"EXPERIMENTAL INVESTIGATION OF SOLAR DISTILLATION SYSTEM AND DOMESTIC HOT WATER IN COGENERATION PROCESS"

Submitted to Delhi Technological University in Partial Fulfillment of the Requirement for the Award of the Degree of

Master of Technology

In

Mechanical Engineering

With specialization in Renewable Energy Technology

By

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CERTIFICATE

This is to certify that the project entitled "Experimental Investigation of Solar Distillation system and Domestic Hot Water in Cogeneration Process" being submitted by me, is a bona fide record of my own work carried by me under the guidance and supervision of Mr. Raghavendra Gautam (Assistant Professor) in partial fulfillment of requirements for the award of the Degree of Master of Technology in Production Engineering from Department of Mechanical Engineering, Delhi Technological University, Delhi.

The matter embodied in this project either full or in part have not been submitted to any other institution or University for the award of any other Diploma or Degree or any other purpose what so ever.

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ABSTRACT

Flat Plate Solar Water Distillation (FPSWD) system works on the simple principle of evaporation and condensation process .Unlike other types of distillation system which works either by consuming electrical energy or by burning fossil fuels, it works simply on thermal energy provided by the Sun which is free in nature. The hot waste brackish water is cogenerated. It takes brackish or impure water as an input to the system and fresh water as well as hot brackish water as an output. The simple design of the system makes it suitable for disaster situations mainly flood, where the water is plenty but unsafe to drink. This system which consists of 10 panels i.e. area of 30 m^2 has been evaluated and observations were recorded on the basis of field data collected at the Out –Door Test Bed of (period of 8-10 hours) in the month of May,2015 at National Institute of Solar Energy (Latitude: $28^0 25'$N, Longitude:$77^0 9'$E) ,Haryana (India) by taking reading of daily fresh water production corresponding to variation of temperature ,wind speed, solar intensity and ambient temperature during daytime for every hourly basis during daylight from (9.00a.m. to 5.00 p.m.) The inlet feed water that comes from tank is 360 ppm and out let of fresh water & hot brackish water reached at zero ppm & 650 ppm respectively. The fresh water has been achieved 5.2 litres/day m^2 at the titled global radiation of 6.2kWh/m^2. The average temperature of hot water (brackish water) is 47 ^{0}C at the ambient temperature of 24^0C. The fresh water output is 4.68 litres/day m^2 and collected hot water (brackish water) is reached approximately 480 litres/day at 48^0C, which can be used for domestic proposes.

INDEX

LIST OF FIGURES

LIST OF TABLES

ABBREVIATION

^{O}C	Degree Celsius
ETCs	Evacuated Tubular Collector
ED	Electrodialysis
EHPTs	Evacuated Heat Pipe Tubes
FPSWDs	Flat Plate Solar Water Distillation System
FPCs	Flat Plate Collector
LFRs	Linear Fresnel Reflector
PTCs	Parabolic Trough Collector
TDS	Total Dissolved Solids
MSF	Multiple Stage Flash
MSF-BR	Multi-stage Flash with Brine Circulation
MSF-OT	Multistage Flash Once Through Process
MEB	Multiple Effect Boiling
ml	Milliliter
m	Meter
RO	Reverse Osmosis
VC	Vapour Compression
NISE	National Institute of Solar Energy