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1 INTRODUCTION

As the world's population is increasing daily, the scarcity of water will be felt more and more. Having healthy water for human needs is known as a factor in civilization, so that it has always been respected by societies. Water scarcity has endangered the lives of billions of inhabitants of the earth, especially in poor countries. Over more than 1.1 billion of the world's population do not have access to safe water. Water scarcity is a big progressing matter which cause not only by destructive climate changes and increasing water and agriculture damage as well as human activities that consume water trough evaporation or incorporation (Fasel, Bréthaut et al. 2016).

The water scarcity is not because of less water, though the earth's most parts rounded by the water, it is because of not being enough clean and sweet water in the world. Most of the water in the world contains lots of minerals and salts that make it inappropriate for drinking, cooking, and washing and so on. Researches show that about 97.5%of water in the world contains salts which make it useless. So, in order to save the world's population, it is necessary to find some solutions to overcome the water sacristy(Dervin, Dionysiou et al. 2016).For instance, it is necessary to find a methods treating salty water and provide safe water which is still a major global issue .

After doing a lot of investigation and researches, scientist had founded out that if they can remove the salts which are in the water, they can create a great opportunity for producing fresh, sweet water for the world. They added that some process such as desalination can significantly influence and affect the future of fresh water supplying in the world. Many years ago this process had been found by the previous researches and it has been used for more than 50 years (Eykens, De Sitter et al. 2017).In addition, some of these processes, such as reverse osmosis desalination(RO) and Graphene Oxide membrane distillation. These methods are not costly and seem to be straight forward. To use this process and its technologies, about 3kwh of energy is needed to force pre-filtered sea water trough permeable membranes to be able to produce a 1 m3 of drink water(Dervin, Dionysiou et al. 2016).

Fortunately, amount of all those method there are two methods that require less energy and lowest cost. These methods are Reverse Osmosis & membrane distillation. Membrane desalination process is not only for pure water, it is widely used for large applications such as purifying sea water, storms and water discharges. Comparing both methods, they consume a bit amount of energy but only differences is between this two that each of them require certain processes and reverse Osmosis require less energy and has four process such as pre-treatment, pressurization, separation & stabilization(Macedonio and Drioli 2017).

1.1 Desalination

Desalination is a water treatment process that removes mineral and salt components from water. In this method which the water is heated first and then the vapour molecules go through the Micro porous hydrophilic membrane. During the heating process there will be create some temperature gradient which will cause vapour pressure differences. The liquid that is created after the vapour being cold, does not wet the membrane fabric because of water's dipole properties and nonpolar of membrane's hydrophilic synthetic materials (Priyamjeet Deka. 2016). Membrane distillation was introduced and standardised first time in 1986 during a MD workshop. Since then, a lot of studies and laboratory investigation have been done to develop this process (Sanmartino, Khayet et al. 2016).

Membrane desalination method has its advantages and disadvantages as well that we cannot ignore them at all. The advantages of membrane distillation are, it needs lower operating pressure and temperature, and it also requires small spaces and will decrease the cost of making membrane distillation method.

2.10.1Assembly

Once all the components of the gravure printing machine have been successfully designed and manufactured. We are required to assemble the components. Firstly, I mounted two rollers parallel in vertical direction and adjusted the gap between the rollers by placing a single row deep groove ball bearings, 50mm bore and connected to the gear drives. The gap between two rollers is almost adjusted to zero which is hard for the nylon subtracts to get through.

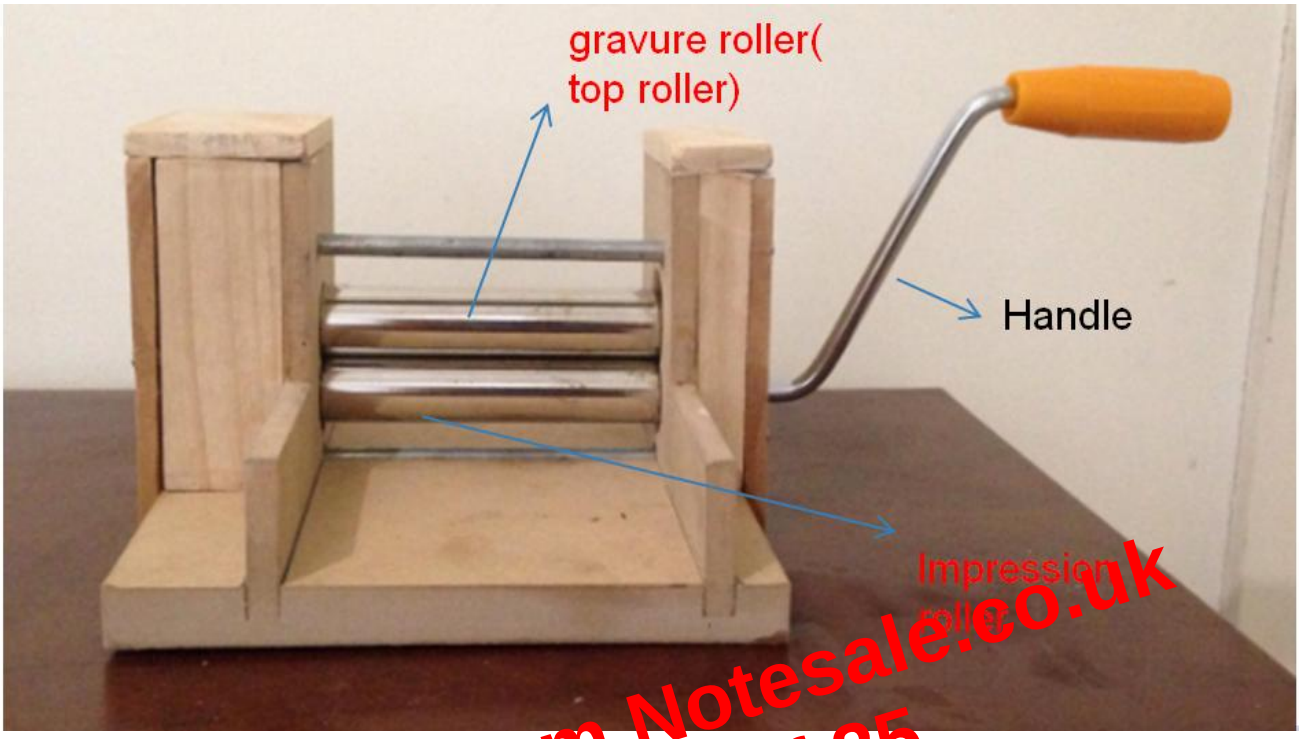

Figure 11: Schematic Diagram of Gravure Printing Machine.

However, in printing process if the substrate is thicker than the gab size between the two rollers, gravure roller can be pushed upward automatically which is acting as a spring force in order to print the membrane on top of nylon substrate.

3 PREPARATION OF GRAPHENE OXIDE SOLUTION –WATER REDUCTION PROCESS

Graphene Oxide is a combination of Carbone, hydrogen and oxygen made of single-atomic layers materials that are laced to each other. Since this substance can disperse in the water so easily (Akbari, 2016).At the start, the amount of 8.8 mg/ml of Graphene Oxide solution can disperse in only 14-17 ml of water. Then, we can add some Hydrogel beads, which are super absorbent polymers that they are hydrophilic in the nature and can absorb water quickly to reduce the fluidity of GO solution. They can absorb large amount of water in their three dimensional network because they have strong hydrophilic structures and higher water absorption capacity (Dervin, 2016).

higher salt rejection compared to vacuum filtration is that the concentration of GO solution used in shear alignment method is higher than vacuum filtration process. More concentration leads to higher thickness of the GO film. Therefore, when there is a higher salt rejection of the brackish water for thicker film. The thickness however does not compromise permeability, in fact during shear alignment we expect also the interlayer's between the GO flakes was reduced, which improves salt rejection.

Table 2

	Permeability (L/m2hr)			
GO membranes	**1st**	**2nd**	**3rd**	**Average**
Shear Alignment Method(800µL)(15mg/mL) L	47	33	18	32.7
Vacuum Filtration (300 µL) (13mg/mL) S	31	25	22	26.0
Vacuum Filtration(800 µL) (13mg/mL) S	19	16	15	16.7
Nano filtration(500 µL) (13mg/mL) S				11.0

Graph 2

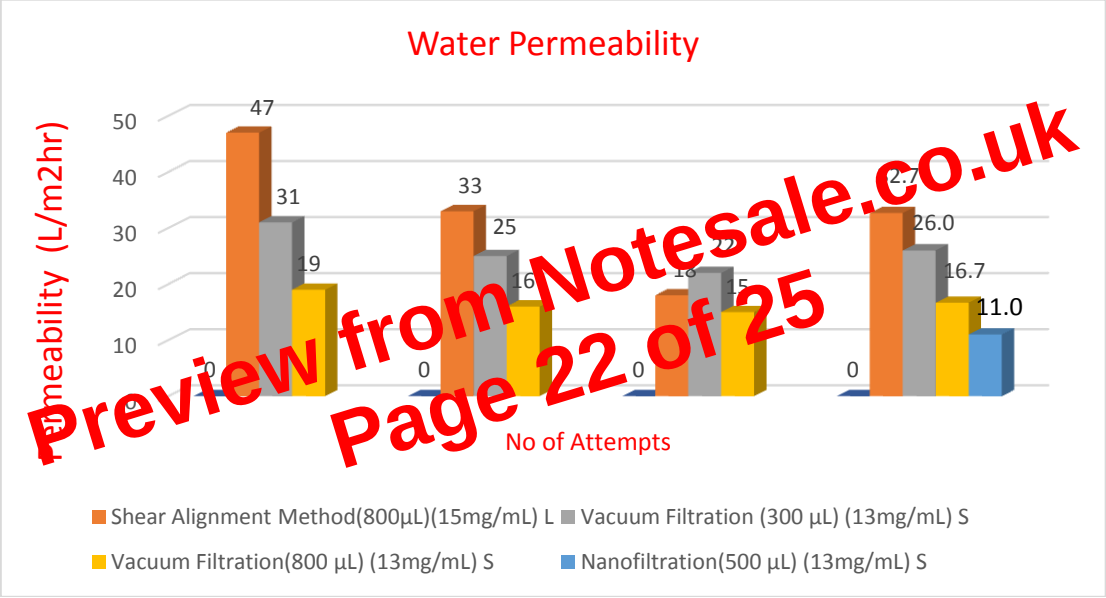

Figure 24: The orange colour represents the permeability of shear alignment method, light gray and yellow represent permeability of vacuum filtration and blue colour bar represent permeability of nano filtration method.

From the bar graph, it was found out that the permeability of shear-alignment membrane is much higher than that of vacuum filtration process. So as the time interval is increased for each 20 mins, the permeability rate is decreasing as such which confirms the degradation of the membrane for every 20 mins. Typically, the thickness of Graphene-based membranes produced by vacuum filtration is very small compare to the shear alignment method. Therefore the correlation between thickness and water permeation is usually insignificant. However, water permeation is expected to be inversely proportional to membrane thickness. When membrane thickness is increased, water permeation is expected to decrease because the water will have to travel over a longer distance, and vice versa. It interesting that the retention is enhanced and the water permeability is improved as result of arranging order in the SAM system. The SAM system had a better water permeability of 47 $m^{-2}Hr^{1}bar^{1}$ which is almost better than vacuum filtration (Akbari, Sheath et al. 2016). We also could get a better water permeability and salt rejection if we used small crystal Graphene oxide in shear alignment method (SAM) to produce membrane for RO system.