Measure the efficiency of the reference in a Isdera

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Abstract

The research study focused on measuring turbidity in a section of the Tigris River that passes in the left coast from the Sherqat district and assessing the efficiency of both the sedimentation and filtration processes in addition to the overall efficiency of removing turbidity. The results of the research for the current study showed that the turbidity values of the raw Tigris River ranged between (65- 6) NTU, and the lowest degree of turbidity was recorded in October of 2019 due to the low level of the river and the lack of swimming in the river and the lack of rain and that the highest value of turbidity was recorded in April of the same year as a result of the high level of the river due to the flooding of the Tigris River, which carried with it a large amount of clay, colloids, and rain. And that the efficiency of the sedimentation unit was fluctuating from month to month and in general the efficiency was low in most months as it ranged between (13.33 - 48.71%) and the efficiency of the filtration process was also fluctuating from month to month and less than the efficiency of the precipitation process as it ranged between (6.66 - 44.44%) while The overall efficiency of the project ranged between (31.66 - 69.23%).

Key words: turbidity, clearance efficiency, filtered water, Tigris river, sedimentation

1. Introduction

Drinking water is closely related to the spread of many diseases, as reports by the World Health Organization (WHO) showed that more than (25) million people die annually due to diarrhea, and about a third of them are children who are less than five years old, and indicated that this is due to pollutants that By water, some studies and statistics indicated in the United States of America that 59% of diseases were caused by contamination of drinking water [1], and many water-related diseases in developing countries are attributed to drinking polluted water. At the beginning of 2000 there were 17% of People without safe water resources and 40% of the world's population have access to water without proper treatment and services in service areas have been below the level of services in urban areas The prevalence of water-borne diseases is inversely proportional to water purification and the spread of cholera and other diarrheal diseases is related to water quality. The cost of treating the disease or death is high if compared to the cost of developing routine preventive health measures such as providing safe drinking water and personal hygiene [2].

Various water sources are currently suffering from great pollution as a result of the large population increase, industrial and agricultural expansion, and the lack of proper planning in building cities, which led to the doubling of the amount of industrial, human and agricultural wastes entering into it, as water is a basic element for all beings, and God Almighty said (and made us water every living thing) Surat al-Anbiya, and the Messenger (PBUH) said (people are partners in three water, kidneys and fire), that the issue of drinking water is of great importance to the relationship of the document with the spread of diseases that are transmitted by it in the event that it does not meet the standard specifications, Where Iraq was in the eighties and earlier, enjoying high-efficiency water and sanitation systems, where the proportion of the population who had access to safe drinking water reached 95% for urban areas, 75% for rural areas, but the deterioration in the services sector as a result of the years of war and the blockade in addition to what the year passed Water resources in Iraq due to droughts and unfavorable climatic conditions (scarcity of rain and snow) and scarce revenue in the Tigris River and its tributaries [3]. Therefore, efforts by the equipped and regulatory authorities in this regard must be combined, especially in the current conditions of the country that led directly or not. Directly to the deterioration of municipal services on a large scale, which affected the quality of water supplied to citizens.

2. Aim of the study

The current study aims to identify the environmental reality of drinking water in the left coast from the Sherqat district and assess the efficiency of the draft project through knowing the quality of the water supplied to the citizens. Diversified in construction between old and modern building, which is reflected in the nature of the drinking water network, The research
aims to reach a logical scientific evaluation of the quality of drinking water by conducting field measurements on water samples, knowing the quality of the water supplied to citizens, determining their characteristics and comparing them with the permissible limits in the Iraqi standards for drinking water [4] and WHO specifications.

3. Study Area

The Asdira Drinking Water Project is located on the left coast of the Sherqat district, about (100 km north of Tikrit). It is supplied with raw water from the Tigris River. This station was chosen as it is one of the largest water projects in this region that provide the largest number of residents with drinking water. The study area includes agricultural lands along the left bank of the river, and a large number of residents are concentrated on both sides of the river, in addition to the presence of some industrial activities such as gravel and sand quarries, in addition to the presence of a number of drains and estuaries for wastewater that drain their waste into the course of the Tigris River, which suggests the presence of Pollution hazards that will affect the river's water quality as a source of water supply for the water treatment plant in the study area.

4. Materials and methods

The process of collecting samples began monthly from April 2019 and continued for ten consecutive months until January 2020, and three places were chosen to collect monthly samples of water, and these places are:

1. From raw river water near dives
2. After the sedimentation process
3. After the filtering process or adding chlorine

The samples were collected by 1 liter plastic bottles (Polyethylene) after they were washed well with distilled water, and the turbidity was measured by the (Turb Direct-Lovibond Hingaria) Turbidity meter after the samples were shaken to mix well and then the specified measurement cell was filled with attention not to leave a trace On the cell with a cloth so as not to affect the accuracy of the device's absorption, after which the results are recorded in NTU unit.

The efficacy of removing the agor for each stage of the filtering phase as a percentage was calculated according to the following formula:

$$\text{Efficiency} = \left(1 - \frac{\text{unit before turbidity of values}}{\text{unit after turbidity of values}}\right) \times 100$$

The nature of the filter station:

Asdira water project works to filter the water under study with the traditional treatment system, whereby it withdraws raw water from the Tigris River by means of pumps drawn low to sedimentation basins, which are rectangular ponds sintered (Clarifloculators) after adding alum to them, and then it turns into filtration basins, which are cylindrical basins located in Inside it are several layers of gravel of different sizes, as well as containing sand, and then the water pushes the ground tanks in which the last process of sterilization with chlorination is performed. The process that contributes to removing suspended materials and clay deposits in this project is sintering and coagulation as well as all of the precipitation and filtration processes. Because the turbidity value rate can be used to estimate the efficiency of the treatment system as a whole [5], it was therefore used in this study to assess the efficiency of both the sedimentation and filtration processes in addition to estimating the overall efficiency of the entire project.

5. Results and Discussion:

5.1. Turbidity in raw water

The turbidity values in water generally range from values near zero (0.05) NTU in distilled water to 1000 NTU in high-turbidity rivers [6], while the values of turbidity in the raw Tigris River in the current ten-month study period ranged between Table 6-1) NTU Table (1) Turbidity values in the Tigris River are related to the amount of rainfall, river discharge, and current velocity [7].

The values of turbidity of water during the current study phase were very different, as they ranged between 65-6) NTU Table (1) The lowest value of turbidity was in October of 2019 due to the low level of the Tigris River to the lowest level, and the lack of swimming In the river or near the water project, as well as the lack of grazing animals and that Because of the cold weather and low temperatures, where in the past summer months there were areas for swimming and grazing animals,
because there are no accompanying places in the area and the absence of special places for grazing livestock, values or rates of turbidity are lower than they are in the rest of the months, while the highest turbidity rate was recorded in the raw water of the Tigris River near From the NTU (65) water project in April of the same year as a result of the high level of river water due to melting snow in Turkey and the northern regions of Iraq, which led to the opening of an additional amount of water from the Mosul Dam to reduce the momentum on the dam as a result of the water in excess of its capacity Absorptive coming from Turkey. Likewise, the second reason is a large amount of rain, which led to the flooding of the Tigris River as a result of floods from the valleys and lands located near the river, carrying with it a large amount of clay and colloidal materials and the remains of dissolved plants and worms as well as industrial waste and sanitation [8].

The study with a number of researchers indicates that the turbidity values increase with increasing drainage of rivers and downpours [9], as mentioned [10], that the turbidity of the water of the Tigris River is greater than the turbidity of the waters of the Euphrates, because the Tigris River has five tributaries.

The Euphrates River has no flow into it inside Iraq, and the results of the current study were higher than the value recorded [11], when studying the water of the Tigris River before entering the city of Mosul, as it was between (25.3-0.1) NTU, and higher than what was recorded [12], as the turbidity ranged between NTN (57.42-1.42) when studying the waters of the Tigris River within the city of Tikrit, while the turbidity values for the current study were lower than that recorded [13], which ranged between (NT 202-20.6) when studying the waters of a river Tigris within the Salahuddin province.

5.2. Turbidity in sedimentation units

The sedimentation unit is considered one of the most important units in water purification projects and that any defect in the work or efficiency of these units will reflect negatively on the units that come after it and then on the quality of the water delivered to the consumer as the inefficient precipitation will allow the transfer of turbidity from the sedimentation units to units Filtration, which negatively affects the efficiency of the filters' work, and consequently It results in a short period of operation, as well as the frequency or increase of washing operations due to clogging of the filter media with suspended material, and this is reflected in the high cost of the product [14].

It is clear that the lowest value was in August of 2019 and the highest value was in April of the same year. The efficiency of the precipitation process was also fluctuating from month to month as it ranged between (48.71% - 13.33%) the lowest value observed in May of 2019 and the highest value recorded In January 2020, knowing that more than (78%) of the positive cases, the efficiency was less than (31%) Table (2) notes that the efficiency of sedimentation basins as the current results indicate was below the aspiration to be reached, and that the efficiency of sedimentation basins in most drinking water filtering stations in Iraq, including a number of researchers such as [1], when studying the Great Gray Water Project As it was stated that the efficiency of sedimentation basins reached ((36%), as well as [15], indicated that the efficiency of sedimentation basins in the new project in the left coast of the city of Mosul In October, it reached (2.5%), and [16], also stated that the efficiency of sedimentation basins was between (79.6% - 53%) when studying three main stations for filtering drinking water in Nineveh Governorate, as well as the study carried out by [9]. As it was mentioned that the efficiency of sedimentation basins was low and varied from month to month as it ranged between (56.6% - 5.12%) when studying it to evaluate the efficiency of four drinking water purification plants in Salah al-Din Governorate.

| Months       | Raw knowledgeable | After sedimentation | After the nomination |
|--------------|-------------------|---------------------|---------------------|
| April        | 65                | 52                  | 32                  |
| May          | 30                | 26                  | 20                  |
| June         | 26                | 18                  | 16                  |
| July         | 12                | 10                  | 8.2                 |
| August       | 8                 | 6.8                 | 4.6                 |
| September    | 9.5               | 7                   | 6                   |
| October      | 6                 | 7.5                 | 7                   |
| November     | 46                | 31                  | 20                  |
| December     | 23                | 18                  | 10                  |
| January      | 19.5              | 10                  | 6                   |
| The year 2020|                   | 24.5               | 18.63               | 12.98               |
5.3. The overall efficiency of the project:

| Months   | Sedimentation efficiency | Filtration efficiency | Overall efficiency |
|----------|--------------------------|-----------------------|--------------------|
| April    | 20                       | 38.46                 | 50.76              |
| May      | 13.33                    | 23.07                 | 33.33              |
| June     | 30.76                    | 33.33                 | 38.46              |
| July     | 16.66                    | 18                    | 31.66              |
| August   | 15                       | 32.35                 | 42.5               |
| September| 26.31                    | 14.28                 | 36.84              |
| October  | *                        | 6.66                  | *                  |
| November | 32.60                    | 35.48                 | 56.52              |
| December | 21.73                    | 44.44                 | 56.52              |
| January  | 48.71                    | 40                    | 69.23              |

* Efficiency is negative

Figure 1. The efficiency of the liquidation of the NTU unit.

Conclusions and recommendations

- The water coming out of the project under study in most months contained turbidity that exceeded the permissible limits in drinking water and the project's efficiency in removing turbidity was low.
- Opening training courses for people working in water stations to increase their efficiency, with continuous periodic checks subject to control over the efficiency of water projects, to assess the potency of drinking water for human consumption, and to support and expand the scope of environmental laboratory work.
- Paying attention to the media aspect of increasing environmental awareness, the meaning of pollution, especially water pollution, and the health damage caused by using water without treatment and rationalizing water consumption, with the importance of maintaining cleanliness and avoiding throwing dead animals and waste to the river and not defecating near water bodies.
- Eliminating the violations that occur on the water distribution networks, repairing damage and fractures in them, and conducting periodic cleaning of the networks.
- Working to raise the efficiency of the station included in the study by doing a detailed study on the station in full cooperation with the management of this station in order to identify the negatives and obstacles that exist in it, as each known station has its own conditions.
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