

Study of The Standards Quality of A Wastewater Before and After Treatment In Kufa Treatment Plant

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الخلاصة

تم في هذا البحث دراسة لجودة مياه الصرف الصحي لمحطة معالجة الكوفة حيث من المعروف ان معايير الجودة لمياه الصرف الصحي يتم من خلال قياس نسب الاوكسجين الحيوي (DO) الممتص والاكسجين الكيميائي (COD) الممتص وهي الاساس في الفحوصات المختبرية لتحديد ضرر مياه الصرف الصحي على الكائنات الحية والاسماك او على حياه النباتات المائية وهناك مؤشرات اضافية تم دراستها لما ذكر منها (pH , التوصيلية الكهربائية E.C , أملاح ذائبة كلية T.D.S , مواد عالقة كلية T.S.S , BOD , الكلوريدات ، نترات ، زيوت وشحوم ، الفوسفات ، درجة الحرارة) قبل وبعد معالجتها في محطة معالجة الكوفة بأوقات مختلفة على مدار السنة (٢٠١١ - ٢٠١٢ م) لثمانية اشهر متتالية.

Abstract

In this research the study of the quality of sewage treatment plant of Kufa, where it is known that the quality standards for wastewater is by measuring the ratios of oxygen vital (DO) uptake and oxygen chemical (COD) absorbed a foundation in laboratory tests to determine the damage sewage on living organisms and fish or which life aquatic plants and there are indications have been studied as well as mentioned (pH electrical conductivity, E.C., salts dissolved total TDS, materials stuck total T.S.S, BOD, chlorides, nitrates, oil and grease, phosphates and temperature). Before and after treatment in the treatment plant Kufa different times throughout the year (2011-2012 AD) for eight consecutive months.

Key Words: Plant, Oxygen, Chemical, Vital, Salts, Materials .

Introduction

The assembly and the disposal of liquid waste from sources produced a significant public health and avoid risks ominous and vary sources effluent depending on water use and varied diversity of agricultural and industrial production, trade and use of water in homes for washing and personal hygiene and other patterns of consumption. And crisis work on the collection and delivery Sewage sludge liquid quickly to plants processed or points final disposal at the cheapest available means until processed or converted into other products are not harmful and does not constitute a danger to human or its products or animals or property. After completion of the treatment of primary and secondary wastewater should not at least alleviated (1-8) times and should not be (BOD) less than (20 mg \ L) or use sand filters removes a large proportion of suspended solids in the case of lack of water to alleviated [1].

That the studies on river pollution and study the effect of sewage and industrial water quality of the river water [2]. Properties or characteristics of wastewater can be divided into three sections, namely physical, chemical and biological weapons. Natural property of most of the sewage is the total content of the material Solid. Consisting of floating material, suspended solids, colloidal material and dissolved substances. Other physical properties are odour, color and temperature [3].

Practical part

The characteristics of the wastewater

pH: Is a measure of the acidic or basic nature of the wastewater. Wastewater modern generally be of the nature of the alkaline where the pH is between (7.3 to 7.5), but with the passage of time tends pH to go down due to acid production by bacteria and are measured pH using a device (Electrode) to see pH) of water involved in the study according to the above-mentioned dates. The value is measured pH using (pH-Meter) in which two electrodes, one of them will be fixed in the device and the other electrode is used to measure the temperature.

Electrical conductivity (E.C): Electrical conductivity reflects the rates and the presence of salts dissolved in the wastewater, Fartfalla shows high rates of salts in wastewater it is, the more salts in the water increased electrical Tusiltha (electricity supply) dependent electrical conductivity of wastewater.

- Total dissolved solids.
- Water temperature.
- Ions concentration.
- Equivalent ions.

There are several ways to measure this property including roads, electrical and electronic, but the method used to measure the conductivity in this study is using the All-In-tests (Y.S.I).

Measuring total dissolved salts TDS: Refers dissolved solids in the water to dissolved salts ibex mostly composed of molecules and ions organic and inorganic in sewage in solution can be added dissolved solids large amount during the treatment process, but high concentrations of solids dissolved may negatively affect the body of water the future and the future use of its water.

Measuring the proportion of total suspended solids TSS: The tests task that indicate the degree of contamination of the form of water and suspended solids can consist of sand deposited quickly or solids slow sedimentation. Suspended solids Volatile represent organic materials that affect dissolved oxygen, they also cause increased turbid and pregnancy of clay materials.

Measuring the need for chemical oxygen COD: Known (COD) the amount of oxygen required for the oxidation of organic material that can be used to measure the content of organic material for each of the natural water and sewage and dissolved oxygen is important determinants of aquatic environments as all aquatic need dissolved oxygen for the sustainability of metabolic processes as it gives an idea of the nature of the water resource as it consumes through redox reactions to produce chemical compounds [4]. And the amount of dissolved oxygen in the water affected by temperature and atmospheric pressure, salinity and movement, water quality and aquatic density [5].

Was measured ratio of COD using the method of color (Closed reflux colorimetric method) and the method is based on the oxidation of organic matter in the drinking water industry by powerful oxidizing agent is ion Dai chromate The method is based on the digestion and then read Device spectrophotometer (Spectrophotometer Cecil 7200).

Measuring biological need for oxygen BOD: Either vital oxygen consumed by microorganisms it is one of the important quality standards for water and by which they can determine the degree of organic pollution him [6]. A measure of the amount of oxygen consumed as it would have made bacteria and protozoa sufficient oxidize organic materials in one liter of water. If the level is too low, the aquatic organisms will be in danger. The presence of oxygen essential to pays homage to small organisms. Continue aerobic activity only with the presence of dissolved oxygen in the wastewater and then begins anaerobic activity, which results in the case of rot. So the oxygen is required in the wastewater to oxidize both organic materials and inorganic material. Method was used based on feature osmosis for oxygen through the membrane user Electrode. Was using a Dissolved Oxygen Meter.

The relationship between (BOD) and (COD): No rates fixed between oxygen vital consumer and oxygen chemical consumer, and have oxygen chemical usually greater than the oxygen vital consumer because chemical oxidation decomposition of organic materials that cannot microorganisms oxidized Moreover, the BOD (oxygen vital consumer) expresses oxygen

consumer in the oxidation of materials Member within five days, but measuring BOD gives quick idea of the possibility of biological treatment or not of liquid wastes. considered measuring COD is the most common where we get results within 3 hours, but does not give a strong indication of whether biological treatment feasible for this type of waste or necessary treatment in some other way.

Unite pollutants sewage significantly and comes on top of these pollutants oils and greases food where represent with each two principal sources to raise the indicators wastewater pollution (BOD, COD, TSS) and the impact negative heavily on systems sewage networks in general and on systems to address this especially water [7].

Measure the percentage of dissolved oxygen (DO): The content of natural water of dissolved oxygen factor environmentally important role in the growth and distribution of aquatic that you need for the process of respiration to maintain survival alive. The value (5 mg / l) of oxygen dissolved effective value of the system water affected values of dissolved oxygen by several factors. Including abundant aquatic plants and Speed wind and water currents and the phenomenon of the tides as lead all to increase solubility of oxygen in the water there is an inverse relationship between oxygen dissolved and temperature [8] is a high concentration of oxygen dissolved in the aquatic environment evidence on the validity of such an environment for living neighborhoods either low level of dissolved oxygen has put an end to process breathing aquatic and stop the development of embryos and eggs to hatch, as well as the failure of reproduction which leads to change the size of residential communities to revive and abundance and diversity. nor indispensable even in the case of low concentration below a certain level to sustain life in the aquatic environment [9]. DO value was read by a device model DO – Meter.

Measuring The Proportion Of Chlorides: Metal chlorides are salts so they are not affected by the biological performance of the wastewater. Chlorides in natural waters be a result of melting salt rocks and soil by water. Chlorides in wastewater be remnants (kitchens and secretions humanity). An estimate by the chloride process Altzhah and the method used in the current study is Silver Nitrate Method[10].

Measuring The Proportion Of Nitrates: The presence of nitrates evidence of organic material complete oxidation. The **Figure** shows the most stable material nitrogen in the wastewater, any show oxidation good for sewage treatment. Increase the proportion of nitrates during the treatment process is working as a guide to measure progress in the process of wastewater

treatment and there are several ways to measure this property and the method used in this study are (Ultraviolet method) (UV appreciation).

The formula where there are nitrogen returned is ammonium nitrate or nitrite nitrogen and organic. All formats nitrogen gas, and also nitrogen can be converted from one format to another Bayukimaaúaa and therefore fall within the nitrogen cycle in nature.

Measuring The Proportion Of Oil And Grease: Oils and grease usually consist of kitchen waste. A component of meat, food items such as butter, vegetable oils and oils. Oils found in meats, seeds, nuts and almonds in some fruits [3]. There are also oils and oils in the remnants of industrial wastewater. Oils and grease a vehicle Estrat alcohol or glycerin with oily acids., Such as materials that float on the sedimentation basins and the way that applied to measure the percentage of oil and grease in wastewater on the present study are (Gravimetric method). The domestic use of oils and grease food leads to the arrival of large quantities of them into a network of exchange and which harden later inside the lines sewerage network and causing narrowing section runoff, which leads to the formation of anaerobic conditions and produce odors and disturbing poisoning aqueous medium [11].

Was measured ratio of oil and grease Gravimetric method and the basis of this method is the extraction of fatty substances form by an organic solvent is hexane.

Temperature:

Waste water temperature higher than normal water temperature due to the addition of hot water from domestic and industrial activities. Average annual temperature varies according to geographical location between (10-30 C°) temperature wastewater affect the organisms and reaction rates chemical, biological and limits dilution of gases such as lack of solubility of oxygen dissolved with a high temperature high temperatures help the growth of types of floating plants wastewater and there are several ways to measure this property is.

A - Mercury thermometer or alcohol.

B - a lot of electronic devices and water-ringed there is a pole to measure temperature devices such as pH and BOD devices and conductivity measurement method used to measure the temperature by (Y.S.I) device.

Measuring the proportion of phosphate: Phosphorus is one of the key elements necessary for the growth of plants and animals. Phosphorus in the form is very toxic. Formed phosphate $[PO_4]^{-3}$ of this element. This may result from the breakdown of harmful algae that contain

phosphates. They may exist in solution, or particles, or loose parts, or in the bodies of aquatic organisms. Phosphate present in nature in four formats:



Formula relies ionic phosphate on the hydrogen ion concentration, temperature and percentage of phosphate measured by following method (Ascorbic acid method) which is the way light[10].

Results and Discussion

pH was measured for a wastewater treatment plant Kufa before and after treatment, as shown in **Figure 1**.

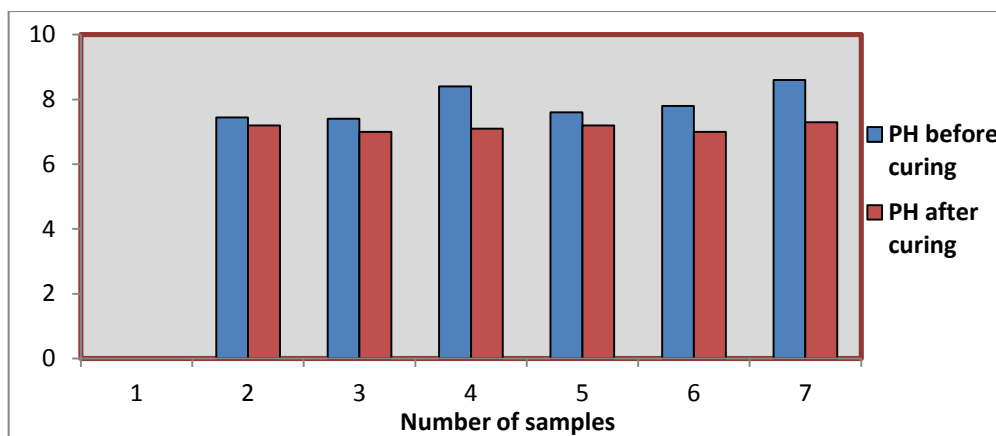


Fig. 1:The Ph Values Of The Wastewater Before And After Treatment

Modern wastewater are generally alkaline nature (where the pH is between 7-8.6), but with the passage of time tends pH to go down due to the production of acids by bacteria, where they become relatively stable wastewater they become alkaline Secondly, as the water oxidizing be pH about 7.3 high concentration of acids (pH less than 7) to alkali (pH greater than 7).

That the high pH value in the water on the study is to demonstrate the presence of remnants of industrial wastewater in the sewage. Also been studied electrical conductivity of the water on the study and the results were as shown in **Figure 2**. Sewage connectivity ranged between (2410 Us/cm) as the minimum value (3700 Us/cm) as the highest value to the high value of conductivity is due to increase the proportion of salt dissolved in water Fartfalla indicates high rates of salts in the water he is, the more salts in the water increased electrical Tusiltha (electricity supply), as well as increasing connectivity increase of industrial waste in the

sewage (such as ice cream and salted meat) as well as nominated groundwater in the water lines sewage pipes near saltwater beaches and marine that cause an increase in the proportion of chlorides which are mineral salts and thus increasing the conductivity and less conductivity down salts [4].

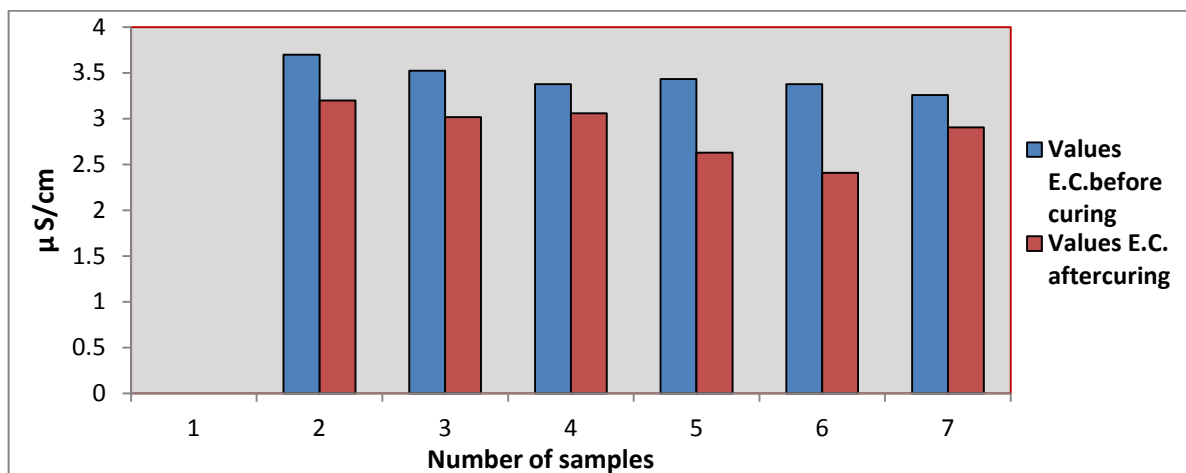


Fig. 2: The Values Of Conductivity Of Wastewater Before And After Treatment

Also been studied total dissolved salts (TDS) in water drainage on the study and the results were as shown in **Figure 3**. That the percentage of dissolved substances total ranged between (167500 mg / L as the minimum value) and (262000 mg / L highest value) to increase the proportion of dissolved substances total in wastewater due to increased household waste, industrial and consisting of molecules and ions organic and inorganic in wastewater are solutions. As well as getting down the amount of oxygen required vital (BOD) [11,12].

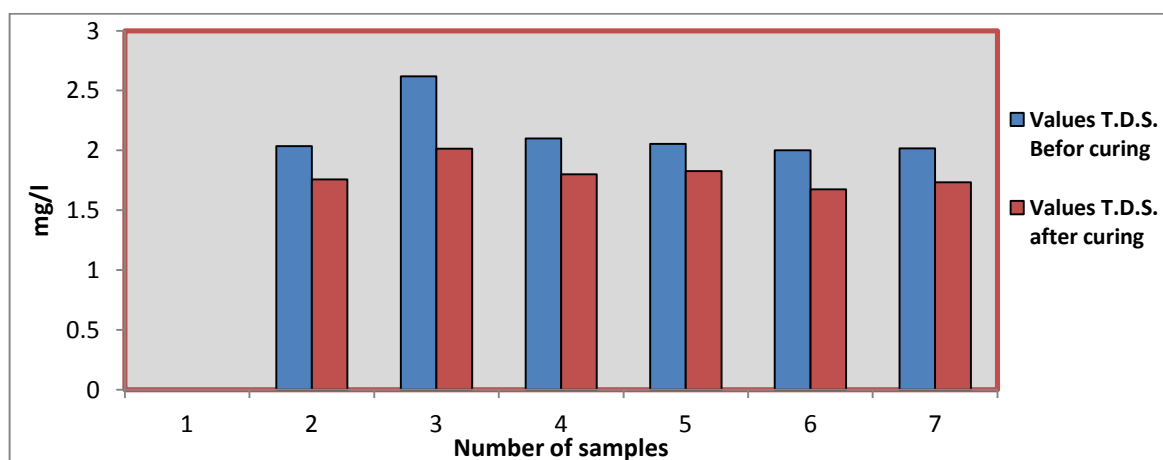


Fig. 3: The Values Of Total Dissolved Salts Wastewater Before And After Treatment

There were a measure of the proportion of suspended solids Total (TSS), which illustrated form (4), which shows that the percentage of suspended solids total ranged between (2340 mg/L) as the maximum value and (15600 mg/L) as the high value. To increase the proportion of suspended solids total result increased sediment mud because of the increased proportion of arable land, silt, sand and dirt. Or the presence of organic materials and inorganic as well as the presence of factory waste in the sewage. The high temperature increases the viscosity of wastewater and thus increases the deposition of suspended solids. As well as getting down ratio of oxygen vital required BOD). That low suspended solids total due to the decrease in temperature is also very low temperatures affect the efficiency of deposition. As less increase the proportion of oxygen vital to be where she works organism's small biodegradable suspended solids total.

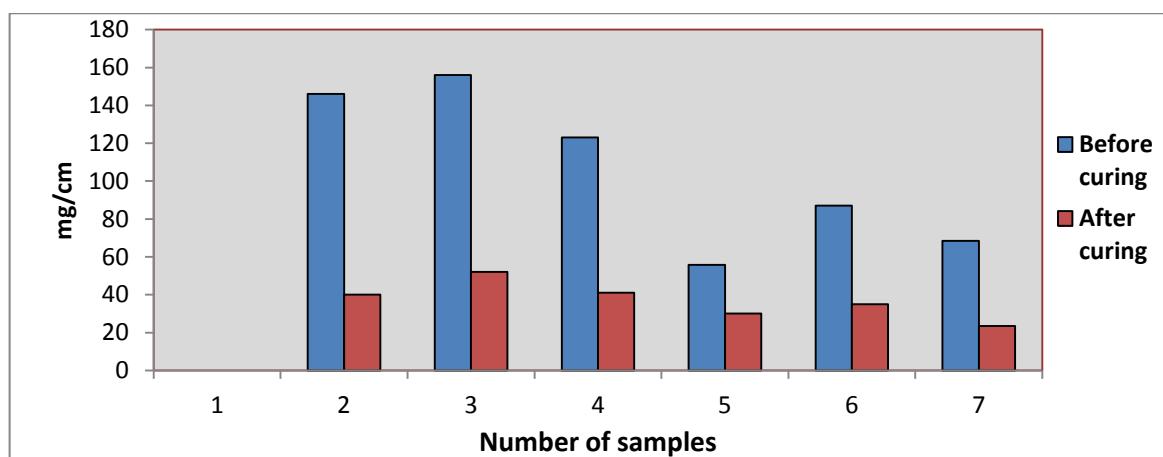


Fig. 4: The Values Of The Proportion Of Total Suspended Salts Of Wastewater Before And After Treatment

The **Figure 5** shows the change in the chemical oxygen required by the sample collection date that the rate of chemical oxygen required ranged between (37 mg /L) as the minimum value and (600 mg /L) as the highest value. The low rate of chemical oxygen required due to the high temperature. High temperatures help the growth of types of floating plants and at least as well as increase the number of bacteria in terms of the number of bacteria in the sewage treatment plant (510-810) per cubic centimeter and at least the greater organic load. And increases with low temperature and low organic load and isaid the number of bacteria in the treatment plant [4]. COD values were high before treatment and the added benefit of air in the aeration basin dropped those values after treatment to be less than (100 mg/L) which means

analyzing a large part of the chemicals to simple materials less complicated and less polluted [13].

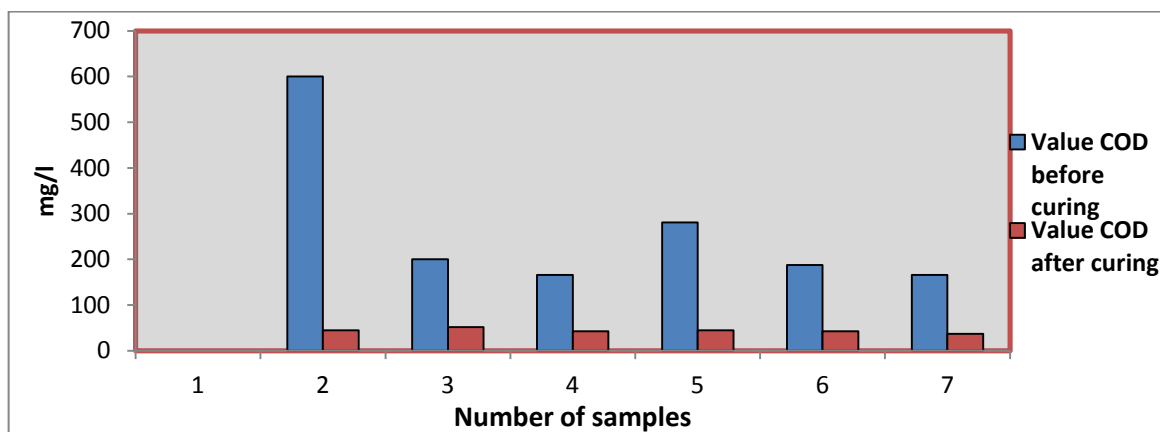


Fig. 5: The Values Of Chemical Oxygen Ratio Of Sewage Before And After Treatment

Were also measured the proportion of oxygen vital required, which ranged between (9.6 mg/L) as the minimum value and (120 mg / L) as the highest value and prescribed by **Figure 6**. That the reason for low oxygen vital to be in the wastewater resulting from the increased interactions biochemical associated with high temperature, thereby reducing the amount of oxygen in the wastewater can cause a sharp drop in the concentration of dissolved oxygen, especially when exchange a large amount of wastewater relatively warm in the water bodies as well as reduced oxygen vital required whenever increasingly contain wastewater organic materials and inorganic. Increasingly vital oxygen required low temperature [6].

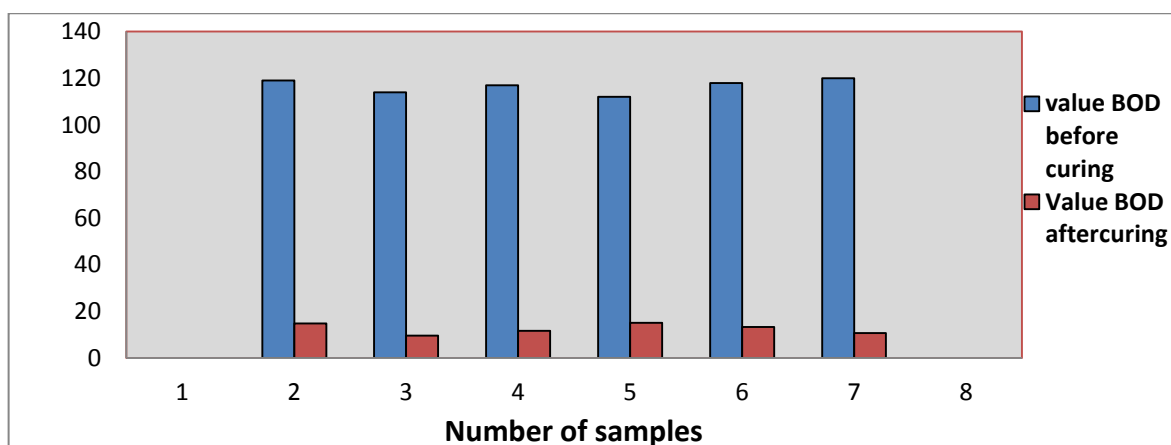


Fig. 6: The Values Of Vital Oxygen Ratio Of Sewage Before And After Treatment

As has been the study of concentration of dissolved oxygen DO, which ranged between (0.48mg/L) as one of the lowest and (9.4 mg/L) maximum, which illustrated form (7) and measured values vary according to changes in temperature and increase organic matter in the water [14].The high values of dissolved oxygen may be due to good ventilation and continuous mixing, as well as the significant role of aquatic plants and phytoplankton [15] .

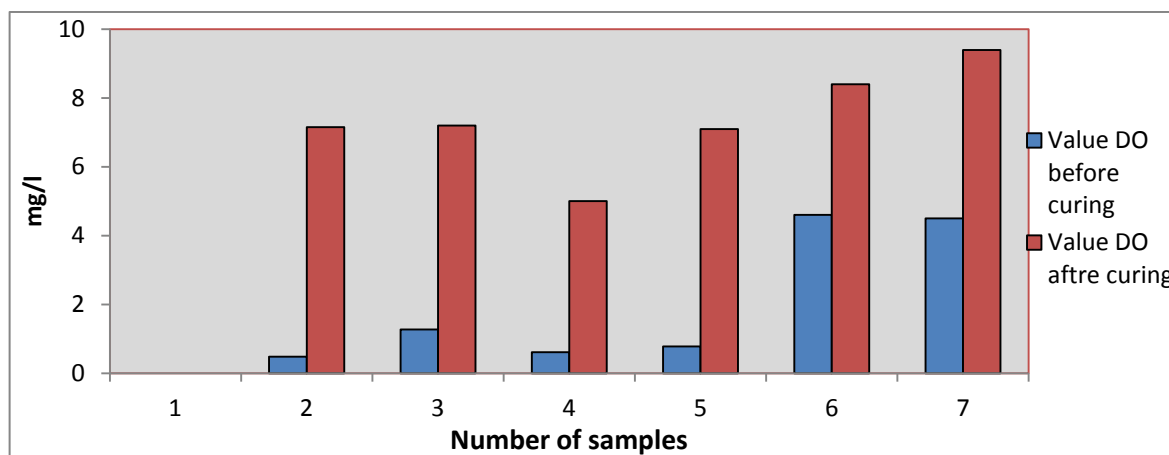


Fig. 7: The Values Of Dissolved Oxygen Before And After Treatment

That the percentage of chlorides in wastewater ranged between (259.6 mg/L) as the minimum value to(538.8mg/L) as the highest value specified by the form (8) that the reason for increasing the proportion of chlorides in the wastewater resulting from the increase of kitchen waste and secretions and water supply and groundwater infiltration and remove chemicals Price , as well as brackish removal devices add large amounts of chlorides, as well as large quantities of chlorides up to wastewater from industries such as (exponent cream and salted meat) and was nominated groundwater in lines sewage pipes near saltwater marine beaches.

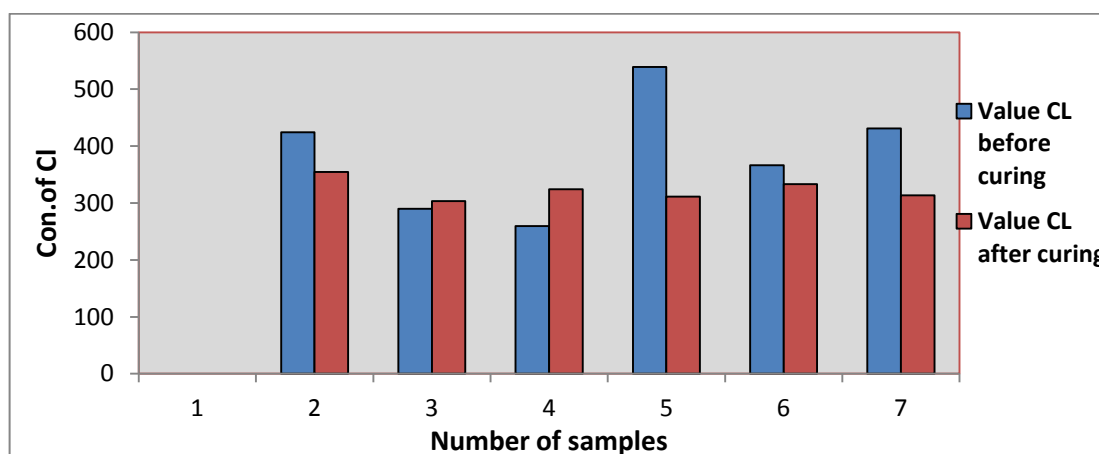
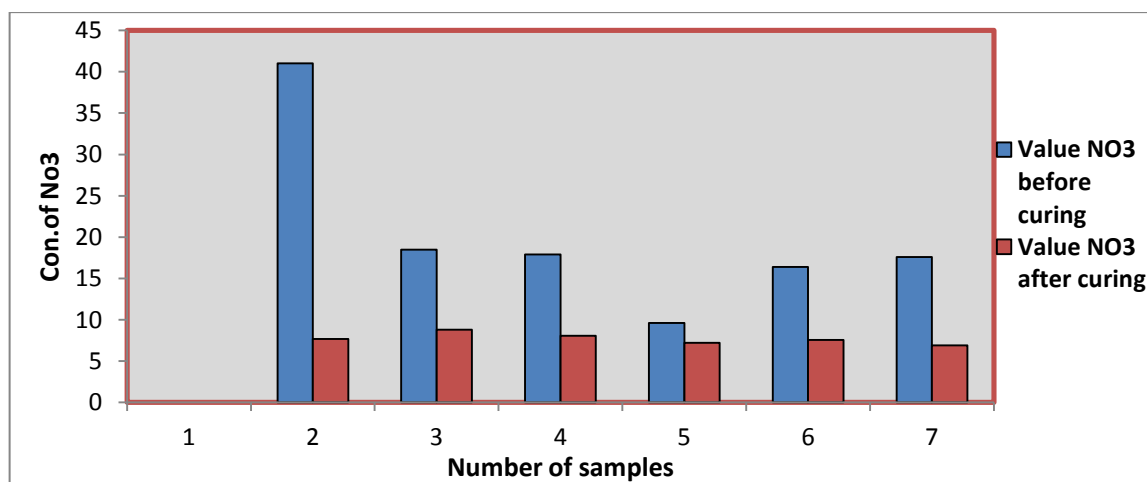


Fig. 8: The Change In The Chlorine Content Of The Wastewater Before And After Treatment

The nitrates in the wastewater, which shows the results in **Figure 9** ranged from (6.9 mg/L) as the minimum value,(41 mg/L) as the highest value that increased nitrates due to an increased level of household waste which includes (urine and other secretions), consisting of urea, protein and hydrocarbons, industrial, its decomposition occurs either way (oxidation) by pathogenic bacteria aerobic or anaerobic bacteria-induced decay, resulting in the formation of ammonia and other gases, then turn into ammonia process alntrgh first to nitrite by oxidation Partial and then finally to nitrate by aerobic bacteria (nitrate increases with increasing the amount of oxygen in the water). low nitrates are either because of low level waste, or nitrite in wastewater can turn and boil down to free nitrogen (and sometimes ammonia) by anaerobic bacteria through the process of removing alntrgh, (which decreases the concentration of nitrate in the low amount of oxygen in the water), the presence of nitrates evidence of fully organic oxidation of any show of good water oxidation Treatment [9].

**Fig. 9:** The Change In Nitrate Content Of Wastewater Before And After Treatment

As a proportion of the content of oil and grease in water measured in the present study, which is illustrated by **Figure 10** range (1.4 mg/L) as the minimum value (61.8mg/L) as the highest value. The natural presence in the treated water is (0-10) to increase the proportion of oil and grease, (38.4 mg/L) in wastewater is due to increased waste containing these substances, including remnants of houses containing oil and grease as well as remnants of factories Invasive and the existence proof of the severity of pollution and their presence in water is a

testimony to the inefficiency of the treatment the proportion of oil and grease, which amounted to (1.4 mg/L) and is within the normal range and the reason To efficient processing plant because of low concentrations of oil and grease which are remnants of homes and factories and as a material in high lead to confusion in the treatment plant.

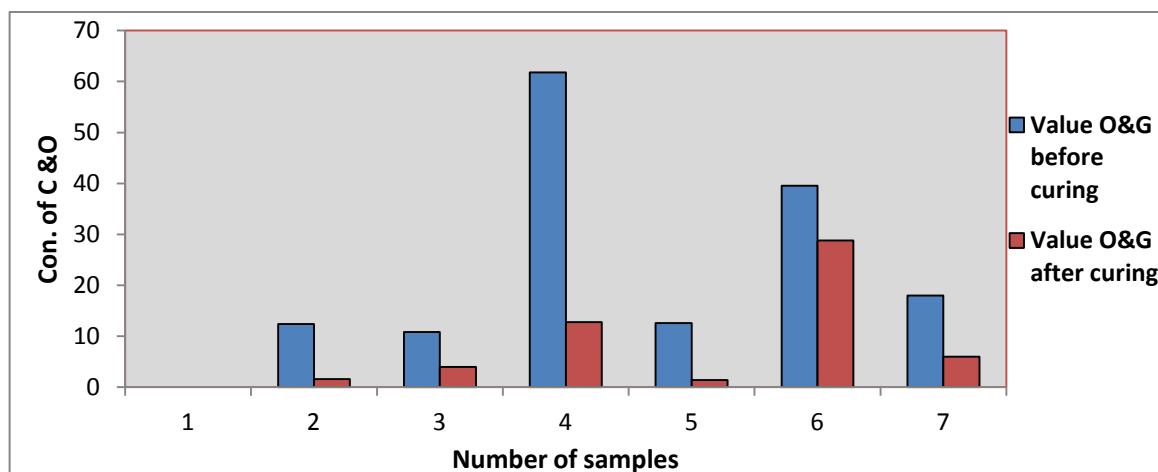


Fig. 10: The Proportions Of Oil And Grease Wastewater Before And After Treatment

As the temperature ranged between study (15.3 C°) as the minimum value (29.7 C°) as the highest value and the manner specified by **Figure 11**, these percentages obtained when measuring temperature is normal for the temperature of the water where the average annual temperature varies according to geographical location between (10-30 C°). generally the wastewater temperature is higher than the water supply because of the addition of hot water for domestic and industrial activities that decrease in temperature almkasemh is due to a reduction in degrees Temperature is affected by chemical and bacterial walviziauet qualities in different temperature of the wastewater temperature rise increases the viscosity of the water and increasing the activity of bacteria with high temperature to degrees (60) and then decreases the activity of bacteria in the sewage gases melting down with the high temperature and the resulting expulsion of dissolved oxygen and other gases and increase the temperature of the water affect the objects in bodies of water like some aquatic plants and fungi [11].

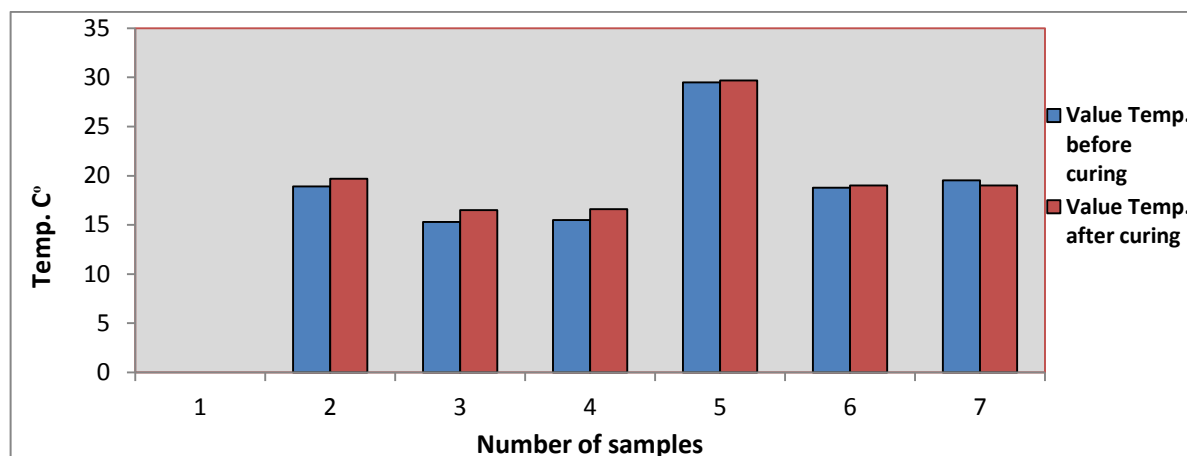


Fig. 11: The Change In The Temperature Of The Wash Water Before And After Treatment

The proportion of phosphate were measured in effluents ranged from (0.16 mg/L) as the minimum value (7.02 mg/L) as the highest value of which is illustrated by **Figure 12**. To increase the proportion of phosphate in wastewater is due to the increase in household waste containing detergents and washing powders, as well as increase of decomposition of harmful algae in sewage, and that the pH effect of removal efficiency of phosphorus in the treatment plant where competence increasing the pH (10, 11).

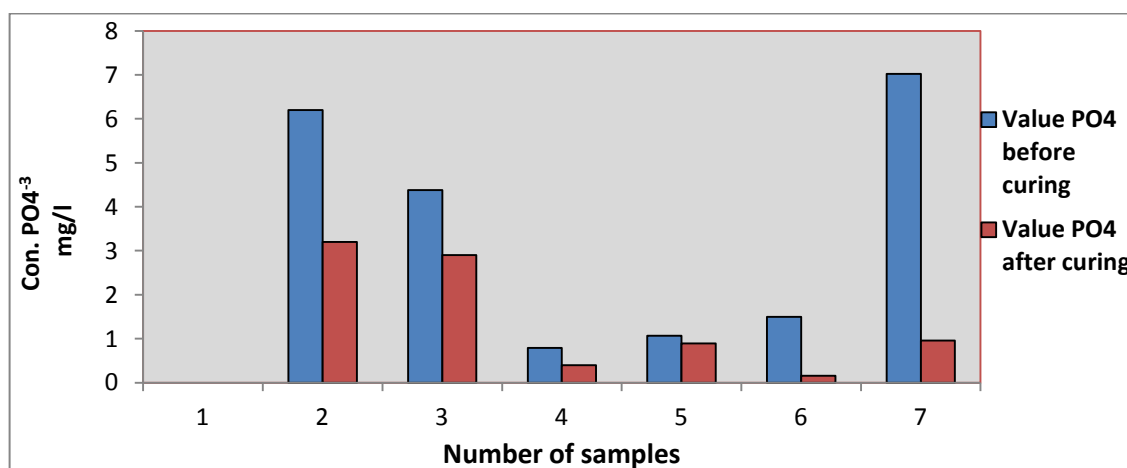


Fig. 12: The Proportion Of Phosphate For Wastewater Before And After Treatment

The following table shows the determinants of Iraqi and international validity of the statement of wastewater after treatment and use as drinking water or irrigation [16, 17, 18].

World Health Organization W.H.O	According To The Specifications And Limitations Of The Iraqi	The Measured Value In The Present Study After Treatment	The Measured Value In The Current Study, Pre-Treatment	Parameter
6.5-9.5	6.5-8.5	7-7.3	7.7-8.6	Ph
-----	S/Cm μ 1000	2410	3700	E.C.
1000	500	167500	262000	T.D.S
10-20	30	23.40	156.00	T.S.S
Low3	---	37	600	Cod
Low5	5	9.6	120	Bod
5 High	High 5	9.4	0.48	Do
45-250	250-350	259.6	538.8	Cl ⁻
50	50	6.9	41	No ₃ ⁻
0 -10	0-10	1.4	61.8	O&G
Normal	Normal	29.7	15.3	Tem.
0.5	----	0.16	7.02	Po ₄ ³⁻

Conclusions

It is known that the main objective of any treatment plant is to produce safe drinking water and healthy at the same time palatable taste and suitable for domestic use. Has been found in this study that the wastewater after treatment their suitability to be used for drinking purposes Awalra and when compared to the determinants of Iraq and the determinants of international show suitability for drinking.

References

- (1) Srih M.[2012]. Search Sources Of Waste And Liquid Waste And Collection Methods .Sanitation.
- (٢) مجلة الهندسة والتكنولوجيا.(٢٠٠٩)، المجلد ٢٧، العدد ٢.
- (٣) الخليل، محمد احمد.(٢٠٠٧). تصميم عمليات المعالجة للصرف الصحي ط ١ القاهرة:دار الكتب العلمية للنشر والتوزيع.
- (4) American Public Health Association (APHA).[1998]. Standard Method For The Examination Of Water And Wastewater.20thed. American Public Health Association. Washington.
- (٥) العمر، مثنى عبد الرزاق. [٢٠٠٠]. التلوث البيئي. دار النشر. عمان – الاردن.
- (6) Train R E. [1979].Quality Criteria For Water . U.S. Environmental Protection Agency Washington D.C.
- (7) Bush P B. [2000]. Laboratory Results For Fat, Oil And Grease Sample For Private Client. University Of Georgia Feed And Environmental Water Laboratory.
- (٨) الحقيبة البيئية.[٢٠١١]. دروس في مشكلات البيئة وحمايتها، تلوث المياه، ص٣.

(9) Abowei J F.[2010]. *Adv. J. Food Sci.Technol.* 2:36-40.

(١٠) مختبرات البيئة.[٢٠٠٩]. الفحوصات الكيميائية النمطية لتحاليل مياه الشرب والمسطحات المائية والتصارييف الصناعية والابار المتبعة في وزارة البيئة قسم التحاليل البيئية. ص (٢٣-٥٤).

(١١) ديوب ، ناجي.[٢٠٠٩]. دراسة الزيوت والشحوم الغذائية المصروفة إلى شبكة الصرف الصحي في بعض أحياء مدينة اللانقية. رسالة ماجستير في الهندسة البيئية

(12) Tood, D K.[1980]. Ground Water Hydrology. J. Wiley. New York .p336.

(13) Tebbutt T H. [1977]. Principles Of Water Quality Control .2nd Edition . Pergamon Press. Oxford. p:201

(١٤) عادلي، بتول محمد ،حمزة،حازم عزيز،هادي ،زينب مهدي.[٢٠٠٦]. خواص المياه المعدومة الناتجة عن عمليات المعالجة في محطة معالجة مياه الصرف الصحي في المعميرة وقائع المؤتمر العلمي السنوي الثاني لبحوث البيئة ،مركز بحوث البيئة،جامعة بابل.

(١٥) اكبر،منال محمد وعلي،ناصر عبد ومزهر،علياء حسين. [٢٠١٢] -مجلة أبحاث البصرة: العدد ٣٨، الجزء ٤.

(١٦) عباوي ، سعاد عبد وحسن ،محمد سلمان .(1990)الهندسة العلمية للبيئة وفحوصات الماء . دار الحكمة للطباعة والنشر . وزارة التعليم العالي والبحث العلمي .جامعة البصرة . ص ٢٤٨- ٢٧٦ .

(17) World Health Organization. [2011].Guidelines for Drinking-water Quality.4th Edition.

(١٨) خويدم،كريم حسين. [٢٠١٢].المجلة العراقية، المجلد ٥٣، العدد ١،الصفحة ١١٣-١٢٤.