Ann. For. Res. 65(1): 5438-5455, 2022
ISSN: 18448135, 20652445

ANNALS OF FOREST RESEARCH
https://www.e-afr.org/

A STUDY OF THE EFFECT OF THE DISCHARGE OF A SEWAGE TREATMENT PROJECT ON THE WATER QUALITY OF THE EUPHRATES RIVER

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Abstract

The current study was conducted to find out the effect of the discharge of a sewage treatment project on the water quality of the Euphrates River. Samples were collected from wastewater stations (water entering the station, treated water or leaving the station) and river water during the winter and summer seasons from six stations. The study includes three aspects, the first aspect measures the physical properties, which include (temperature, turbidity, electrical conductivity, total suspended solids). The second aspect is concerned with the measurement of chemical properties, which includes (pH, sulfate, chloride, phosphate, total hardness, and total basicity). The third aspect is the measurement of the vital properties, which is represented by (the vital requirement for oxygen, oils and fats). As the results were compared with the Iraqi specifications and the limits of the World Health Organization, and it was found that the turbidity and electrical conductivity exceeded the permissible limit, while the temperature and suspended solids were within the Iraqi specifications. The sulfates and the total hardness were higher than the permissible limit, while the rest of the chemical properties were within the Iraqi specifications, and the vital properties exceeded the limits of the World Health Organization and the Iraqi specifications.

Key words: impact study, wastewater treatment, Euphrates River.

Introduction :

Water is the backbone of life, as life began in it and does not continue without it. Since the dawn of history, man has realized the importance of rivers and lakes, as he supplies water from them and uses it to perform his various purposes[1]. Water covers about 71% from the surface of our earth, and the proportion in the human body is about 65% ,where water is the secret of life on earth. Therefore, it is an important and basic element for all living creatures, as it is a major pillar for all human activities in various agricultural, industrial and health fields, where The amount of fresh water is 3 % of the total water on the surface of the earth, and that 0.01 % of this water is available for human use [2]. The discharge of sewage water without any treatment will result in the release of a continuous load of nutrients and organic matter to the receiving water body. This leads to a number of effects on the components of the environment, including physical changes in water quality represented by an increase in the concentration of ammonia that results from the partial decomposition of protein, which leads to It leads to an increase in the concentration of nitrates and nitrites, a lack of dissolved oxygen in the water, blackening in the lower layer of the water body, and an increase in the turbidity of the water [3]. Wastewater contains quantities of detergents, which when thrown away lead to the formation of a layer of foam on the surface of the water, and this foam hinders the gaseous exchange between water and air, as well as causes an increase in the concentration of phosphates in the receiving water [4]. In view of the aforementioned effects and in order to reduce the damage that results from the discharge of sewage water directly into rivers, countries have established stations whose purpose is to treat water and reduce these pollutants in which they are found to the permissible limit, which does not harm the quality of water or aquatic life, as these include these Treatment is a group of chemical, biological and physical processes that take place on this water for the purpose of improving the properties of this water and reducing the negative effects that harm the environment. The purpose for which the water to be treated is used, the method of disposal of this water, and the amount of dilution in the receiving water [5].

Wastewater purification stages[6]

Primary treatment: The purpose of this treatment is to remove floating materials, large solids, and suspended materials such as solids, oils, greases, and sands. This is done by using some physical processes such as flotation, sedimentation, filters (clips) and others.

Biological or secondary treatment: In this stage, the organic matter is destroyed by microorganisms, using different techniques such as Trickling filters, aeration tanks, and Lagoon lakes.

Advanced treatment: The purpose of this stage is to improve the quality of the water that was treated in the aforementioned stages by removing some substances such as plant nutrients, especially phosphates, nitrates, heavy metals, viruses and bacteria by a combination of physical, chemical and biological processes .

modeling:

Samples were collected from (before and after) treated sewage water plants and river water near these plants located in Ramadi-Anbar during the winter and summer seasons. Samples were collected using polyethylene containers washed with dilute nitric acid (0.1 N) and subsequently with distilled water. Samples for determining physical, chemical and biological tests were collected in one-liter bottles. The bottle was homogenized with river water before collecting samples, then the bottle nozzles were tightly closed to prevent air from entering and stored at 4°C. Models were collected from six sites for sewage and river water stations close to the stations, the first site is Al Warar station, the second site is Albu Farraj station located below the Albu Farraj bridge, the third site is Al Sufia station located at the beginning of Al Sufia after Al Anbar International Hotel, the fourth station located At Tamim - Al-Akrad neighborhood, and the fifth site in Al-Siddiqiyah area And the sixth location in the stadium area.

practical part :

physical examinations :

Water temperature: The water temperature was measured directly at the sampling sites, using a graduated mercury thermometer from (0 - 100) degrees Celsius.

Turbidity: A field turbidity meter was used to determine the turbidity. The turbidity device was measured in NTU, and it was calibrated to standard solutions of suspended Furmazine polymers that are included in the device accessories [8].

Electrical conductivity: Use the Electric Conductivity ⁄ TDS meter, which measures electrical conductivity in micro-Siemens units/cm, and TDS estimates it in mg/L units.

suspended solids: It was estimated using the filtration method [7].

Chemical checks :

pH: The pH was measured using a field (pH-meter) device after calibrating the device on the solutions of the standard regulator (4, 7, 9).

total basal: The spectroscopic method was used to estimate the total basality at a wavelength of 610 nm for the Acid ⁄ indicator [8].

Total hardness: It was estimated by the method approved by the World Health Organization [9].

Chloride: The spectroscopic method was used to determine the chloride ion at a wavelength of 530 nm using the silver nitrate turbid method [10].

Determination of the sulfate ion: The spectroscopic method was used to determine the sulfate ion at a wavelength of 530 nm using the Barum sulphate - Turbidity method [10].

Determination of the phosphate ion: The method of ferrous chloride was followed, as 4 ml of ammonium molybdate solution and 10 drops of ferrous chloride solution were added to 100 ml of the sample, then the absorbance was measured at the wavelength 690 nm and the results were expressed in µg / liter.

Biological examinations

Biological need for oxygen: The method (Abbawi and Hassan) was followed as shown in [11] to determine the biological requirement for dissolved oxygen in water, expressed in units of mg / liter and calculated according to the following equation

BOD = (initial oxygen value - oxygen value after 5 days / dilution ratio)

Oils and greases: The process of extracting oils and greases in water samples was carried out using chloroform as a solvent. A volume of 500 ml was taken from the sample in a separating funnel and 2 ml of (1:1) hydrochloric acid and 15 ml of chloroform were added to it. After the intense shaking process, the chloroform layer separated and filtered through a filter paper containing Anhydrous sodium sulfate we show moisture absorption , The filtrate was then collected in a clean, pre-weighted eyelid (W1). The extraction process was repeated with a new volume of chloroform 15ml several times to the extent that the chloroform layer remained clear and free of oily stains. The chloroform layer is collected in a ceramic jar, the model is evaporated on a water bath, then the lid is placed in an oven at a temperature of 70 ° C for a quarter of an hour, then cooled for the same period, then the lid is re-weighted (W2).

Results and discussion :

physical examinations

Water temperature: The average temperatures of the incoming and treated water and the river water of the Al-Warar station are (28, 25, 20.5) degrees Celsius, respectively. And Albu Farraj station (28, 23.5, 20.5) degrees Celsius, respectively, while Al-Soufiyah station recorded (30.5, 25.5, 21) degrees Celsius. As for Hay al-Akrad station, it recorded (29, 25.5, 20.5) degrees Celsius. And the stadium station (29.5, 25, 22) degrees Celsius. Al-Siddiqiyah station recorded (27.5, 24.5, 21.5) degrees Celsius as shown in Table (1) and Figure (1) illustrates this.

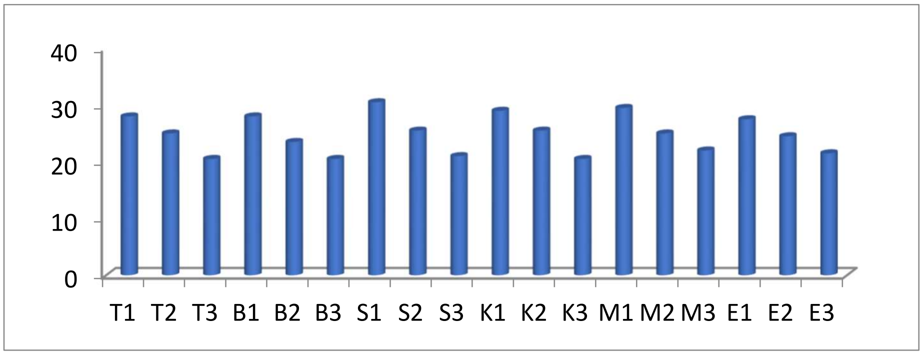

Figure (1) shows the average temperature of incoming and treated water and river water during winter and summer.

This discrepancy in the water temperature is due to the clear variation in the climate of the region between the winter and summer temperatures as a result of the climatic conditions. The water in the winter is lower than the temperature in the summer, and the water of the sewage units is characterized by the fact that it contains organic substances and these substances are in high concentration, and this leads to an increase in the processes of decomposition and organic decomposition by microorganisms and large numbers of bacteria, and thus leads to an increase in the energy emitted [12].

turbidity: Turbidity was recorded in the incoming water, treated water from the stations, and river water in Al-Warar station (T) at a rate of (35.1, 15.2, 1.8) and in (NTU) respectively, and in Albu Farraj station at a rate of (26.8, 18.4, 2.1) NTU, and in Sofia station at a rate of (36.5, 20, 2.35) and NTU. Its average is in the Al-Akrad neighborhood station (35.73, 13.02, 2.7) in the NTU unit, in the stadium station (35.75, 18.5, 3.2) NTU, and in Al-Siddiqiyah station (33.25, 17.15, 1.75) and in the NTU unit. Figure (2) illustrates this .

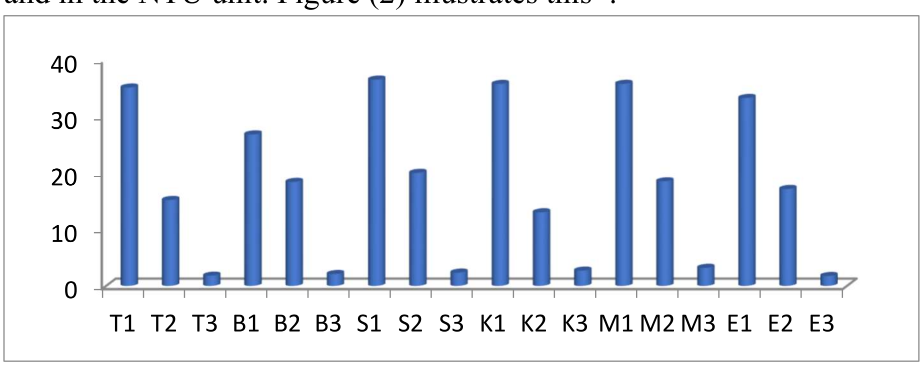

Figure (2) shows the rate of turbidity in the incoming and treated water and river water during the winter and summer seasons.

The sludge results in the treatment unit were distinguished compared to the sludge results before treatment. We note a high rate of turbidity in the site (M2) compared to the rest of the sites, as this is due to the quality and quantity of sewage waste components of inorganic, organic, floating materials, phytoplankton as well as The decrease in values in the rest of the sites is due to the effectiveness of the sedimentation basins and their ability to block and reduce dirt, plankton, microorganisms, organic detritus, and organic and inorganic materials [12]. And the turbidity rate of the river water was high, especially in the site (M3, K3, S3, B3), as it exceeded the permissible limit. The reason for the high turbidity rate in the river water is due to sewage and sewage water [13].

electrical conductivity: The electrical conductivity of the incoming and treated water and the river was recorded at Al Warar station at a rate of (10578, 5034, 1212.5) micro-Siemens/cm, and it was recorded in the Al-Bou Faraj station at a rate of (7928,5,5520.5, 1138) at micro-Siemens unit/cm. The conductivity rate was recorded at the Sofia station (17685, 6564, 1148.5) and in micro-Siemens/cm. And the electrical conductivity rate at Hay Al-Akrad station is (12306, 7974, 1174.5) micro-Siemens/cm. In the stadium station, the electrical conductivity rate was (8082.5, 3745.5, 1275.5) in micro-Siemens/cm. At Al-Siddiqiyah station, the rate is (6531, 5561, 1175) micro-Siemens/cm.

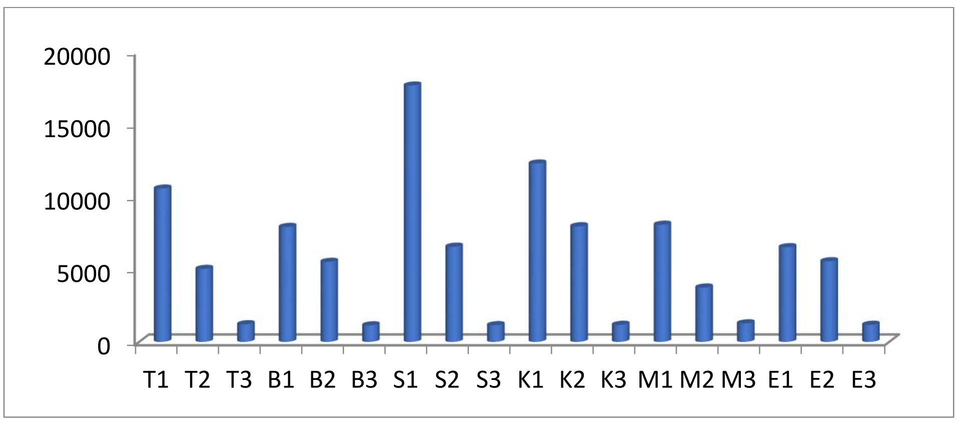

Figure (3) shows the rate of electrical conductivity in incoming, treated and river water during winter and summer.

The reason for the high conductivity values in the water entering the station is that the water is untreated and contains large amounts of salts, and the reason for the high electrical conductivity values in the treated water in sites (K2, R2, S2) is that it is relatively high and exceeds the standard specifications, and this is due to the fact that the water It represents domestic waste water, which is loaded with quantities of salts, in addition to being a major source of negative and positive ions [14]. As for the electrical conductivity rate in the river water, it was high and exceeded the Iraqi specifications and the limits of the World Health Organization. We note the high values of electrical conductivity during the summer. The reason for this is that the increase in temperature leads to an increase in evaporation and salt melting, and the lowest values were recorded in the winter period due to the decrease in the evaporation process. As a result of a decrease in temperature and an increase in the mitigation processes that result from rising water levels and rainfall [15].

suspended solids: The rate of (TSS) in incoming and treated water and river water in Al-Warar station was (123.5, 22.65, 17) mg / liter, respectively, and the rate of TSS was recorded in Albu Farraj station (133.85, 25.4, 18.4) mg / liter, and in Sofia station it was recorded The average TSS rate is (106.55, 21.6, 13.9) mg/liter, and the average TSS rate in Hay al-Akrad station is (79.35, 75.95, 22.18) mg/liter. As for the stadium station, the TSS was recorded at a rate of (134.3, 30.7, 26.25) mg / liter. While the suspended solids were recorded in Al-Siddiqiyah station (110.65, 34.4, 21) mg / liter. Figure (4) illustrates this.

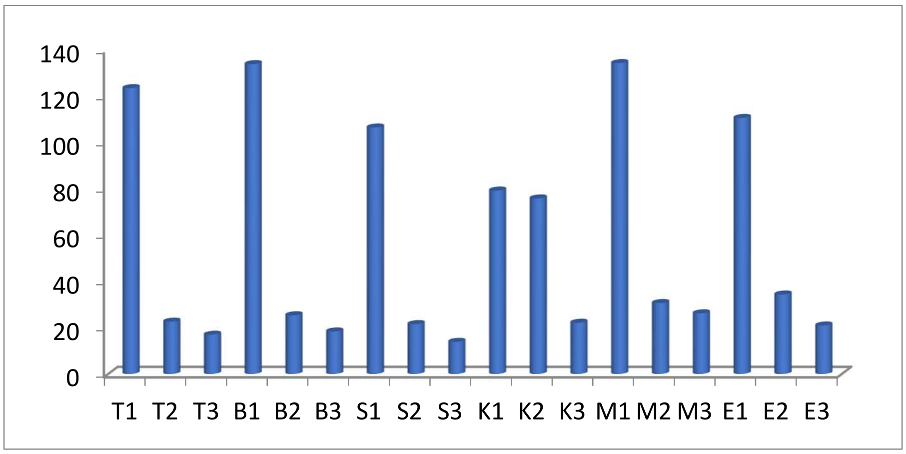

Figure (4) shows the rate of total suspended solids in incoming and treated water and river water during winter and summer.

Among the results that were reached through the study, it was found that the treated water was within the Iraqi standard specifications, and we note that the values in the site (K2) did not exceed the Iraqi specifications. The reason for this may be due to a defect in the filtering equipment and the removal of weak particles from the primary treatment unit, the type of filter and the size of the filter. The thickness of the filter distance, in addition to the amount of sludge, cleaning and maintenance operations, in addition to the station stopping suddenly as a result of a power outage [16]. As for the river water, all the values were within the permissible limits, as we note the high values of (TSS) in the sites (K3, E3, M3), but they did not exceed the permissible limit.

Chemical checks:

pH: The average pH of incoming water, treated water from the stations, and river water at Al-Warar station is (7.6, 9.25, 7.85) respectively, and (pH) averaged (8.7, 7.25, 8.05) was recorded at Albu Farraj station, and the pH record It averaged (7.45, 8.7, 7.75) at the Sofia station, and the pH rate was (7.2, 8.25, 7.45) at Hay al-Akrad station. The average pH in the stadium station was (8, 8.3, 7.9), and in the Seddiqiyah station, the pH was (7,7, 8.75, 8.05). Figure (5) illustrates this.

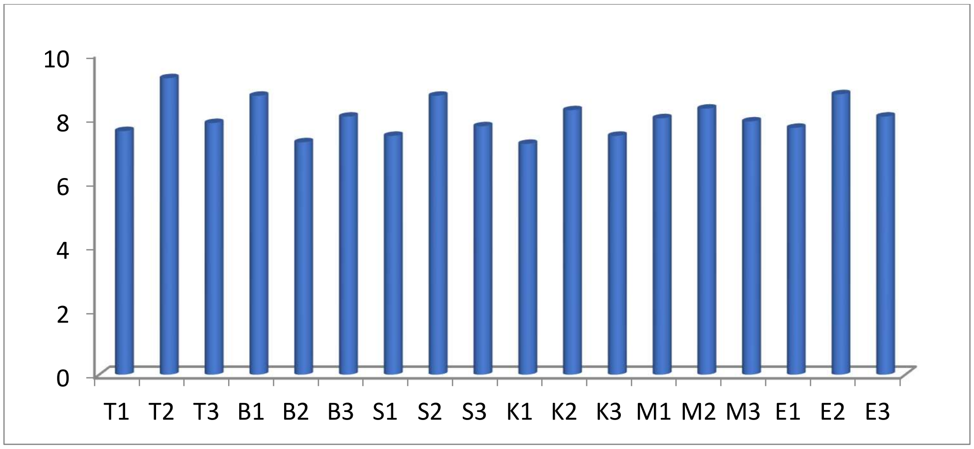

Figure (5) shows the pH rate in the incoming and treated water and river water during the winter and summer seasons.

From the results that were reached, it was found that the incoming and treated (outgoing) water from sewage water plants did not exceed the Iraqi standard limits, and although there is a rise in the pH of the treated water in the sites (S2, E2, T2), it did not exceed the permissible limit. As we notice that there are changes in the acidity function, as the treated water was higher in basicity than the water entering the plant, and the reason for this is the increase in some determinants that increase the basicity during treatment, such as nitrates, or because of the increase in bacterial activity and the increase in organic waste, which constitutes a burden on the biological treatment unit, in addition To a decrease in the percentage of oxygen in the aeration ponds necessary to digest organic materials and thus remove them [17]. As for the river water, according to the results shown above, there is a rise in the two sites (E3, B3), but it did not exceed the permissible limit according to the standards of the World Health Organization. pH less than 8.3 [18].

Sulfate: The rate of sulfates in the incoming or outgoing water and treated water and river water in Al-Warar station was (1458.5, 1456, 4000.5) mg / liter, respectively, and the sulfate rate was recorded in Albu Farraj station (716, 690.5, 382) in the unit of mg / liter . The rate of sulfate was (1737.5, 588.5, 407.5) mg / liter in Al-Soufia station, and the sulfate rate amounted to (1410, 1301.5, 464.5) mg / liter in Al-Akrad station, and the sulfate rate in Al-Malaab station reached (1602.5, 1176.5, 459.5). In Al-Siddiqiyah station, the sulfate rate was recorded (1558.5, 1430, 357) mg/L. Figure (6) shows this.

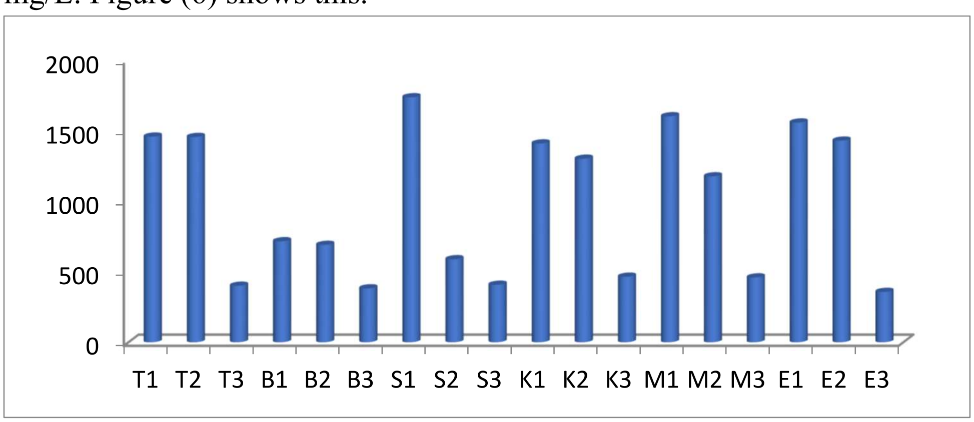

Figure (6) shows the rate of sulfate in incoming and treated water and river water during winter and summer.

From the results obtained, it was found that the water entering and leaving the plant exceeded the permissible limits according to the Iraqi specifications due to the absence of a special treatment unit for sulfate. Despite the absence of a treatment unit, there is an efficiency in the reduction due to sedimentation processes in addition to the oxidation of some of it in Aeration ponds by aerobic bacteria [17]. As for the river water, all values exceeded the limit allowed by the Iraqi specifications and the World Health Organization, and the reason for this is due to the use of quantities of sulfuric acid in painting, cleaning and washing in the units of industrial complexes, and the absence of a chemical treatment unit that works to reduce the proportion of sulfates before it is put into the river[13] .

Chloride: The rate of chloride in the water (incoming, treated) from the stations and river water, as the rate of chloride was (203, 174, 153.5) mg / liter in Al-Warar station, and it was adjusted in Al-Bofraj station (177, 173.3, 162.5) mg / liter, and it was recorded The rate of chloride was (237.5, 182.75, 170) mg / liter in Al-Soufia station, and it was adjusted (109.16, 180.5, 171.5) mg / liter in Al-Akrad station, and the rate of chloride in the stadium station was (285.9, 226.5, 175.5) mg / liter. A rate of (196.5, 175.5, 166.5) was recorded in the unit of mg / liter in Al-Siddiqiyah station. Figure (7) illustrates this .

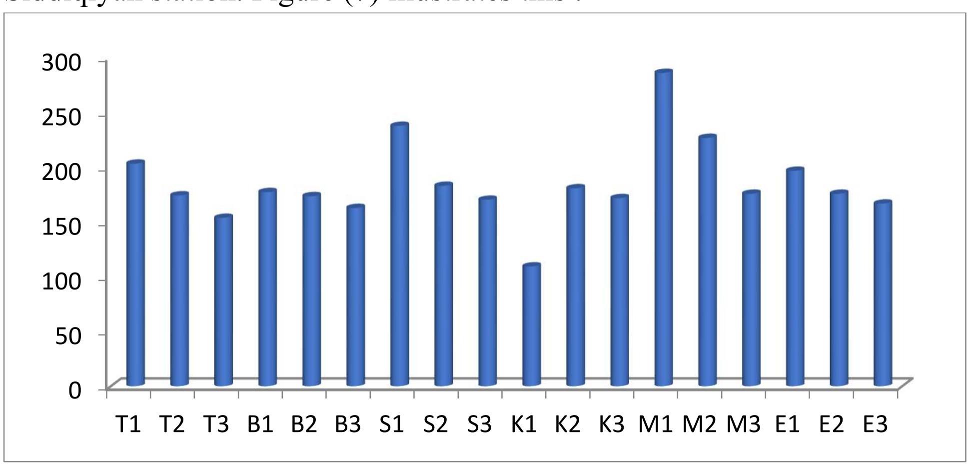

Figure (7) shows the rate of chloride in incoming and treated water and river water during winter and summer.

From the above results, it was found that the chloride rate in the incoming and outgoing water from the plant did not exceed the Iraqi specifications, but there was a rise in the chloride rate in the two sites (M2, R2), but it did not exceed the permissible limit. The reason for the high chloride rate values of treated water is due to the decomposition of materials The organic matter and the complexes that sewage waste contains, in addition to the chloride that human urine adds to 6 g / day [19]. And that the rate of chloride in the river water did not exceed the limit allowed by the World Health Organization, as it was the lowest rate in the site (T3) and the highest rate in the site (M3). Wastewater, given that chloride is used to sterilize water and that this water returns to the river as it causes an increase in the concentration of this ion.

Phosphates: The results showed that the rate of phosphate ion in the incoming water as well as the water leaving the sewage and river water treatment plants, where the rate of phosphate ion in Al-Warar station was (2.1, 1.515, 0.775) micrograms / liter, and the rate of this ion in Albu Farraj plant was (6.63, 0.68). , 0.195) micrograms/liter. In the Sofia station, the phosphate ion rate was (1.65, 0.56, 0.8) micrograms/liter, and the phosphate ion rate was (2.735, 0.77, 0.785) per microgram/liter in the Al-Akrad station, and the phosphate rate at Al-Malaab station was 3.17, 2.3, 0.38) µg/L, and the phosphate ion was reached in the Sadiqiyah station at a rate of (4.55, 0.415, 0.25) µg/L. Figure (8) shows that

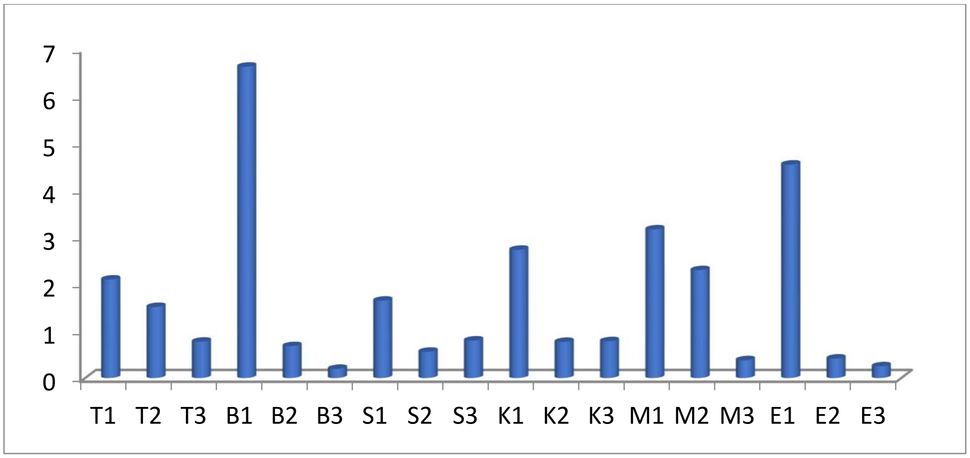

Figure (8) shows the rate of phosphate in the incoming and treated water and river water during the winter and summer seasons.

From the results obtained, it was found that the phosphate rate for the incoming water and treated water was within the permissible limit, but there was a rise in phosphate in the sites (M1, E1, K1, B1, M2) as it exceeded the Iraqi specifications due to the increase in industrial and agricultural activity, as it is used Fertilizers for agricultural lands, as this water enters the sewers as a result of composting operations, in addition to the water that comes from sewage networks as a result of industrial activities [20]. And that the phosphate rate of the river water was within the Iraqi standard specifications and the limits of the World Health Organization.

Total hardness: The results showed that the total hardness rate of the incoming water as well as the water leaving the sanitary treatment plants and the water of the Euphrates River, as the total hardness rate of the Al-Warar station (1713, 865, 568.5) mg / liter, As for the Albufaraj station, the total hardness rate was (1932, 861.5, 795) mg / liter. While the hardness rate for Sofia station was (2517, 1097, 470) milligrams / liter, while the hardness rate for the Al-Akrad station was (1114, 952, 478.5) milligrams / liter. And its average in the stadium station (1122.5, 898, 520) mg / liter, The hardness rate of the Al-Siddiqiyah station was (2081.5, 929, 474.5) in milligrams / liter. As shown in figure (9).

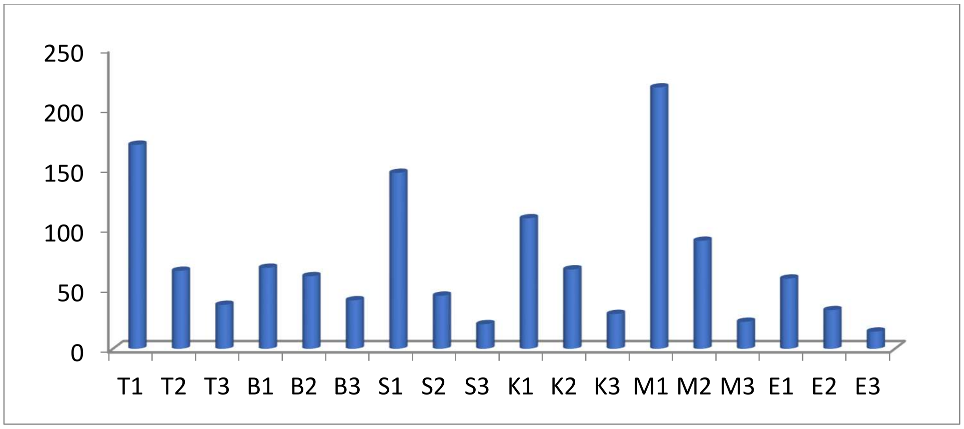

Figure (9) shows the total hardness rate in the incoming and treated water and river water during the winter and summer seasons.

The high values of the total hardness of the incoming water and the treated water that exceeded the permissible limits resulted from sewage water as a result of high concentrations of dissolved ions and salts, and these dissolved ions of magnesium and calcium ions, in addition to the activity of microorganisms with the high temperature that causes the decomposition of organic materials as The decomposition of organic matter produces ions and elements that are precipitated and dissolved or suspended [12]. As for the river water, the total hardness rate was within the limits allowed by the Iraqi specifications except for the sites (M3, T3, B3) that exceeded the permissible limit due to the discharge of heavy water into the river water without treatment or inefficient treatment, as sulfate, calcium and magnesium ions increase [21].

total base: The results showed that the total basicity rate of the incoming and treated water in sewage stations and Euphrates River water. As the total basicity rate of Al-Warar station was (195, 167, 137) mg / liter, respectively. For the Albu Farraj plant, the basal rate is (246.7, 205.5, 136.5) mg / liter, And for the Sufi station, the basal rate was (203, 190.5, 151) mg / liter. And the basal rate for Hay Al-Akrad station was (209, 173, 123.5) mg / liter. And the total basal rate of the stadium station (220.5, 214.4, 144.5) in units of mg / liter. In the Al-Siddiqiyah station, the basal rate was (203.4, 190.3, 149.5) mg / liter. Figure (10) illustrates this.

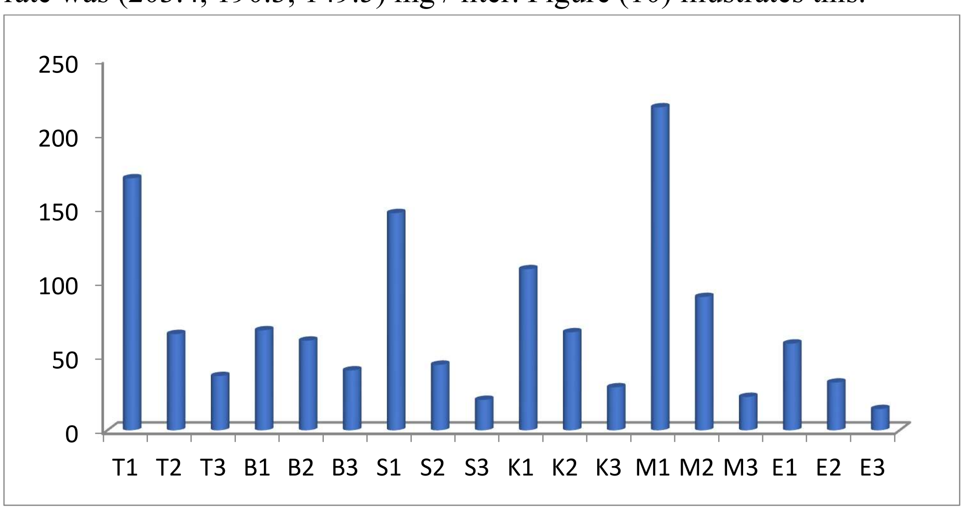

Figure (10) shows the total alkalinity rate in the incoming and treated water and river water during the winter and summer seasons.

The results of the basicity showed that the basicity rate of the water entering or entering the stations was high, except for the sites (T1), which was within the permissible limit. As for the treated or incoming water, its rate was within the permissible limits, except for the two sites (B2 and M2), which was high and exceeded the permissible limit. This gas leads to the formation of bicarbonates that cause alkalinity [12]. The ratio of the baseline reduction for the Ramadi plant is 36.2%. And the high concentrations of magnesium, salts and calcium cause an increase in the basal, in addition to the productive state of phytoplankton [22]. As for the basal rates of river water, they were within the limits allowed by the Iraqi standards and the limits of the World Health Organization.

Biological examinations:

biological need for oxygen: The results showed that the average vital need for oxygen for the incoming and treated water in the sewage and Euphrates water plants, as the Al-Warar plant had an average of BOD (70.5, 50.4, 14) mg / liter, and the BOD of the Albu Farraj plant was adjusted (128, 37.5, 7) mg / Liter, The BOD of the Sofia plant is modified (184.5, 121.8, 16) mg / liter. And the BOD rate for the Al-Akrad station was (62.5, 16, 14,5) mg / liter, and the BOD rate for the stadium station was (108, 24.5, 9) mg / liter. For Al-Siddiqiyah station, the average vital requirement is (180, 41.4, 18.5) mg / liter.

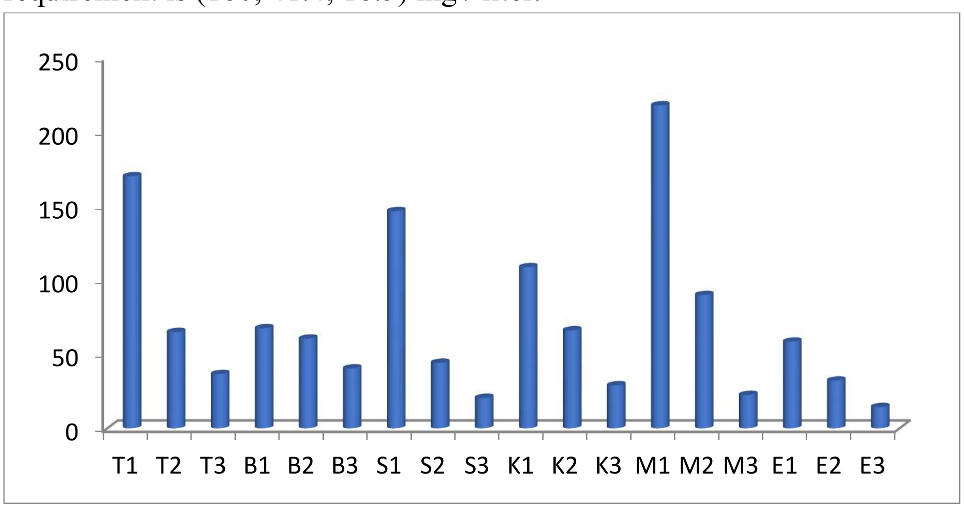

Figure (11) shows the rate of biological oxygen demand for incoming and treated water and river water during winter and summer.

It showed that the BOD results of the incoming water exceeded the Iraqi specifications and the reason for this is due to the increase in the daily discharge of sewage water and thus an increase in the organic waste, as the oxygen and bacterial activity is increased as it constitutes a burden on the biological treatment units. As for the treated water, it was the Al-Malaba, Al-Bofraj and Wahi Al-Kurd stations, which were denoted by the symbols (M2, B2, K2) within the Iraqi specifications. As for the rest of the stations, there is a noticeable increase in their values, as they exceed the permissible limit, which indicates the efficiency of the station in treatment and the low percentage of dissolved oxygen in Aeration tanks necessary for the digestion and removal of organic materials

[20]. As for the river water, all the values exceeded the permissible limit. The reason for this is due to the effect of the sewage water that is dumped into the Euphrates River, as it is loaded with organic materials and the effect of the waste of the industrial district.

Oils and greases: The results showed that the average of oils and greases for the (incoming and treated) water in the sewage and Euphrates water stations, as the Al-Warar station had an average of (170, 64.95, 36.6) mg/liter, and the oils and greases of the Albu Farraj station were (67.5, 60.5, 40.4)) milligrams / liter. And the oils and greases of the Sofia station averaged (146.6, 44.25, 20.5) mg/liter. And the average of oils and greases for the Al-Akrad station was (108.75, 66.13, 29) mg / liter, and the average of oils and greases for the stadium station was (217.8, 90, 22.5) mg / liter. For the Al-Siddiqiyah station, the average of oils and greases was (58.5, 32.2, 14.3) mg / liter.

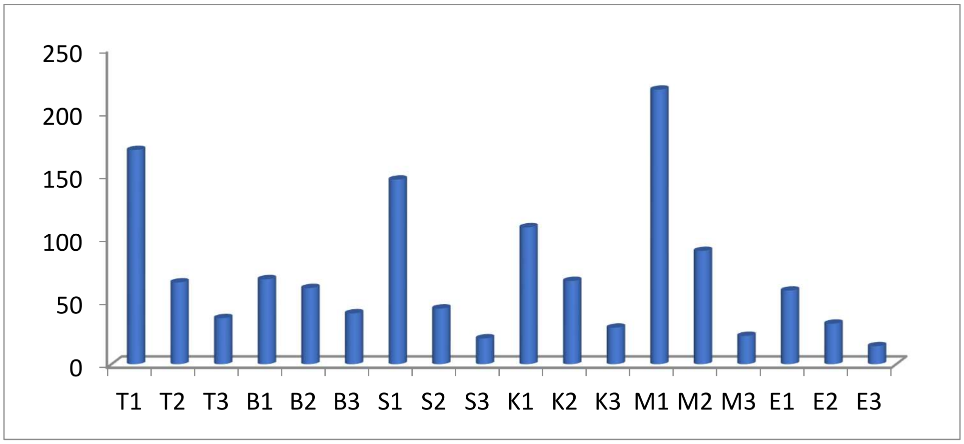

Figure (11) shows the average of oils and greases for incoming and treated water and river water during the winter and summer seasons.

The results showed a significant increase in the values of oils and greases in the incoming water, as they exceeded the audible limit, and the reason for this rise is due to the effect of industrial waste and the impact of household waste that flows into the sewage networks and thus returns to the stations. As for the treated water, we notice an increase in the values of oils and greases, and the reason for this rise is that the station is inefficient in reducing the percentage of oils and greases. As for the river water, all values in the study areas exceeded the permissible limit, and the reason for this is due to the domestic and industrial wastes of the neighborhood that are dumped into the Euphrates River through sewage plants without efficient treatment.

Table (1) shows the physical properties of incoming and treated water from sewage water stations and nearby river water

Pro…	Sym	winter	summer	aver	Pro..	Sym	winter	summer	aver
T(C°)	T1	18	38	28	E.C us/ cm	T1	9937	11219	10578
	T2	16	34	25		T2	4729	5339	5034
	T3	13	28	20.5		T3	1139	1286	1212.5
	B1	18	38	28		B1	7817	8040	7928.5
	B2	15	32	23.5		B2	3611	7430	5520.5
	B3	13	28	20.5		B3	1122	1154	1138
	S1	19	42	30.5		S1	17400	17970	17685
	S2	16	35	25.5		S2	6458	6670	6564
	S3	13	29	21		S3	1130	1167	1148.5
	K1	17	41	29		K1	12112	12500	12306
	K2	15	36	25.5		K2	7848	8100	7974
	K3	12	29	20.5		K3	1156	1193	1174.5
	M1	19	40	29.5		M1	7965	8200	8082.5
	M2	16	34	25		M2	3691	3800	3745.5
	M3	14	30	22		M3	1257	1294	1275.5
	E1	18	37	27.5		E1	6392	6670	6531
	E2	16	33	24.5		E2	5443	5680	5561
	E3	14	29	21.5		E3	1150	1200	1175
Turbidity NTU	T1	31.2	39	35.1	T.S.S mg/l	T1	130.8	116.2	123.5
	T2	13.5	16.9	15.2		T2	24	21.3	22.65
	T3	1.6	2	1.8		T3	18	16	17
	B1	21.7	32	26.8		B1	136.8	130.9	133.85
	B2	14.9	21.9	18.4		B2	26	24.8	25.4
	B3	1.7	2.5	2.1		B3	18.8	18	18.4
	S1	31	42	36.5		S1	113.5	99.6	106.55
	S2	17	23	20		S2	23	20.2	21.6
	S3	2	2.7	2.35		S3	14.8	13	13.9
	K1	26.47	45	35.73		K1	80	78.7	79.35
	K2	9.64	16.4	13.02		K2	76.61	75.3	75.95
	K3	2	3.4	2.7		K3	22.36	22	22.18
	M1	33.5	38	35.75		M1	135.6	133	134.3
	M2	17.3	19.7	18.5		M2	31	30.3	30.7
	M3	3	3.4	3.2		M3	26.50	26	26.25

	E1	28.5	38	33.25		E1	137	84.3	110.65
	E2	14.7	19.6	17.15		E2	42.6	26.2	34.4
	E3	1.5	2	1.75		E3	26	16	21

Table (2) shows the chemical properties of incoming and treated water from sewage and river water stations close to these stations.

Pro…	**Sym**	**winter**	**summer**	**aver**	**Pro..**	**Sym**	**winter**	**summer**	**aver**
pH	T1	7.6	7.6	7.6	Cl^- mg/l	T1	208	198	203
	T2	9.2	9.3	9.25		T2	178	170	174
	T3	7.8	7.9	7.85		T3	157	150	153.5
	B1	8.9	8.5	8.7		B1	180	174	177
	B2	7.4	7.1	7.25		B2	176	170.6	173.3
	B3	8.2	7.9	8.05		B3	165	160	162.5
	S1	7.6	7.3	7.45		S1	260	215	237.5
	S2	8.9	8.5	8.7		S2	200	165.5	182.75
	S3	7.9	7.6	7.75		S3	186	154	170
	K1	7.2	7.2	7.2		K1	260	219	239.5
	K2	8.2	8.3	8.25		K2	196	165	180.5
	K3	7.4	7.5	7.45		K3	186	157	171.5
	M1	7.9	8.1	8		M1	290	281.8	285.9
	M2	8.2	8.4	8.3		M2	230	223	226.5
	M3	7.8	8	7.9		M3	178	173	175.5
	E1	7.6	7.8	7.7		E1	208	185	196.5
	E2	8.6	8.9	8.75		E2	186	165	175.5
	E3	7.9	8.2	8.05		E3	176	157	166.5
PO^{-3}_4 mg/l	T1	2.52	1.68	2.1	Sulfate mg/l	T1	1413	1504	1458.5
	T2	1.82	1.21	1.515		T2	1411	1501	1456
	T3	0.93	0.62	0.775		T3	388	413	400.5
	B1	6.8	6.46	6.63		B1	708	724	716
	B2	0.7	0.66	0.68		B2	683	698	690.5
	B3	0.2	0.19	0.195		B3	378	386	382
	S1	1.9	1.4	1.65		S1	1633	1842	1737.5
	S2	0.64	0.49	0.56		S2	553	624	588.5
	S3	0.9	0.7	0.8		S3	383	432	407.5
	K1	2.93	2.54	2.735		K1	1144	1676	1410

	K2	0.85	0.7	0.77		K2	1031	1572	1301.5
	K3	0.84	0.73	0.785		K3	377	552	464.5
	M1	3.84	2.5	3.17		M1	1489	1716	1602.5
	M2	2.8	1.8	2.3		M2	1093	1260	1176.5
	M3	0.46	0.3	0.38		M3	427	492	459.5
	E1	5.5	3.6	4.55		E1	1447	1670	1558.5
	E2	0.53	0.3	0.415		E2	1328	1532	1430
	E3	0.3	0.2	0.25		E3	378	436	357

Table (3) shows the chemical and biological properties of incoming and treated water from sewage and river water stations close to these stations.

Pro…	Sym	winter	summer	aver	Pro..	Sym	winter	summer	aver
T.H mg/l	T1	2010	1416	1713	BOD mg/l	T1	76	65	70.5
	T2	1015	715	865		T2	54	46.8	50.4
	T3	667	470	568.5		T3	15	13	14
	B1	2130	1734	1932		B1	110	146	128
	B2	950	773	861.5		B2	32	43	37.5
	B3	565	460	795		B3	6	8	7
	S1	2560	2474	2517		S1	265	104	184.5
	S2	1116	1078	1097		S2	175	68.5	121.8
	S3	478	462	470		S3	23	9	16
	K1	1134	1094	1114		K1	77	48	62.5
	K2	969	935	952		K2	23	9	16
	K3	487	470	478.5		K3	15	14	14.5
	M1	1140	1105	1122.5		M1	156	60	108
	M2	912	884	898		M2	25	24	24.5
	M3	528	512	520		M3	13	5	9
	E1	2132	2031	2081.5		E1	253	107	180
	E2	952	906	929		E2	29.8	23	41.4
	E3	486	463	474.5		E3	26	11	18.5
	T1	153	237	195		T1	154	186	170
	T2	147	187	167		T2	58.9	71	64.95
	T3	121	153	137		T3	33.2	40	36.6
	B1	207.5	322	246.7		B1	68	67	67.5
	B2	161	250	205.5		B2	61	60	60.5

A.L.K mg/l	B3	107	166	136.5	Oil and greases mg/l	B3	40.8	40	40.4
	S1	150	256	203		S1	114.4	178.8	146.6
	S2	141	240	190.5		S2	34.5	54	44.25
	S3	112	190	151		S3	16	25	20.5
	K1	203	215	209		K1	97.5	120	108.75
	K2	168	178	173		K2	59	73.26	66.13
	K3	120	127	123.5		K3	26	32	29
	M1	201	240	220.5		M1	193.6	242	217.8
	M2	195.8	233	214.4		M2	80	100	90
	M3	132	157	144.5		M3	20	25	22.5
	E1	157.8	249	203.4		E1	49	68	58.5
	E2	147.6	233	190.3		E2	27	37.6	32.3
	E3	116	183	149.5		E3	12	16.6	143

Table (4) lists the standard specifications for incoming, treated and river water.

property	in	out	river water
T(C°)	45	35	35
E.C us/cm	……..	1000	……..
Turbidity NTU	……..	8	5
T.S.S mg/l	750	60	…….
pH	…….	6 – 9.5	6 – 9.5
PO_4^{-3} mg/l	…….	3	3
Cl^- mg/l	…….	600	200
Sulfate mg/l	……	400	200
T.H mg/l	……	500	500
A.L.K mg/l	…….	200	170
BOD mg/l	1000	40	2

Oil and greases mg/l	**…….**	**10**	**0.01**

in = Standard specifications for water incoming to wastewater stations.
Out = Standard specifications for treated water from wastewater plants .
river water = Standard specifications for river water near wastewater stations.

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