Purification Of Water From Nsukka Water Pond Using Solar Still.

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Abstract: This work presents the analysis of a solar water distillation system. There is important need for good drinking water in the world today due to harmful effect of water borne diseases. Most water from rivers, ponds; seas are either salty or brackish and require purification before drinking. The water used in this work is collected from pond at Nsukka Urban and the experiment was performed at University of Nigeria, Nsukka. Twenty litres of water was used for the experiment and 4 litres was obtained as the maximum volume after 10 days .The average temperature recorded during the experiment was 29°C. The chemical and physical properties of the distillate correspond to world Health Organization Standard.

Keywords: Distillation, Purification, Temperature, Diseases, Drinking water.

1. INTRODUCTION

The need for good drinking water is on increase over the years due to importance of good health [1]. The rising waves of water born disease have also affected man kind as result of poor quality water intake in the society [2]. Since the cost of heat plays a decisive role in various distillation processes, viz., single stage, multistage distillation, flash distillation and vapour compression distillation; it seems advantageous to harness the heat of the sun for this purpose [3]. Over a period of 100 years several types of solar stills have been designed and tested [4]. There has been a significant progress in the field of solar distillation during the past four decades, perhaps, due to the general increase of interest in solar energy utilization [5]. Because of cost free energy and low operating cost, as there are no moving parts involved in these systems, the solar distillation shows a comfortable economic advantage over other seawater distillation processes [6]. Further, solar distillation requires simple technology and less maintenance so that it can be used at any rural place [7]. Thus, in order to capture this very advantage of distillation process, cost effective Solar Stills have been designed and developed. And they have proved their performance and cost effectiveness. Solar distillation uses the heat of the sun directly in a simple piece of equipment to purify water. The equipment, commonly called a solar still, consists primarily of a shallow basin with a transparent glass cover. The sun heats the water in the basin, causing evaporation. Moisture rises, condenses on the cover and runs down into a collection trough, leaving behind the salts, minerals, and most other impurities, including germs. Although it can be rather expensive to build a solar still that is both effective and long-lasting, it can produce purified water at a reasonable cost if it is built, operated, and maintained properly. The energy required to evaporate water, called the latent heat of vaporisation of water, is 2260 kilojoules per kilogram (kJ/kg)[8]. This means that to produce 1 litre (i.e. 1kg as the density of water is 1kg/litre) of pure water by distilling brackish water requires a heat input of 2260kJ [9]. This does not allow for the efficiency of the system which will be less than 100%, or for any recovery of latent heat that is rejected when the water vapour is condensed [10]. It should be noted that, although 2260kJ/kg is required to evaporate water, to pump a kg of water through 20m head requires only 0.2kJ/kg. Distillation is therefore normally considered only where there is no local source of fresh water that can be easily pumped or lifted.

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2. MATERIALS AND METHOD

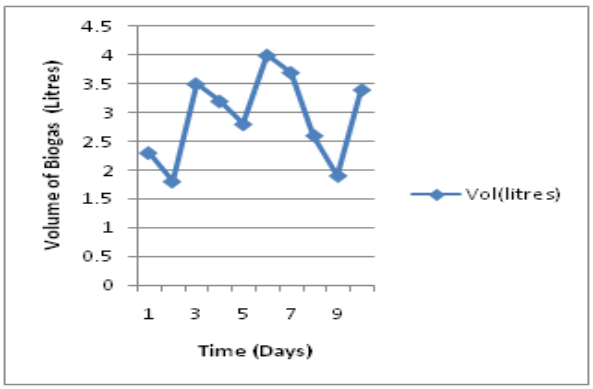
Collection of water.

The water used in this experiment was collected from the pond located at Nsukka Urban in Nsukka local Government Area of Enugu State, Nigeria. The pond has a lot of dirty materials inside it and has been deserted for over 5 years. It also has calcium which causes hardness of water and consumes a lot of soap during washing.

Experimental Method.

The pond water collected was measured to ascertain the volume and was poured through a sieve into a container to remove unwanted materials in it. It was then poured into the solar still basin and exposed to the sun for evaporation. The water receives solar radiation and evaporates to the glass cover where it drops through a channel to a collecting trough.

3. RESULTS AND DISCUSIONS



The volume of biogas yield fluctuates between 1.8 litres to 4.0 litres. This means that the volume produced is not increasing steadily but varies as the solar radiation varies in its intensity. The graph shows that the maximum volume of distilled water obtained was 4 litres and minimum volume obtained was 1.8 litres. This indicates that solar radiation was high at day 10 and low at day 2. The distillate water was free from both temporal and permanent hardness after test.

4. CONCLUSION.

The importance of good drinking water cannot be overemphasised and that necessitated the aim of this work. After the experiment good drinking water was obtained from the poor quality water simply by evaporating the water in the still basin and allowing the water to condense.

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