Global Scientific Review
A Peer Reviewed, Open Access, International Journal
www.scienticreview.com
Volume 35 January 2025 ISSN (E): 2795-4951

Evaluation of the quality of water used in Maysan Oil Factory (Vegetable Oil Factories\Ali Al-Hadi Factories)

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Abstract
The now adays study was conducted to evaluate the quality of water used in the vegetable oil factory in Maysan (Vegetable Oil Factories/Ali Al-Hadi Factories) and its potential impacts on the physical and chemical properties of the Amara River. The study was conducted from April to July 2024. Three sites were choosed in addition to a reference sample of river water. The measured values of temperature, acidity, electrical conductivity, turbidity, total dissolved solids, total basicity, nitrate, phosphate, sulfate, and positive ions of calcium, magnesium, sodium, and potassium ranged from 324 (689-116 mg/L) NTU(65-20)(28-29) (7.9-8.9) (1243-1420) dsm(487) mg/L (14-78) mg/L (34-56) mg/L (456-654) mg/L (45-187) mg/L (54-35) mg/L (76-123) mg/L (45-78) mg/L, respectively. The results showed significant differences between the studied properties with a significant increase in some studied properties compared to the permissible limit for wastewater. At the end of the study, it was recommended that these waters be monitored continuously and that a rapid review and comprehensive assessment of these pollutants be conducted in these locations in the future.

Keywords: Pollution, Water, Ali Al Hadi Factories, Oils.

Introduction:

The quantity and quality of available water is a decisive factor in determining the locations of industrial units (i) , Industry needs water with very different specifications. Water used for cooling and transportation does not require specific specifications, while water used for steam generation and industries in which water is in contact with products during the manufacturing stages must be of a high degree of purity and must be available in locations containing natural water. It is necessary to conduct physical and chemical tests to determine the specifications of natural water and to indicate its suitability for industry, as well as to determine the treatments that must be carried out to obtain water according to the required specifications, as water with different specifications can be obtained by following different methods of treating natural water. Many pollutants of different types negatively affect the quality of the natural water into which they are discharged. The most prominent of these pollutants are inorganic salts that affect the properties of water and then affect the industrial products that water contains. Inorganic salts appear in most liquid waste resulting from industry or in river water naturally, and then add a hard effect to the water, in addition to increasing the salinity rate, and thus it becomes unacceptable for health, industrial and agricultural purposes. The effect of hardness is clear, as hard water is unsuitable for various industries in the oil factory(ii).

And some inorganic salts, such as nitrogen and phosphorus salts, help algae grow, which in turn constitute a form of pollution (iii).

Although their presence in reasonable proportions has the benefit of adding dissolved oxygen to life (9), it is only permissible to throw a specific proportion of these materials into river water so that they do not affect life in these waters. There are solid and liquid materials including oils, greases, various petroleum derivatives, wood materials and other materials that float on the surface. The presence of these materials prevents the entry of sunlight and its penetration through river waters, thus threatening the lives of some aquatic organisms (iv).

The study aims to evaluate the quality of water used in Maysan Oil Factory by studying some of the physical and chemical properties of the water reaching the oil factory in Maysan Governorate. The vegetable oil factories / Ali Al-Hadi factories / in Maysan have begun to establish an industrial water treatment unit. "The Engineering Design Company of the Ministry of Industry and Minerals began establishing the industrial processing unit in vegetable oil factories in 2014. The project includes the construction of concrete basins for the chemical unit works, including ventilation basins and sedimentation units."(v) , The project also includes the preparation of special centrifugal pumps and the installation of control panels and their accessories. "The aim of the project is to prevent the discharge of water directly into the river basin before chemical and biological treatments are carried out, and to exploit chemically and biologically treated water in production departments and steam boilers by applying the system of recycling treated water and benefiting from it according to the instructions of the Ministry of Environment." 26/5/140915([vi]) .

1- Study site

The oil factory in Maysan The factory consists of the following units and sections

First: Solid fat production section, which includes

1- Raw solid fat refining unit

A- The Belgian unit (De Smith) with a production capacity of 50 tons/day

B- The Italian unit (Bernadetti) with a production capacity of 60 tons/day

2- Fat filling section:

There are currently two fat filling lines with a design capacity of 100 tons per day and the current capacity is 35 tons/day

A- A (10) kg package filling line, old Japanese type of origin

B- A (15) kg package filling line, Spanish origin, installed in 2008 and has not entered service yet

3- Metal container manufacturing section (sheet manufacturing) which includes two lines:

A- A (10) kg package manufacturing line, Japanese origin, which is old and consumed and its operational life is only (10) years

B- A (15) kg Spanish package manufacturing line The facility was installed in 2008 and has not been put into service yet.

Second: Industrial Detergents Production Department:

1- Production Unit (Paste) Active Ingredient Mixing, Homogenization and Drying Unit

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www.scienticreview.com
Volume 35 January 2025
ISSN (E): 2795-4951

2- Packaging Unit with a package of (20) kg plastic bag and a design production capacity of 36 tons/day and a current production capacity of no more than (10) tons/day

Third: Soap Production Department, which includes:
1- Soaping Unit (Cooking) with a capacity of 25 tons/day
2- Drying, Mixing and Homogenization Unit 25 tons/day
3- Soap Cutting and Packaging Unit 25 tons/day

Fourth: Supporting Engineering Departments, which include two departments: Engineering Services and Maintenance Department.
Fifth: Laboratories and Quality Control Department.
Sixth: Warehouses, including raw materials and chemicals warehouses, fat raw materials warehouses, ready-made production warehouses, services, services division, and transportation division
Seventh: Administrative Department:
Eighth: Industrial Safety and Engineering Inspection Division.
And other departments, knowing that Maysan Governorate needs the quantities shown below monthly for the purpose of distributing them within the food ration, taking into consideration that the population of the governorate is about one million people. The need for fat is 1285 tons monthly([vii]) .
The need for detergent powder is 257 monthly.
The need for soap is 257 tons monthly.
In the event of rehabilitation, the factory will pay the following percentages of the governorate's need for the following materials:
Providing 85% of fat.
Providing 100% of detergents and soap, and the remainder is marketed to nearby governorates([viii]) .
Materials and methods of work

Three locations were identified inside and outside for the purpose of collecting samples and conducting physical and chemical tests on them. The locations were as follows:

1- The location of the raw water entering the factory
2- The location of the final collection basin water exiting (the river basin).
3- The location of a reference sample of Amara River water
The samples were collected in a single sample and 5-liter polyethylene bottles were used to collect and preserve the samples, taking into account the preservation conditions for each sample and for each analysis of the physical and chemical tests([ix]) .

2- Physical and chemical tests:
The following physical tests were conducted: temperature, electrical conductivity, and dissolved solids. The temperature was measured using a digital and field thermometer, and the electrical conductivity of the water was measured using an electrical conductivity measuring device. The dissolved solids of the water were measured using an electrical conductivity measuring device equipped by WTW Company. The results were expressed in mg/L. The pH of the water samples was measured using a glass

electrode prepared by HANNA Company. The Stannus Chloride method was used to measure phosphate. To measure nitrates, the absorbance of standard solutions was measured at a wavelength of 395 nm. The basicity was measured by neutralizing the samples with a standard acid and using a specific indicator. Sulfates were measured by the turbidity method in the presence of hydrochloric acid. Sodium and potassium were measured by the flame emission method using a PHOTOMETER device manufactured by the Japanese company Grong FLAME[x] .

Results and Discussion

Physical and chemical tests are important factors in determining the quality and suitability of water for various human uses in addition to industrial uses. Therefore, the study included some physical tests, including temperature, electrical conductivity, total solids, dissolved and suspended salts, to indicate the quality of water present in each of the sites specified in the study.
The change in temperature was different for all study sites (28-29) ° C due to the nature of industrial processes taking place in each site, such as heating, evaporation, etc. The electrical conductivity values, which are an indicator of the amount of salts present in the water, were also varied and shown in Table (1) due to their primary dependence on the nature of the incoming water and the industrial processes that take place in each site, which include the addition of different chemicals.
Solid salts are an indicator of the quantity and quality of salts, and it can be deduced from the electrical conductivity values that the values of total, dissolved and suspended solids varied (689-1160) for all sites. This is attributed to the nature of the water coming from the source and the efficiency of the stabilization and filtration basins and coagulants used for sedimentation, which mainly depend on the added chemicals.
Chemical tests are more important than physical tests to determine the quality and suitability of water for human and industrial uses, because the damage resulting from chemical pollutants is a source of disease if exploited by humans and a source of failure for most industrial processes.
The change in the pH values of the study sites (79-8.9) may be attributed to the nature of the water present in each site and the processes carried out on it, such as adding chemicals and others.
As for the phosphate ion values of the water found in all sites and during the study period, the results were within the permissible limit (34-56) mg/L Table (1), while the nitrate ion values varied (14-78) mg/L. The values of this test at site (1) depended on the nature of the water coming from the liquefaction, and the values of this test increased at site (2) as a result of the chemicals and dyes added to these units that contain nitrate ions in their composition.
The increase in the total alkalinity values (324-478 mg/L) may be attributed to the low solubility of carbon dioxide gas in boiler water due to its exit with water vapor, or the increase may be attributed to the added basic chemicals such as NaOH or NaCO3 and others, or to the presence of algae that lead to an increase in alkalinity due to the algae depleting carbon dioxide from the water during the day, while the values of calcium and magnesium varied (45-187) (35-54) mg/L respectively in Table (2) as they were attributed to magnesium and calcium carbonate salts called temporary hardness.
The total hardness values of unit 3 were within the permissible limit due to the use of alum, sedimentation process, biological treatment and filters for filtration purposes in the rest of the sites. Sites (1 and 2) were outside the permissible limit due to the nature of the water from the main source and the inefficiency of the drinking water treatment

Volume 35 January 2025
ISSN (E): 2795-4951

unit in its full operation. The variation in calcium hardness values is due to the amount and nature of the total hardness at the site. The change in the values of sulfate ion throughout the study period was that the values of this ion (456-654) mg/L were outside the permissible limit in all sites due to the nature of the water used from the source, which caused an increase in sodium and potassium sulfates (76-167) (45-78) mg/L respectively, which were within the permissible limit.

N	Properties	First location	Second location	Third location	Allowed limit
1	PH	7.9	8	8.9	9.5-6
2	Turbidity	345	456	234	100mg/L
3	Suspended Matter	234	237	67	60mg/L
4	Electrical Conductivity	1243	1342	1420	Desmans/cm
5	Temperature	29	28	28	Less than 35m
6	Hardness	467	467	134	400mg/L

Physical examinations

1	Potassium	45	78	51	100mg/L
2	Sodium	123	167	76	200mg/L
3	Calcium	123	187	45	150mg/L
3	Sulfate	564	546	456	200mg/L
4	Phosphate	34	45	56	200mg/L
5	Nitrate	34	78	43	3mg/L
6	Magnesium	45	45	35	100mg/L
7	Total Base	324	439	457	400mg/L

Chemical examinations

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Footnotes:

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i- See: Al-Ghanem, Rafid Hassan. (2009). "Environment and Pollution. Cairo University Press. Egypt, p. 184.

ii- See: Nabil Ahmed Hadi (2011). "Industrial Water". Dar Al-Ulum for Publishing, Jordan, p. 45.

iii- See: Al-Omar, Muthanna Abdul Razzaq (2000). "Environmental Pollution". Dar Wael for Publishing. Amman, p. 70.

iv- See: Al-Sahaf, Mahdi (1976). "Water Resources in Iraq and Their Protection from Pollution". Ministry of Information. Baghdad, p. 100.

v- See: Environmental Protection Center. (1993). "Atlas of Environmental Pollutants in the Country". Department of Health Prevention and Environmental Protection. Ministry of Health. Republic of Iraq, p. 81.

vi- See: Hamdan Ali Shabr (2011). "Industry and Its Effects". Iraqi Science Magazine. Babylon, p. 62.

vii- See: Musa Ali Hussein (2006). "Environmental Pollution". Dar Al-Fikr Al-Mu'aser, Beirut, p. 67.

viii- See: Al-Rubaie, Adnan Yassin Muhammad (2002). "Environmental Pollution". University House Press. Baghdad., p. 42.

ix- See :Mawloud, Bahram Khader. And Hussein Ali Al-Saadi, and Hussein Ahmed Al-Azami. (1990). "Environment and Pollution" (Practical). Dar Al-Hikma for Printing and Publishing. University of Baghdad, p. 66.

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