COMPARISION OF ECONOMIC ANALYSIS OF DIFFERENT TYPES OF SOLAR STILL

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ABSTRACT

The primary aim of this study is to compare the economic analysis of different types of solar stills such as single basin, multibasin, pentagon type, solar still in different modes of operation s such as solar, biomass, combined solar and biomass modes and found their payback periods. The results showed that the pay back period of multibain still operated in biomass mode produces least payback time when compared to other modes of operation. The pay back period of multibasin still was126 days and for single basin still 486 days.

Keywords: Analysis, Economic, Multibasin still.

I. INTRODUCTION

Climatic conditions will not be the same through the year. During the summer as the temperature increases the level of water from water resources' such as ponds, well, river Decreases. People of various parts of the country suffer from scarcity of water. To enhance the yield of the single basic solar still, many research works are being carried out. Nabil Hussain A Rahim (2011) adopted a fresh technique to improve the efficiency of horizontal solar still. In this study the efficiency of evaporative and condensing zones are improved by copper condenser tubes inside the still. Asphalt basin liner and sprinkler are used in the still to increase the productivity by O. O. Badran (2008). Kalidasamurugavel and et al., (2008) done the experiment with different types of liner materials to improve absorption rate the answers evidenced that the rubber was the best absorbing material. Rajasenivasan and et.al, used dye in the watershed to increase productivity (1990). In the other work charcoal pieces are utilized in the basin (2007) to raise water temperature. Kaabi Abdenacer PR, Smakdji Nafila (2007) shows the highest output was obtained when water and glass temperature is maximized. Velmanirajan et.al, (2012) analyses numerical modeling of aluminium sheets using response surface methodology. Narayanan and padmanaman (2009) uses resume in their study for predicting bend force during an air bending process in interracial free steel sheet. Muafag suleiman. K. And Tarawneh (2007) conducted the experiment on the impression of water depth on still he also uses sprinkler for glass cooling to reduce glass cover temperature and improves productivity of 14% more than conventional still.

II. METHODOLOGY

SINGLE BASIN STILL

Single basin single slope, solar still was fabricated with 1.4mm thick mild steel. The size of the basin was 0.81x 0.82 x 0.75m. The catchment area is painted black to absorb maximum solar radiation. The bottom ends were covered with 4mm insulation layer (0.015w/Mk conductivity) to reduce heat losses The condensing surface of the blade is made of plain glass with 4mm thickness is set at 300 inclination to the horizontal axis. A silicone rubber sealant is applied to keep the glass intact with the steel to prevent the vapor leakage from the still. troughs were provided, to collect the condensate. Distillate outlets were used to drain the water. FIG.1 shows the sentiment to be fabricated experimental single basin still,

Distillate outlets were provided to drain the water through hoses and to store in jars. Provisions were made to supply raw water, run out the basin water and insert thermocouples. Fig.1 shows the sentiment to be fabricated experimental single basin solar still

MULTIBASIN STILL

A multi basin solar still solar still was constructed with 1.5 mm mild steel. The size of the basin was 0.8X 0.6X 0.5 m. The lower basin was fitted with 0.0125 m diameter G.I heat exchanger having 8 numbers of turns the

upper catchment area was split up into 5 steps having 10 mm gap between the next measure and height 10 cm. The length of the basin is 76 cm. The two basin were separated by a glass cover having a 3 mm thickness. The catchment area is painted black to absorb maximum heat. The side and bottom spots of the stills were insulated with 0.004 m thick layer to reduce heat losses.. The cover surface of the sword is made of glass with 3 mm thick is set at 30L inclination to horizontal . A silicone is used to prevent leakage Collection ways were provided at a lower place the lower edges of the glass cover, to collect the condensate.

PENTAGON TYPE

The 1conventional solar still is constructed using steel of 1.5 mm thickness with base 600mm length and 650mm breadth.The solar still basin plate is located at the height of 550mm at the top and 250mm at the base.. The glass is mounted in the still at an angle of 300 .. A tempered glass cover is used as a condensing surface and allows the solar radiation to reach the basin. The glass is 3mm,thick and 700mm height .Due to solar power condensation and vaporisation takes place inside the still.. A stopper is provided at the bottom surface of glass to collect the condensed water in the collection tank. A Pentagon still was constructed with a 1m2 base and side width 1.6 m, height 1.9 m. The top surface was covered by 3mm glass covers on both sides to act as condensing surfaces like in double slope stills with 300 inclinations Fig.1 experimental set up for various stills Results and comparison
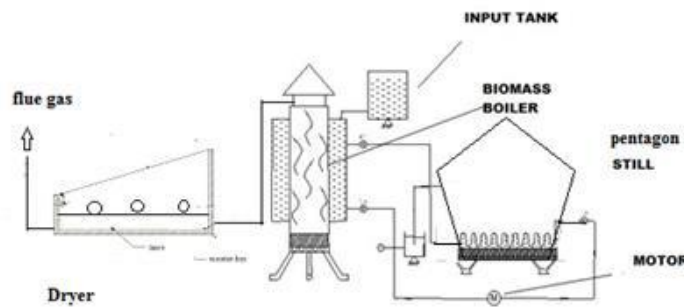

Fig.1: Experimental set up for various stills

III.   RESULTS AND COMPARISON

Economic analysis – pentagon type

Pentagon type The return back period was calculated for different stills. The fig 3 1 shows that the payback period for pentagon still was very low (484 days). The highest payback period was reported by conventional solar still (2500 days) and pentagon, when operated in a solar mode, had 750 days.
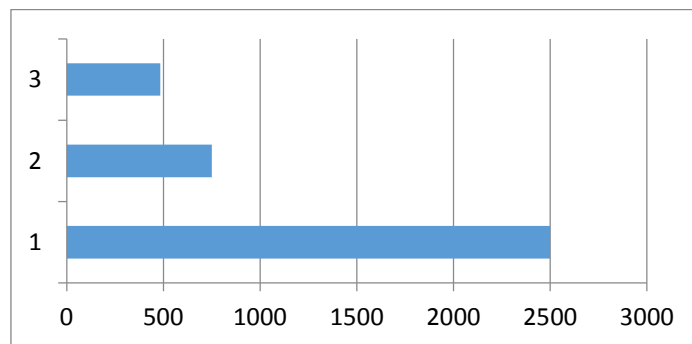

Fig. 3: Economic analysis of pentagon type still

Economic analysis – single basin type

The payback periods on the still depend on maintenance cost, fabrication cost and the cost of production.

Table.-1: Shows the cost analysis.

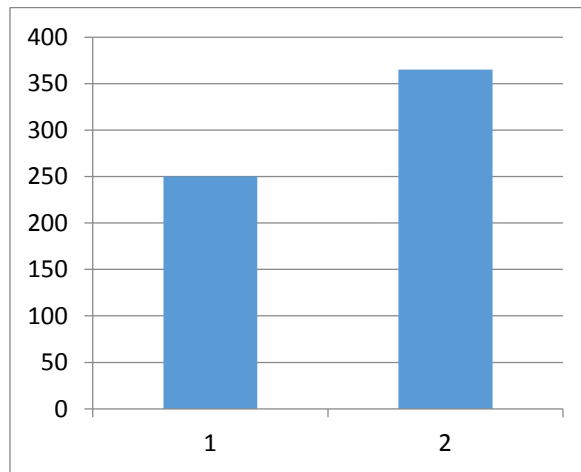| Cs		Rs 10000 for single basin still in solar mode Rs 15000 for single basin with biomass boiler
OMC	other maintenance charges	16% of Annual capital cost Acs
n	number of years	10years
I	interest rate	12%
S	service charges	10% of present Cs
Nd		250 Numbers of clear days in solar mode 365 Numbers of clear day for biomass mode

Fig.4: Economic analysis of single basin still

Economic analysis – multibasin type

The payback period of the solar still setup depends on overall cost of fabrication multibasin type The payback period of the solar still setup depends on overall cost of fabrication, maintenance operating and feed water cost. The fabrication cost is Rs. 12,000 ($200)..The payback period for biomass mode and solar mode are 12,000/ 95 = 126 days and 12,000/25 = 480 days Economic analysis of solar still. Particular Cost no Fabrication cost 12,000 Rs. ($ 200) Economic analysis of solar still.

S. no	Particular	Cost
1	Fabrication cost	12,000 Rs. ($ 200)
2	Operating cost	5 Rs./day ($

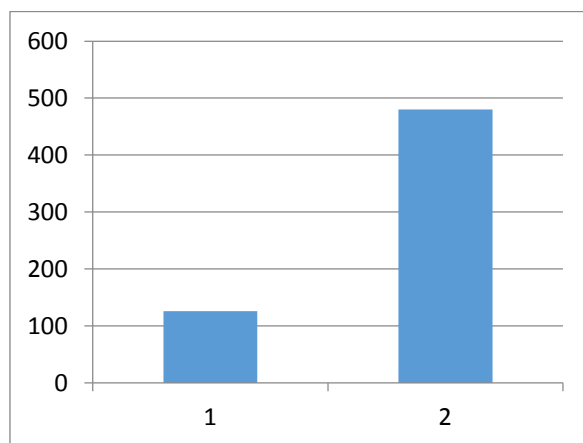|		
		0.1)
3	Maintenance cost	5 Rs./day ($
		0.1)
4	Cost of feed water	1 Rs/day ($
		0.02)
5	Cost of distilled water	12 Rs/L ($
		0.26)
6	Cost of water produced/day	Rs. 60
7	Net profit = cost of water produced-operating cost– maintenance cost–cost of feed water	Rs. 45 ($ 0.95)
8	Payback period	12,000/ 45 = 267 days

Fig.-5: Economic analysis of multibasin still

IV.   CONCLUSION

The review shows that multibasin the multibasin still operated in biomass and solar modes are most successful and has low pay back period of 126 days only when compared to pentagon and single basin still. This is because of more area of contact in the still produces more output. The pentagon type still produces 484 days because of increased area of contact and losses from still. The single basin still produces less output.

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