO (0)	TH & TAL. Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00					Time															
7:00	1.5	250	7.6	0	7:20	2.0	0	ok	ok	ok	11.0	9.5	18.0	6.4	0.15					
8:00				0		3.0	0	ok	ok	ok	11.0					0.007				
9:00	2.5	250	7.8	0	TH 200 mg/l	3.0	0	ok	ok	ok	11.0	10.5								
10:00				0		3.0	0	ok	ok	ok	11.0									
11:00	2.5	250	7.7	0	218	3.0	0	ok	ok	ok	11.0	11.5	17.0	6.6	0.17					
12:00				0	TAL 170 mg/l	3.0	0	ok	ok	ok	11.0									
13:00	2.0	250	7.6	0		2.5	0	ok	ok	ok	11.0	12.0								
14:00				0	162	2.5	0	ok	ok	ok	11.0									
15:00	2.0	250	7.8	0	(Mn) every week Max (0.05) ppm	2.5	0	ok	ok	ok	11.0	11.0	16.0	6.5	0.16					
16:00																				
17:00																				
18:00																				
19:00																				
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00																				
5:00																				

Table 4.4. Raw Water & Treated Water Report on 31-Oct. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	31-Oct. 2017	

	Raw Water					Treated Water (every 1 hour)						Treated Water(every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\$^{cm-2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mulitme dia	Mulitme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine B.RO (0)	TH & TAL. Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00					Time															
7:00	2.0	250	7.8	0	8:00	2.0	0	ok	ok	ok	11.06	10.0	15.0	6.4	0.16					
8:00				0		2.0	0	ok	ok	ok	11.0					0.006				
9:00	2.5	250	7.7	0	TH 200 mg/l	3.0	0	ok	ok	ok	11.0	10.5								
10:00				0		3.0	0	ok	ok	ok	11.0									
11:00	2.5	250	7.6	0	280	3.0	0	ok	ok	ok	11.0	11.5	16.0	6.6	0.17					
12:00				0	TAL 170 mg/l	3.0	0	ok	ok	ok	11.0									
13:00	2.5	250	7.8	0		3.0	0	ok	ok	ok	11.0	10.5								
14:00				0	168	3.0	0	ok	ok	ok	11.0									
15:00	2.0	250	7.7	0	(Mn) every week Max (0.05) ppm	3.0	0	ok	ok	ok	11.0		16.0	6.5	0.17					
16:00				0		2.5	0	ok	ok	ok	11.0	11.0								
17:00	2.0		7.6	0		2.5	0	ok	ok	ok	11.o	10.0								
18:00																				
19:00																				
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00																				
5:00																				

Table 4.5. Raw Water & Treated Water Report on 3-Oct. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	3-Oct. 2017	

	Raw Water						Treated Water (every 1 hour)						Treated Water(every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine	Taste & Appearance			Uv Lamp Intensity mu\$^{cm2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mulitme dia	Mulitme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine / B.RO (0)	TH & TAL Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
0:00	2.5	250	7.6	0	Time	3.0	0	ok	ok	ok	11.0	9.5	18	6.4	0.16					
1:00				0	7:10	3.0	0	ok	ok	ok	11.0									
2:00	2.5	250	7.7	0		3.0	0	ok	ok	ok	11.1	10.0				0.007				
3:00				0	TH 200 mg/l	2.5	0	ok	ok	ok	11.1									
4:00	2.5	250	7.8	0		2.5	0	ok	ok	ok	11.1	9.0	17	6.6	0.15					
5:00				0	217	2.5	0	ok	ok	ok	11.1									
6:00	2.0	250	7.7	0	TAL	2.5	0	ok	ok	ok	11.1	9.0								
7:00				0	170 mg/l	3.0	0	ok	ok	ok	11.0									
8:00	2.0	250	7.8	0	164	3.0	0	ok	ok	ok	11.0	11.0	18	6.6	0.14	0.006				
9:00				0	(Mn)	3.0	0	ok	ok	ok	11.0									
10:00	2.0	250	7.7	0	every week	3.0	0	ok	ok	ok	11.0	10.5								
11:00				0	Max	3.0	0	ok	ok	ok	11.0									
12:00	2.0	250	7.7	0	(0.05) ppm	2.5	0	Ok	ok	Ok	11.0	10.0	16.5	6.4	0.15					
13:00				0		2.5	0	Ok	Ok	Ok	11.0									
14:00	2.0	250	7.6	0		2.5	0	Ok	Ok	Ok	11.0	9.5		6.1	0.17	0.007				
15:00				0		2.5	0	Ok	Ok	Ok	11.0									
16:00	2.0	250	7.6	0		2.0	0	Ok	Ok	Ok	11.0	9.0	17	6.4	0.16					
17:00				0		2.0	0	Ok	Ok	Ok	11.0									
18:00	2.5	250	7.6	0	(Iron)	3.0	0	Ok	Ok	Ok	11.0	10.0				(Mn)				
19:00				0	every week	3.0	0	Ok	Ok	Ok	11.0					Every				
20:00	2.5	250	7.8	0	Max	3.0	0	Ok	Ok	Ok	11.0	9.0	16	6.4		week				
21:00				0	(0.1) ppm	3.0	0	Ok	Ok	Ok	11.0					Max (0.05) ppm				
22:00	2.5	250	7.7	0		3.0	0	Ok	Ok	Ok	11.0	9.5								
23:00				0		2.5	0	ok	Ok	ok	11.0									

Table 4.6. Raw Water & Treated Water Report on 28-Nov. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	28- Nov. 2017	

	Raw Water							Treated Water (every 1 hour)					Treated Water (every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\cm-2	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mul itme dia	Mul itme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine / B.RO (0)	TH & TAL. Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00					Time															
7:00	2.0	250	7.7	0	8.0	2.0	0	ok	ok	ok	11.1	11.0	16.0	6.4	0.14					
8:00				0		3.0	0	ok	ok	ok	11.1					0.008				
9:00	2.0	250	7.8	0	TH 200 mg/l	3.0	0	ok	ok	ok	11.1	10.0								
10:00				0		3.0	0	ok	ok	ok	11.1									
11:00	2.0	250	7.8	0	210	3.0	0	ok	ok	ok	11.1	11.0	16.0	6.7	0.10					
12:00				0	TAL 170 mg/l	2.5	0	ok	ok	ok	11.2									
13:00	2.0	250	7.7	0		2.5	0	ok	ok	ok	11.2	10.5								
14:00				0	167	2.5	0	ok	ok	ok	11.2									
15:00	2.0	250	7.7	0	(Mn) every week Max (0.05) ppm	2.5	0	ok	ok	ok	11.2	11.0	15.0	6.6	0.14					
16:00																				
17:00																				
18:00																				
19:00																				
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00																				
5:00																				

Table 4.7. Raw Water & Treated Water Report on 20-Nov. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	20- Nov. 2017	

	Raw Water						Treated Water (every 1 hour)						Treated Water (every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\cm 2	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mul itme dia	Mul itme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine B.RO (0)	TH & TAL Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00					Time															
7:00	2.0	250	7.7		7:20	2.5	0	ok	ok	ok	11.2	9.5	17.0	6.6	0.17					
8:00				0		2.5	0	ok	ok	ok	11.2					0.008				
9:00	2.0	250	7.8	0	TH 200 mg/l	3.0	0	ok	ok	ok	11.2	10.0								
10:00				0		3.0	0	ok	ok	ok	11.2									
11:00	2.0	250	7.7	0	217	3.0	0	ok	ok	ok	11.2	10.0	16.0	6.4	6.16					
12:00				0	TAL	3.0	0	ok	ok	ok	11.2				0.15					
13:00	2.0	250	7.6	0	170 mg/l	2.5	0	ok	ok	ok	11.2	10.5								
14:00				0	162	2.5	0	ok	ok	ok	11.2									
15:00	2.0	250	7.7	0	(Mn) every week Max (0.05) ppm	2.5	0	ok	ok	ok	11.2	10.5	15.0	6.6	0.16					
16:00				0		2.5	0	ok	ok	ok	11.2									
17:00																				
18:00																				
19:00																				
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every Week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00																				
5:00																				

Table 4.8. Raw Water & Treated Water Report on 11-Nov. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	11- Nov. 2017	

	Raw Water							Treated Water (every 1 hour)					Treated Water (every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\ $^{cm-2}$	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mul itme dia	Mul itme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine B.RO (0)	TH & TAL. Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00					Time															
7:00					7:20															
8:00	2.0	250	7.7	0		2.0	0	ok	ok	ok	10.9	10.5	17.0	6.4	0.17	0.007				
9:00				0	TH 200 mg/l	2.5	0	ok	ok	ok	10.9									
10:00	2.0	250	7.6	0		2.5	0	ok	ok	ok	10.9	11.0								
11:00				0	218	2.5	0	ok	ok	ok	11.0									
12:00	2.5	250	7.8	0	TAL 170 mg/l	2.5	0	ok	ok	ok	11.0	11.5	16.0	6.6	0.15					
13:00				0		2.5	0	ok	ok	ok	11.0									
14:00	2.0	250	7.7	0	167	2.5	0	ok	ok	ok	11.1	9.5								
15:00				0	(Mn) every week Max (0.05) ppm	2.5	0	ok	ok	ok	11.1									
16:00	2.0	250	7.6	0		2.5	0				11.1	10.0	17.0	6.4	0.14					
17:00																				
18:00																				
19:00					0.03															
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every Week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00					0.016											0.01				
5:00																				

Table 4.9. Raw Water & Treated Water Report on 2-Nov. 2017

Form Name	Raw Water & Treated Water Report	
Department	QC Water Treatment	
Date Issued	2- Nov. 2017	

	Raw Water							Treated Water (every 1 hour)					Treated Water (every 4 hour)				Back Wash (weekly)			
Test	(every 2 hour)			(every 1hour)		Free Chlorine		Taste & Appearance			Uv Lamp Intensity mu\cm 2	TAL** Max 50 mg \l	TDS Max 50 ppm	pH (5-8.5)	Turbidity none visual or 1 ntu max	Iron every shift 0.1 mg\l	Carbon	Carbon	Mul itme dia	Mul itme dia
Time	Free Chlorine (1.5 – 2.5) ppm	TDS 500 PPM	pH (5 – 8.5)	Free Chlorine B.RO (0)	TH & TAL Every day	GRP (1.5 -3) ppm	A.AC 0	No Off Taste	Odor None	Appearance clear							Filter 1	Filter 2	Filter 1	Filter 2
6:00	2.0	250	7.6	0	Time	2.0	0	ok	ok	ok	10.9	10.0	16.0	6.4	0.17	0.006				
7:00				0	8:00	2.0	0	ok	ok	ok	10.9									
8:00	2.0	250	7.8	0		2.0	0	ok	ok	ok	11.0	10.5								
9:00				0	TH 200 mg/l	3.0	0	ok	ok	ok	11.0									
10:00	2.5	250	7.6	0		3.0	0	ok	ok	ok	11.0	11.5	16.0	6.6	0.16					
11:00				0	200	3.0	0	ok	ok	ok	11.0									
12:00	2.5	250	7.8	0	TAL 170 mg/l	3.0	0	ok	ok	ok	11.0	11.0								
13:00				0		2.5	0	ok	ok	ok	11.0									
14:00	2.0	250	7.7	0	168	2.5	0	ok	ok	ok	10.9	11.5	15.0	6.5	0.16					
15:00				0	(Mn) every week Max (0.05) ppm	2.5	0	ok	ok	ok	10.9									
16:00	2.0	250	7.7	0		2.5	0				10.9	11.0								
17:00																				
18:00																				
19:00																				
20:00																				
21:00																				
22:00																				
23:00																				
0:00					(Iron) every week Max (0.1) ppm											(Mn) Every Week Max (0.05) ppm				
1:0																				
2:00																				
3:00																				
4:00																				
5:00																				

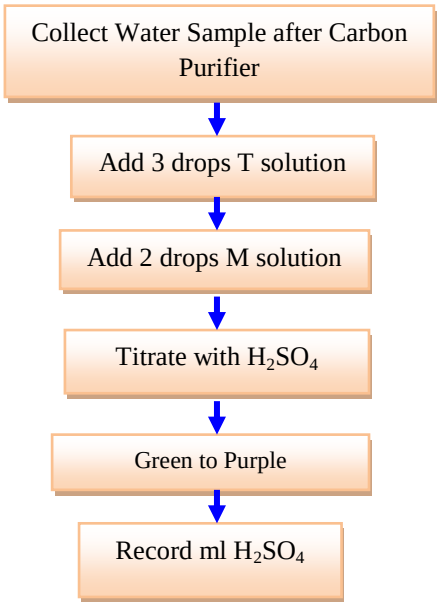
4.1. Procedures Manual

4.1.1. Total Alkalinity: pH Indicator Methods

Test Procedure: Fill the burette to the zero line with 0.02 N Sulfuric Acid. Open petcock and allow a low drop of acid to rinse to waste in an empty beaker. This will expel air. In glass assembly and will fill petcock and tip with acid. Refill bur rate to zero mark with acid. Collect water sample in 250 mL beaker from the appropriated point after the polisher. Allow water to rinse to waste before collection sample. Rinse beaker several times with the water prior to collecting sample. Transfer water sample to 100 mL graduated cylinder. The bottom of the meniscus should be exactly on the 100 mL mark. Carefully transfer water Sample from the cylinder to a clean, dry beaker or other

acceptable vessel. Tilt cylinder completely and allow at least 15 seconds completing drainage. Do not lose any water. Add 3 drops of T solution and stir mixture with magnetic stirrer .This removers any chlorine that might be present. To the colorless solution, add 3 drops of M indicator this will turn the water sample grin. Position the beaker containing the sample directly under burette tip. Do not touch sides of beaker with burette.

Flow Chart 1



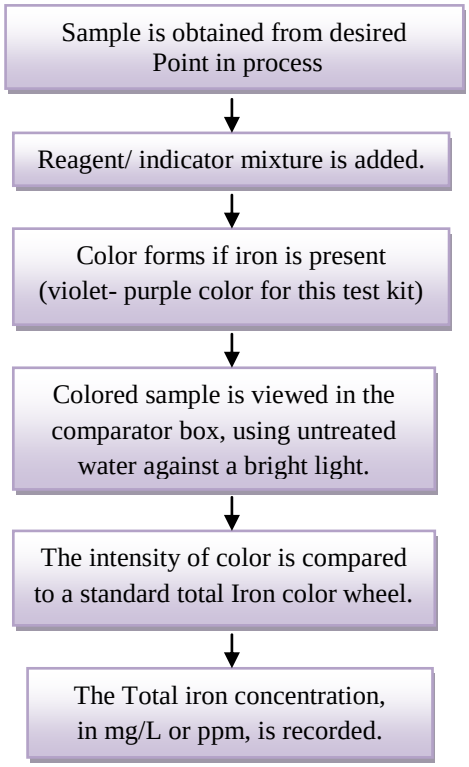
4.1.2. Water Testing: Total Iron

Test Procedure: Low range (0–0.2) mg/L. Fill the clean graduated vial to the 25 mL mark with the water to be tested. Open the Ferrozine Iron Reagent solution pillow, add the contents of the pillow to the sample and swirl to mix. A violet color will develop if Iron is present in the sample. Allow least 5 minute but not more than 30 minute for full color development. Fill one sample tube to near the top with the prepared water sample. Place the length wise viewing adapter in the comparator. Place the tube of prepared water sample in to the comparator opening labeled sample. Fill the other sample tube with distilled water (untreated water) and stopper the tube making sure air bubbles are expelled. Insert this tube in to the comparator opening labeled untreated sample. Hold the comparator up to a light source such as a window. The sky or a lamp and view through

the opening of the comparator. Rotate the disc to obtain a color match. Read the mg\L total Iron (Fe) through the scale window on the end view scale. If the maximum reading is obtained, proceed to the high range test, high range (0-0.1) mg/L.

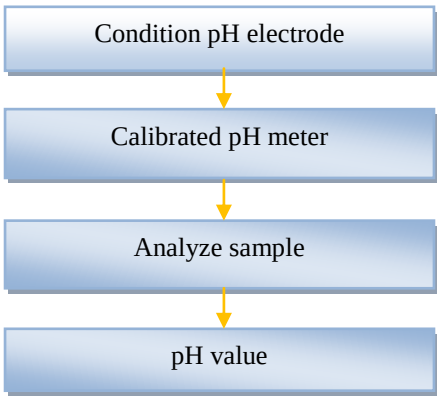
High range (0–1.0) mg/L. Fill the clean graduated vial to the 25 mL mark with the water to be tested. Open the Ferrozine Iron Reagent solution pillow, add the contents of the pillow to the sample and swirl to mix. A violet color will develop if Iron is present in the sample. Allow least 5 minute but not more than 30 minute for full color development. Fill a viewing tube to the 5 mL mark on the prepared water sample, place the sample tube in to the comparator labeled treated sample. Fill the other viewing tube with untreated water and place it in the left top comparator opening labeled untreated sample. Hold the comparator up to a light source such as a window, the sky or a lamp and view through the opening in the front rotate the disc to obtain a color match. Read the mg\l total Iron through the scale window on the side view scale. (Equipment: Color comparator, color disc ferrozine, iron) 0-0.2 mg\L, color viewing tube, lengthwise viewing adapter, stopper, hollow, vial, graduated. Reagents/Chemicals: Distilled water, ferrozine iron reagent solution, 5% hydrochloric acid solution).

Chart 2, iron



4.1.3. Water Testing: pH

Flow Chart 3

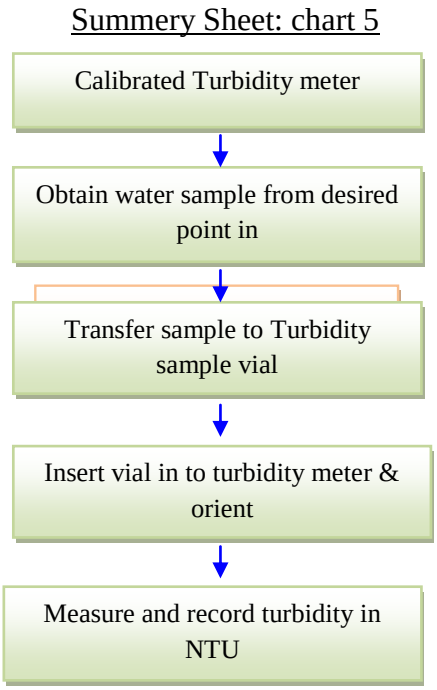


Test Procedure: Use a condition pH electrode calibrated pH meter. If the pH electrode is new or has not been used for it must be conditioned to moisten and activated the electrode and dissolve any white crystals present electrode is conditioned by soaking the glass bulb into 3 M KCl for 24 hours. Turn on pH meter. Rinse the electrode thoroughly with estate water and dab dry with disposable tissues (Note: Do not wipe electrode or touch the rounded electrode-sensing bulb. These actions may severely damage the electrode). Pour the water to be analyzed into a clean beaker. Carefully place a clean, dry stir bar into beaker containing water. Place beaker containing water on a magnetic stir plate. Turn on stir plate until the water is gently an agitated. Immerse the bottom third of the electrode into beaker containing water to be analyzed if the meter is not temperature compensated. And adjust the temperature knob of the meter accordingly (Note: The opening located at the upper side of the electrode must be uncovered during pH measurement. Allow pH to stabilized and record pH to the nearest 0.1 pH unit. Rinse electrode with distilled water. Store electrode in 3 M KCl solution) (Note: The opening located at the upper side of the electrode must remain covered during storage).

4.1.4. Water Testing: Chlorine, Total

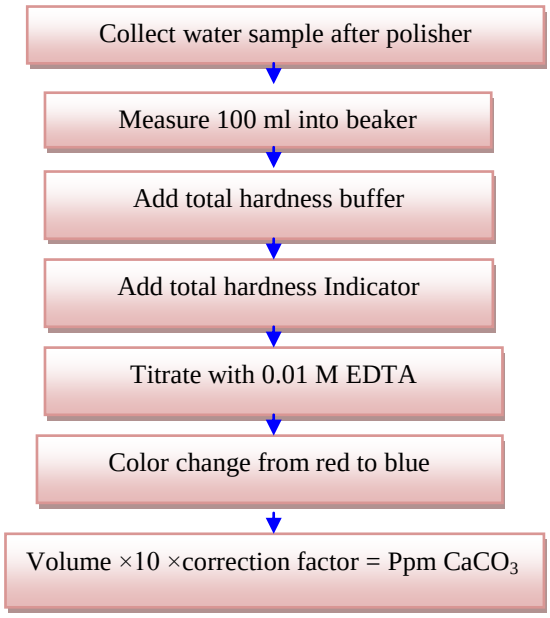
Flow Chart 4

4.2.5. Water Testing: Turbidity



Test Procedure: Use a calibrated turbidity meter. Turn instrument on. Collect a representative sample in a clean container. Be sure allowing the sample tap to run to waste for at least 5 minute prior to collecting the sample. Fill the glass sample cell to the line with the water sample (approximately 15 mL). Only the handle sample cell by the top; do not touch the sides (to prevent contamination by finger print, oils, etc.). Wipe the cell dry with a kim wipe. For low turbidity measurement, apply a thin, even film of the special silicone oil to the cell with a Kim wipe. Do not over apply! Placed filled sample in to the instrument compartment, and orient the diamond marking on the cell with the raised mark on the front of the cell compartment. Close the cell compartment cover. Select (Manual or Automatic) range by pressing “Range” key .the Automatic range is most often used. Select the signal averaging “mode by the pressing the “Signal Avarage” key. Use signal average mode if the reading is not stable (display changes frequently). Press the “Read” key. The Turbidity of the sample in NTU is automatically display record all data (Equipment: Portable turbidity meter, glass sample cells, with cap. Reagents: Distilled water for rinsing, special silicon oil for low turbidity measurements, acetone, <0.1, 20, 100 and 800 NTU stab 1 cal. stabilized formalin standards, 100 mL, Gelex secondary standards, set includes standards and 3 sample cells).

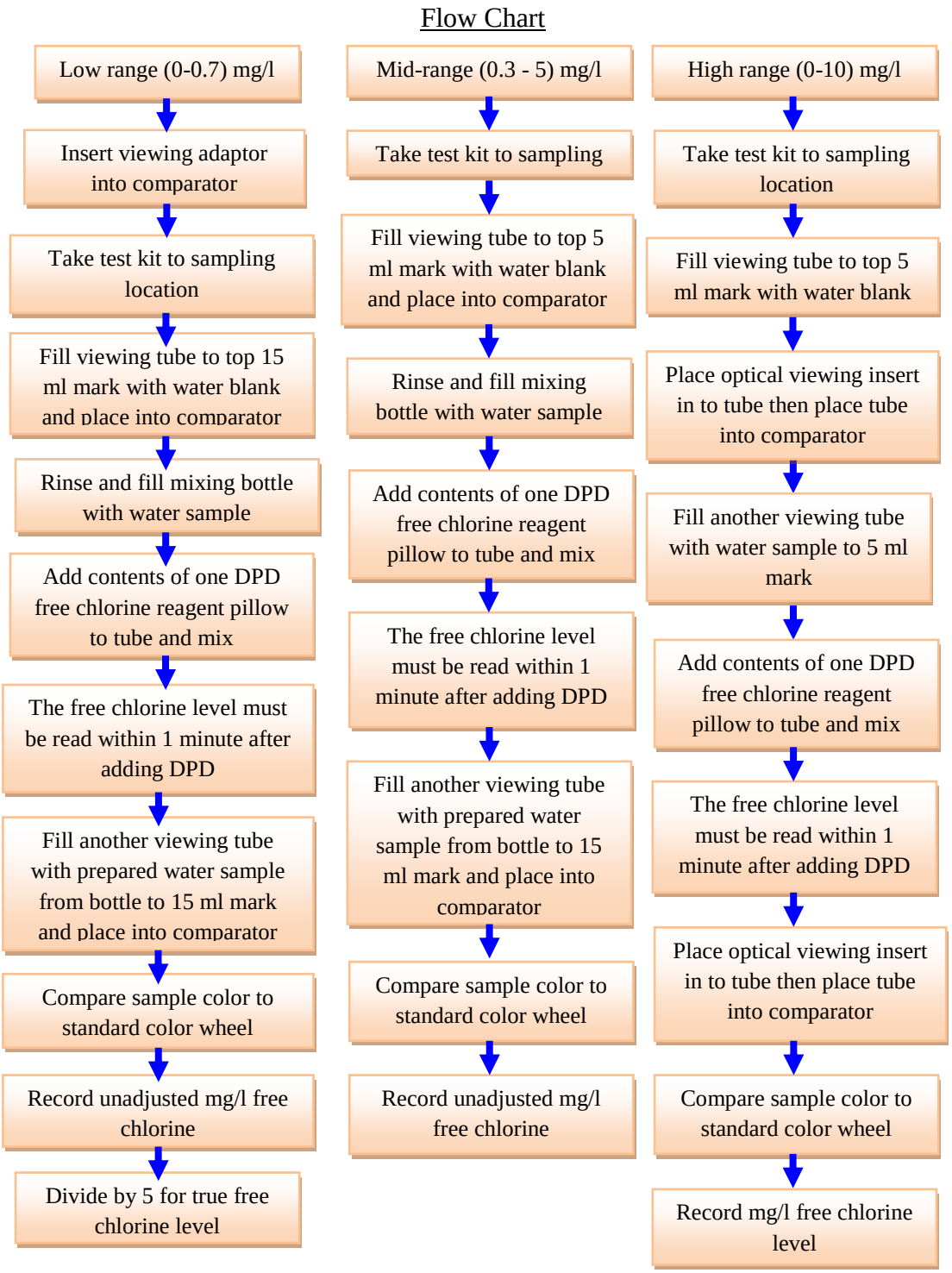
4.1.6. Water: Total Hardness



Test Procedure: Fill to zero line with hardness titrating solution EDTA. Open petcock and allow a few drops of solution to rinse to waste to an empty beaker. Refill bur rat to zero mark with titrating solution. Collect water sample in 250 mL beaker from a prorate point in the system. Allow water to rinse to waste before collecting sample. Rinse beaker with water prior to sampling. Transfer sample to 100 mL graduated cylinder. Fill until bottom of meniscus rest exactly on 100 mL mark. Carefully transfer sample to clean, dry, 250 mL beaker. Allow at least 15 second for complete drainage. Don't lose any water. Add 4.0 mL of total Hardness buffer to sample .stir with glass rod magnetic stirrer. Add two level measures 0.3 gm of total hardness indicator to sample. Stir with glass rod magnetic stirrer. If hardness is present, solution will turn red. Position the beaker contains the sample directly under burette tip. Open petcock slowly, adding solution drop by drop. Continue to add solution until sample solution changes to blue color (no purple) that persists for 15 second or longer. Read number of milliliters to the nearest (1-10) of the titrating solution used. This number multiply by ten (for a 100 ml sample) and the EDTA correction factor equals water total hardness in part per million, experts as calcium carbonate results (Summery Sheet: Equipment; One 100 mL gratuated cylinder, two 250 mL glass beakers, burette 25 or 50 mL with stand, magnetic stirrer with star bar, medicine dropper 0.5-1 mL capacity for hardness buffer, measuring spoon 0.2 mL for

hardness indicator powder. Reagents/Chemicals: Total hardness indicator powder, total hardness buffer solution, hardness titration solution- standard EDTA titration, 0.01 M) (Vol (mL) titrant × correction factor = ppm of total hardness as $CaCO_3$).

4.1.7. Water Testing: Chlorine, Free



5. RESULTS AND RECOMMENDATIONS

Water shortage has been a noteworthy risk to advancement and water security in numerous parts of the World. The non-accessibility of consumable water of ongoing ends up troubling that the district government set out on the development of dams and present-day ordinary water treatment towards easing the torment of the overflowing masses. This postulation talks about techniques and procedures in present-day regular water treatment utilized for carbonated beverages and furthermore features existing issues militating against its selection in the district. Surmounting these issues require the consolidated endeavors of all partners in water resources (Government at all levels, a private association, and the overall population) for commonly fulfilling cure in light of the fact that an all-around outlined and developed current customary water treatment does not ensure general arrangement of consumable water and wellbeing.

The targets of this proposal were given in decreasing the ecological effect of soda producing plants. These goals were accomplished by the usage of evaluating technique joined with the system to enhance materials proficiency. These techniques were then connected to an exclusive refreshment organization with the essential center being to enhance the nature of the last gushing.

My exploration results are as per the conclusion of a few specialists, who say that in the soda pop section, mineral water will likely demonstrate a specific level of development later on.

Based on the model, the not so distant future can be anticipated appropriately, however, the far future may be impacted by various sudden components, so it is prescribed to rehash the expectation after each new utilization information. With my counts, I've demonstrated that the model is touchy.

The utilization of soda pops has expanded massively finished the most recent decades. In any case, the connection between soda pops and unfavorable wellbeing impacts isn't totally comprehended. Despite the fact that there are a few observational examinations supporting there is a connection between soda utilization and weight increase, outright affirmation is yet to be demonstrated various approaches to accomplish this objective have been proposed. Many concur that it is critical to connect with the general population before extensive utilization propensities have been produced. Additionally look into is important, to sum up, the discoveries to the entire of the nation.

Intercessions must be begun at the school level and at home. This could be accomplished on various levels:

Parents: Guardians have an awesome duty to confine their kids' pop admission at an early age. A total boycott of pop items in the house isn't justified, yet diminishing of non-slim down items and advancement of eating regimen items is something that ought to be prescribed. Specialists, school attendants, and other wellbeing experts ought to be more dynamic in instructing individuals about the conceivable wellbeing impacts of extensive pop utilization. Getting some information about pop utilization ought to be a piece of the anamnesis, and the educated with respect to patients, when essential, to expend less. The educational system should stop offers of soda pops in their containers. Impediments or bans on soda pop automats ought to be considered. Advancement of more advantageous beverages, for example, water and low-fat drain ought to be accomplished through publicizing and instruction.

School: Business promoting for cool beverages at schools ought to be limited. Notices ought to be observed. The joint effort between the general population and private area is expected to execute legitimate measures against undesirable dietary propensities. Visit checkups of students can be suggested with observing of fundamental measurements and weight record.

Government: The administration should support more research to additionally investigate the impacts of Soft beverages utilization on stoutness, diabetes mellitus, dental rot, and Hypokalemia and bone thickness. Besides, medications are critical at these levels; the

human services area, government, media and the soda pop industry too need to assume a part.

Regardless of noteworthy advancement in water treatment by electric flow, a few territories require advance examination:

• Further study ought to be led to investigate the full abilities of this framework before it might be acknowledged for use by water utilities.
• Determination of zeta potential, which is identified with the level of molecule destabilization, by electro kinetic estimations.
• Development and assessment of active models on sedimentation time which influences the expulsion of turbidity and of aggregate suspended solids.
• Development and assessment of active models that think about the basic components impacting the mortality of microbes.
• Identification of the microscopic organisms of concern most impervious to electric current.
• Studies are expected to keep on bettering comprehend the impact of the sort of microorganisms on microbial inactivation.
• Confirm the components of microbial inactivation.
• Process framework plan, assessment, and cost decrease.
• Ensure the responsibility of senior administration is acquired, by underscoring the financial favorable circumstances. This will help in achieving the required data from the organization to lead the investigation.
• Request secrecy consent to be drafted and marked by the individual directing the investigation keeping in mind the end goal to increase simpler access to data.
• Select an undertaking group that comprises of individuals from different orders which have an adequate expert to execute and keeps up the prescribed changes. Keeping up relations with all colleagues is imperative in creating arrangements.
• Have customary input gatherings to refresh administration and to keep up the energy of the task.
• Information ought to be imparted to every single important partner.
• Monitoring ought to happen every now and again (day by day, week by week or month to month).

• Train specialist's inaccurate utilization of apparatus to maintain a strategic distance from age of emanating at the source.
• Investigate the utilization of darker sugar for dull shaded soda pops as dark-colored sugar is essentially more affordable.
• Implement an upkeep program that offers need to the repairs of water spills.
• Staff preparing and mindfulness projects ought to be actualized with the focal point of making mindfulness among the representatives on the effect of the emanating, how to deal with squanders and diminish them at the source.
• Develop a natural administration framework.

Numerous people group are confronting issues caused by maturing gear, offices, and framework. The unavoidable rot caused by framework age is exacerbated by expanding weight on deficient more established frameworks to meet requests of the expanded populace and urban development. Offices worked in the 1970s are presently 30 to 40 years of age, and not exclusively are they hinting at wear and tear, they essentially were never wanted to deal with the level of development that has happened in numerous districts. Directions regularly give the motivation to redesign. By coordinating assets or giving government monies to take care of a portion of the costs, regions can exploit a window of chance to enhance their office at a lower guide expense to the network. Those government dollars, obviously, do accompany strings appended; they are intended to be spent on particular ventures in particular territories. Changes in control may drive the issue. The utilization of chlorine as a disinfectant is under examination now, and strain to move to different types of dis newborn child is expanding.

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CURRICULUM VITAE

I was born on July the 1st,1970 in Hawler province in which I completed my primary and secondary and high school in there in 1988. I started my bachelor degree in chemistry at Salahaddin University and graduated in 1998. From 1999 to 2012 I worked as a teacher of chemistry in different secondary and high school in Hawler. From 2013-2018 I working as a director of high school in Hawler and from 2016 to 2018 I have been pursuing my higher studies at Bingöl University in Turkey and been awarded a master degree in analytical chemistry.