

Feasibility of Solar Distillation as Household Water Supply in Saline Zones of Bangladesh

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Abstract : Scarcity of potable water as the result of rapid climate change and saltwater intrusion in groundwater has been a major problem in the coastal regions over the world. In equinoctial countries like Bangladesh, where sunlight is available for more than 10 hours a day, Solar Distillation provides a promising sustainable way for safe drinking water supply in coastal poor households with negligible major cost and difficulty of construction and maintenance. In this paper, two passive type solar stills- a Conventional Single Slope Solar still (CSS) and a Pyramid Solar Sill (PSS) is used and relationship is established between distill water output corresponding to four different factors- temperature, solar intensity, relative humidity and wind speed for Gazipur, Bangladesh. Comparison is analyzed between the two different still outputs for nine months period (January-September) and efficiency is calculated. Later a thermal mathematical model is developed and the distilled water output for Khulna, Bangladesh is computed. Again, difference between the output of the two cities- Gazipur and Khulna is demonstrated and finally an economic analysis is prepared. The distillation output has a positive correlation with temperature and solar intensity, inverse relation with relative humidity and wind speed has nugatory consequence. The maximum output of Conventional Solar Still is obtained 3.8 L/m²/day and Pyramid still is 4.3 L/m²/day for Gazipur and almost 15% more efficiency is found for Pyramid still. Productivity in Khulna is found almost 20% more than Gazipur. Based on economic analysis, taking 10 BDT, per liter, the net profit, benefit cost ratio, payback period all indicates that both stills are feasible but pyramid still is more feasible than Conventional Still. Finally, for a 3-4 member family, area of 4 m² is suggested for Conventional Still and 3m² for Pyramid Solar Still.

Keywords : solar distillation, household water supply, saline zones, Bangladesh

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