



TECHNO TREATMENT SYSTEM

Nada Wagdy – Manar Amer – Basmalla Ahmed



Key words: water treatment – decanoic acid – Arduino - car washing
Group No: 23226 –STEM Qena –Grade 11 –Semester 1 – 2022/2023

Abstract

"Only in the darkness can you see the stars." Said by martin Luther king Jr. Every problem has a solution regardless to its difficulty or complication. We are going to solve many problems which represent great danger in the society and economy . among these problems is lack of sources of water . this problem is due to overpopulation and climate change, our idea is to make treatment to industrial water " marble factory " due to their large ratio. this process will be in 3 different stages . Also, by making this process we will produce fresh water can be used in car-washing .The treatment process are as follow : the first step is chemical as we added decanoic acid to ethanol which dissolve in it then added this solution to the water and by heating and control the sunlight by using Arduino system , a large aggregate of salts was created and by filtration it , the TDS reduced till it became 52 ppm, and the water became acidic . the second step is physical as we added activated carbon to the water which removes the color and smell then, filter the solution from impurities. The last step is chemical as we added sodium bicarbonate (NaHCO₃) to raise the PH till it became 7.23 and thus ,make the water fresh and Using it in several things.

In conclusion, after all this process I can say we achieved our target by using a wasted water to produce a treated water as we can use it.

Introduction

Water is an essential supply for our environment. Currently, lack of water is considered a global crisis that led to focus on filtration to provide more water resources for our world. To contribute for this crisis, Reverse Osmosis and Hydrogel Polymers were previously used as a solution. Reverse Osmosis is an excellent water contaminant filter, safe and ecofriendly. However, this process wastes tons of water and causes noticeable pressure to drop. Additionally, Hydrogel polymers, which is environmentally sensitive that have the ability to sense the pH, temperature, and metabolite but it is expensive and difficult to handle. This year's challenge solved many of Egypt's other problems, such as sewage and polluted water and manage and increase sources of clean water and recycling and Public health issues and Alternative energies. And our challenge is water pollution in factories and sewage, wasting water in an exaggerated manner and throwing it into the Nile River, which leads to pollution of the river water and pollution of drinking water, and all this causes a lot of diseases by drinking this water or using it for human uses such as agriculture and bathing. And the Other Solutions Already Tried, reducing water pollution is the need of the hour and industries can use various methods for achieving these goals. Pilot water treatment plants can help industries find an effective solution for their water treatment needs. It can help address a wide range of issues like removing harmful contaminants, water recycling, reducing water wastage and much more. There are various methods that industries can use to reduce water pollution and one of them is Water treatment which is a process that can eliminate the most dangerous elements from the water. After treatment, the wastewater can either be eliminated by realizing it or reusing it. Either way, water treatment is one of the best methods of reducing water pollution. There are various types of methods used for water treatment. In this challenge we should achieve the design Requirements which are specific amount of dissolved chemical compounds in wastewater after treatment compared to before treatment, optimizing materials and chemical compounds used for the wastewater.

In our project, there were strengths and weaknesses, the strengths were ecofriendly, cheap, and can be widely applied. The weakness was the.

Materials

Materials	Image	Amount	Usage
Decanoic Acid (C ₁₀ H ₂₀ O ₂)		5 gm	Reduce the TDS and EC
Ethanol		30 Cm	To dissolve decanoic acid in it
Marble Water		1 Litre	Using it in car washing
Arduino		1	To control the heat of sunlight
beaker		1	To add the solution to the water
Wood		1 Peace	To stand all materials
Tap		2	To control on passing the water
pump		1	Passing the water from container to another
Sodium bicarbonate(NaHCO ₃)		40 gm	To raise the PH
Activated Carbon		40 gm	To remove the color and smell

Methods

First, we prepared the beaker. second, we put 30 ml of ethanol then, we added 5 grams of decanoic acid then, we start to dissolve it then , added this solution to 150 ml of marble water and start heat it . finally, the decanoic acid created aggregate causing reduce to the total dissolved solute (TDS). second, we added activated carbon to it , after 20 minutes , we started filtration the solution by filter paper which make the water clean as it makes water without color and smell . third and finally, we added sodium bicarbonate to the water as it is basic to increase the PH of water.



Fig 5



Fig 6

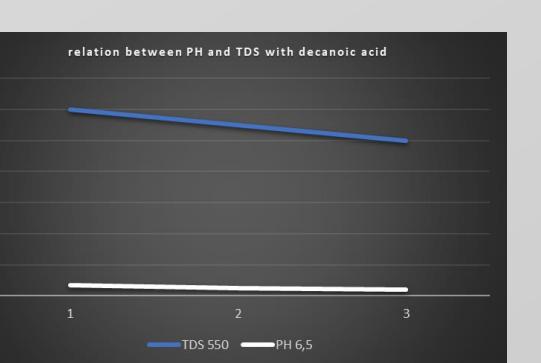
4- we used pump then we connected a hose to the container to transfer water to the beaker of the second stage which contains activated carbon to remove the color and smell of the water.

. 5- we connected a hose " on the inside of the hose is a filter paper to remove undissolved solutes " to transfer water to the last stage of another container which contains sodium bicarbonate to increase the PH of water because it is basic.

Results

Devices	Before	After
TDS	550 Ppm	55 Ppm
PH	6.5	7.23
Conductivity	1100 ds/m	110

Table 1



The positive results	The negative results
The water became treated water can be used	There is a smell of treated water, which is not strong and bad, not like fresh water.
Reducing the TDS to be 55 Ppm	
Making the PH equals 7.23	
Reducing the conductivity 110 ds/m	
Removing the color and has low cost	

Table 2



Fig 9

For further information

nada.2321544@stemqena.moe.edu.eg
Basmalla.2321509@stemqena.moe.edu.eg
Manar.2321540@stemqena.moe.edu.eg

Acknowledgment

first and most importantly, we want to thank Allah for the Guide, the most Gracious and Most Merciful for guiding and supporting us. Then, we want to thank all STEM staff who was very helpful to us. Ultimately, we would like to express our deepest gratitude to Mrs. Hala elzokeam, Mr. Amr elbayomy, for their continuous and excellent support, their patience, their guidance and for the inspiring and motivating discussions we have had. Also, we want to thank Dr. Ahmed Wahba "professor in the faculty of science

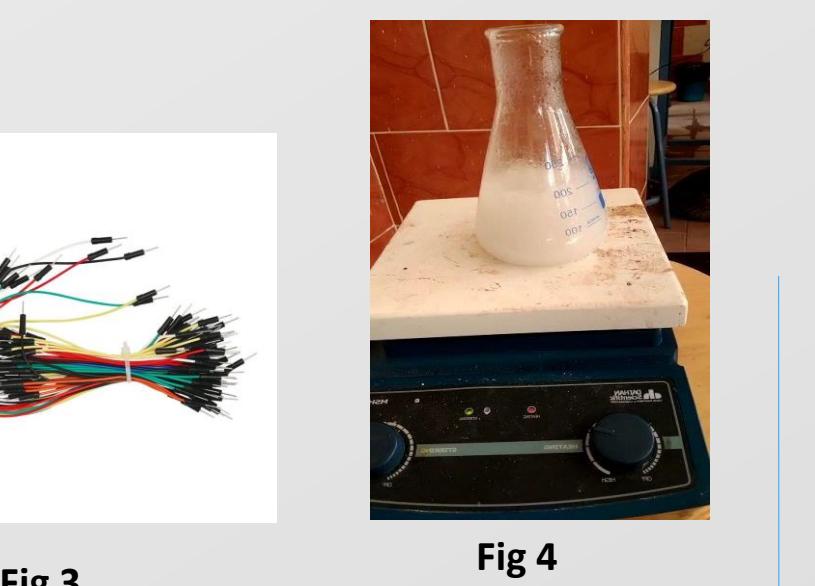


Fig 3



Fig 4

We built the project according to several steps:

The first step we bought a wood shelf and to put our materials on it, 1-We put two containers in the begging and at the end of the prototype to carry the marble water and the product water after treatment.

2- we put another container in the middle which contains decanoic acid dissolved in Ethanol that will remove salts from water and thus reduce the TDS of water also the PH decreased.

3- We put a small concave mirror opposite to the beaker of decanoic acid as the acid works by heating then we used Arduino system to control the sun light as we need less than 80 c



Fig 7

Fig 8

Analysis

It is agreed that managing and increasing the sources of clean water is a great challenge facing Egypt, so we decided to increase clean water resources by filtration of industrial water, granted from the preceding results, our results are positive, met the design requirements and the prototype succeeded:

1-Parameter of car washing water which is TDS,

2- pH and all of these minerals obtained in the required proportions. We made a prototype that reduced the TDS of marble water from 550 ppm to 55 ppm to meet our design requirements and the parameters of car washing. as shown in graph 1.

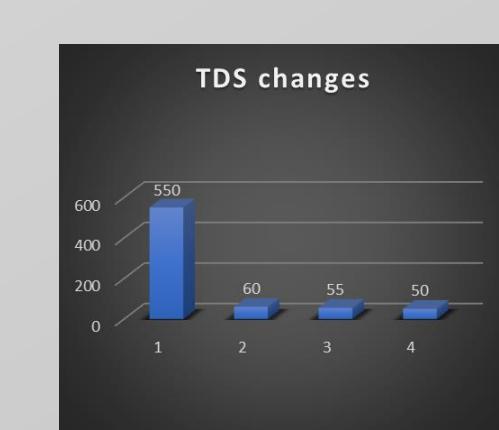
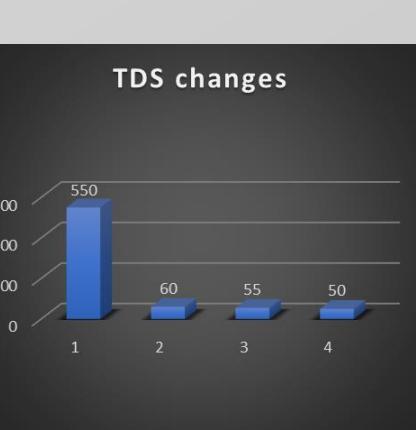


Fig 10



Graph 2

The structure of the prototype:
Three stages of treatment were used, each stage responsible for removing some particles and toxins:
The first stage: filtration by decanoic acid (C₁₀H₂₀O₂), we used heating and cooling of the solution to precipitate salts and get the purified water, we put a small concave mirror opposite to the beaker of decanoic acid to collect the rays of sun which work as solar cell as the acid works by heating then we used Arduino system to control the sun light as we need less than 80 c and more than 40 c, then we added ethanol(C₂H₆O) to decanoic acid to make it in a liquid state, then it is heated and maintained at 40–80 °C and the saline solution is added while stirring. Upon mixing, the beaker turns cloudy indicating emulsion formation. The cloudiness reduces, indicating the dissolution of some water. After stirring is stopped, the remaining brine settles gravitationally, leaving clear decanoic acid and ethanol with dissolved water above.

The cloudiness reappears as pure water precipitates due to cooling. Pure water separates gravitationally leaving clear decanoic acid above and forming a clear water layer at the bottom. Then we used a filter paper to separate salts, leaving a solution of pure water and ethanol. We raised the temperature of this solution until it reached 70 Celsius degree, to make ethanol evaporates from the solution, leaving pure water. The second stage: absorption of smell and color to get pure water. The third stage: water titration which we added sodium bicarbonate (NaHCO₃) to the water as it is basic to increase the PH of water and this time TDS changed. we used scientific laws, theories, and our learning transfers to support our solution and prototype. Like

1-PPM: Mass of solute/mass of solution 10⁻⁶ As ppm (part per million) is the measuring unit of TDS we used this law to calculate the TDS of water before and after treatment, but as we chose marble water and its TDS is in the range of 550 ppm so we needed to convert ppm into ppt (part per thousand) by dividing the values in ppm by 1000.

2-Molarity: Moles of solute/volume of solution in a liter As molarity law is a method to calculate the concentration of the solution, we used it to calculate the molarity of the solution of decanoic acid and water, Moles of solute = (5/172) The volume of solution = 1 liter then the Molarity = 0.96511 mol/l

We used PH law to calculate if the PH of water after treatment is appropriate for growing plants that are less sensitive to salinity or not as if the water is acidic or basic

Conclusion

Physics	LO.1	As we study gravity and effects of gravity far from the Earth's surface, which helped us a lot in our system as which separation of layers depend on the pull of gravity.
Math	LO.1	As we study how to Create, interpret, and analyze polynomial which helped us a lot to draw graph and analyze our results.
English	Cycle.1	We always learn about presentation skills in English and practice a lot in English sessions. This helps us in capstone exhibition to get high evaluation.
Geology	LO.4	As we study waste water treatment and its series of steps, so that helped us a lot to choose the best solution to remove TDS and PH.
Chemistry	LO.3	We learned about PH and this is used as we put the change in PH as a design requirement and measured it before and after testing.

Table 3

