DESALINATION OF SALT WATER FOR IRRIGATION PURPOSES USING NON-CONVENTIONAL ENERGY SOURCES

By

Hamdy Ibrahim Ahmed Ibrahim

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Master in Environmental Sci., Ain Shams University, 2008.

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
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APPROVED SHEET

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ABSTRACT

Desalination of Salt Water for Irrigation Purposes Using Non-Conventional Energy sources

The research aims to study the desalination using renewable energy for irrigation purposes. The treatments were carried out through two approaches:

The first approach

In Egypt, Sun is continually moving throughout the day, and to get the very best from your photovoltaic system you would need to angle panels a motor is used to move photovoltaic panels each month to adjust the best angle to receive as much sunlight as possible at this time. January and November (44°), February and October (52°), march and September (60°), April and August (68°), May and July (76°),June(84°)and December(36°). So, moving motor will save cost of tracker and electricity consumption daily to move tracker but only move motor once each month facing suitable direction to receive the best sun light to be converted to electricity more than half the amount by low cost. Electricity produced is 127.5W on average at an angle of 30 degrees. The area of photovoltaic panel was (0.18 m^2).Adjusting solar angle using motor electricity produced 164.5 W on the same area of solar cells on average throughout months of the year. The produced electricity is used for desalination with efficiency 75%.

Estimation the amount of power available from hydropower system is directly related to the flow rate, head and the force of gravity and efficiency factor for small systems could be taken as approximately 50 %

installing hydropower system in canals in different places as agricultural drainage, small irrigation canals in Koum Hamada Beheira Governorate) (Beban Agricultural drainage flow rate (0 ,0.5, .6) head (0.1m) electricity generated(0 ,3 3.5Watt), Deeyab canal flow rate (4 , 5, 5.5) head (0.1m) electricity generated(47 ,58,65Watt),and Shahin canal flow rate (6, 6.3, 6.5) head (0.1m) electricity generated(70 , 72.3, 76.3Watt),

The second approach

Design and manufacture of a water desalination (sort membrane electro dialysis s) with an area of (29 cm length x 26 cm width) of the membranes sort membrane electro dialysis (anion / cation) solar-powered. Using solar cells area of (60 cm length × 30 cm width) as an energy source and that convert solar radiation to electrical energy and produces 164.5 watts / day on average and are stored electrical energy produced in batteries 12 volt / 5 amp and consume electricity stored in the desalination process because of solar panel is small enough to operate for 3 hours a day for 8days (equal 24 hours a day) so solar panel to operate all day equal 8 times in area using sort method membrane electrolysis experiments were performed using the desalination of water with different concentrations of salts sodium chloride (4500.9110, 20000.30000 ppm) for water with concentrations (zero, 500, 1000 ppm (of sodium chloride and was efficient a desalination compared with theoretical values about 75% of the concentrations of different NaCl (zero, 500, 1000 ppm)respectively (4500.9110, 20000.30000 ppm These studies showed that

the use of solar energy in water desalination using electrical membrane screening method is an effective way to remove the sodium chloride from salt water in the case of the appropriate use of solar cells to generate electricity needed for desalination and at the same time can produce chlorine gas and also sodium hydroxide**.**

Solar photovoltaic system (0.60 m x 0.30 m)area 0.18 m^2 cost (100)USD (American dollar)(1 American dollar equal 5.5 Egyptian pound in 2010) but to operate all day using area 1.60 m^2 cost(800)USD and The electro dialysis cell cost 100 USD. Solar The electro dialysis cell system consists of Solar photovoltaic (long life 25 years) plus The electro dialysis cell(long life for membrane 12-15 years) equal 1000 USD so, one cubic meter fresh water (1000, 500 , zero ppm) salt from salt water (4500 ppm) equal (1.90, 2.20 , 2.50 USD), (9110 ppm) equal (4.56, 4.76 , 5.10 USD), (20000 ppm) equal (10.59, 10.85, 11.06 USD), (30000 ppm) equal (15.88. 16.16, 16.60 USD) .

The results obtained for estimate the amount of power available from hydropower system showed that hydropower is not efficiency in generate electricity and economically

Key Words: Desalination, Photovoltaic, Hydropower, Electro dialysis

List of Abbreviations

Electro Dialysis(ED)

Electro Dialysis Reversal (EDR)

Photovoltaic Electro Dialysis (PV-ED)

Reverse Osmosis (RO)

Photovoltaic Reverse Osmosis (PV-RO)

Multi-Stage Flash Distillation (MSF)

Multi-Effect Distillation (MED)

Vapor Compression (VC),

Thermal Vapor Compression (TVC)

Mechanical Vapor Compression (MVC)

Micro Filtration (MF)

Ultra Filtration (UF)

Nano Filtration (NF)

Solar Photovoltaic (PV)

Total Dissolved Solid (TDS)

Direct Current (DC)

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