DOE/R4/10136--T1

DOE/R4/10136--T1

DE84 000773

Final Report on Solar Still to Dept. of Energy

Grant No. DE-FG44-80R410136

13-0249

Presented by

William D. Adams

July 20, 1982

DISCLAIMER

Summary

Solar Power Alcohol Distillation

The utilization of solar power for distillation, in our project proved not to be effective from a proof (i.e 100 proof), flow (minimal) and a cost to construct (approximately $1,500 materials alone.)

The reason for limited success was that a packed column was used to facilitate seperation of the alcohol / water vapors. Passive solar could best be applied to pre-heat make-up water for fermentation and to maintain proper fermentation temperatures during the winter; or,

in a vacuum still, passive could be effective in providing 150° F temperatures.

Body of Report

We were not able to achieve higher than 120-140 proof range by using the solar still. We were only able to achieve that high of proof due to adding a packed column packed with popped popcorn which gave good surface area for the water vapors of the alcohol/water vapor coming from the still to absorb the water away from the alcohol

(the cracked corn research) as done in the 1920's) thereby upping the proof. The concept we first presented (allowing the vapors to condense on the inside of inclined glass) allowing the alcohol to remix with water negating the distillation process. A way to increase the proof is to add a taller column. A way to increase the flow amount is to use the solar box but add a heat exchanger inside to further increase net B.T.U. input

effecting a greater evaporation / distillation rate.

The use of Lexane to construct the solar hot boxes was good material selection, from both a forming and operations standpoint. The 2" ø (w/ 8" ø floats) float valves worked well along with the application of silicone for sealing leaks. In painting the Lexane, paint was applied underneath or the backside.

Conclusions and Recommendations

Either commit to use solar in a very active way IE (High intensity collectors for process steam to district with) or use a passive system to gain heat for dimentation (in winter) and warming water.

Supply	Relative Cost	% Etoh Beer Mash	Potential Yie
Doughnuts	Inexspensive	Lard content inhibited yeast growth	Low
Jerusalem Artichoke	Inexspensive Can be harvested many times	12% on 3 days	High (Better than any other crop)
Kudzu Root	Inexspensive Too hard to ~~raise~~ harvest	8% on 4 days	~~8~~ Moderate to High
Cattail Roots	Inexspensive	6% on 4 days (Believe higher % obtainable	High (Especially if harvested several times)
Bread (waste)	Inexspensive (8^{xx}/ton)	10-14% on 4 days	High (Not seasonal)
~~Soft Drink~~ Soda Syrup	Moderate	High % can only be obtained after considerable alterations to stock	Medium
High Fructose Corn Syrup	Inexpensive	~~Great~~ High 14% 3 days	~~Is~~ High

If crops are to be raised Jerusalem Artichoke is recommended

The author recommends using waste starches and sugars