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Low-Cost Solar Collector Test and Evaluation

GRANT CLOSEOUT FINAL REPORT

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SUMMARY

Project was to test and evaluate a highly efficient low cost solar collector and to make this technology available to the average homeowner. The basic collector design was for use in mass production, so approximately forty collector panels were made for testing and to make it simple to be hand built. The collectors performed better than expected and written and visual material was prepared to make construction easier for a first time builder. Publicity was generated to make public aware of benefits with stories by Associated Press and in publications like Popular Science.

PROJECT OBJECTIVES

1. Test and evaluate a chemically etched solar collector.
2. Develop a Do-It-Yourself Version.
3. Develop several simple, no energy devices to make the solar collector adaptable to different houses.
4. Develop written and visual material so that average homeowner can duplicate results.
5. Generate publicity on project so public will be informed of the benefits.

APPROACH USED TO ADDRESS OBJECTIVES

A workshop was rented in Cape Canaveral at 119 Monroe ave. This provided suitable storage area, a working area and space for developing written and visual materials. Since collectors were going to be hand built as opposed to a production line item everything was purchased and worked out with the average homeowner in mind. This meant that if I found an item that would work quite well but could not be found or ordered from anywhere in the country, I did not use it. Most of the actual collector construction had already been developed under the work that had been going on for the patent, this meant that the grant work could concentrate on making the collector feasible for the homeowner.

It should be noted that there are several enclosures to go along with this report that will help in understanding this project. The Bensun Solar Corp construction manual, which was developed prior to the grant but which makes the understanding of just how to do chemical etching easy. Two sets of plans on how to use a solar collector. One video tape on how to construct a chemically etched solar collector. The video tape is the easy way to understand this project. The tape is produced on VHS and is approximately 23 minutes long.

Now back to the Collector, work was done with 3M and Dow Chemical to make sure all materials were readily available and would not be harmful to humans, it wouldn't do much good to have a great collector if it would kill someone. After quite a lot of experimenting with construction techniques and

trying to duplicate mistakes first time builders would make, I could make a complete collector in a few days with about four hours of actual working time. This easily put it in the range of a weekend project. The manifolds were designed with low cost and ease of construction. The window mounted model can be made from a single piece of $\frac{1}{4}$ " plywood, and vertical model from far less. I ended up with about ten collectors to test and evaluate with.

To begin with I mounted one of the vertical mounted collectors on the rear door of my workshop on Monroe Ave, not only for testing but also for heating. I never turned the heat on again in that building using just the solar heat from one two by six foot panel. Tests showed that in January and February the collector would put out 140°F air at about 125 ft/min in the thermosyphon mode. Tests were then made using a blower to speed the airflow up. More total BTU's were put into the room but it got too hot to work comfortably so I returned it back to the thermosyphon state. It should be noted that this back door faced a local tavern and at night the collector had beer and other liquids sprayed on it along with bottles thrown at it. The collector held up quite well and never needed any maintenance. The collector also held up to the sun due to the design of the manifolds which will not let the collector stagnate.

Several full sized collectors(2x8') were used to test the maximum output. On December 21, airflow was pushed to over 1000 ft/min through a 3" manifold and still was reading

over 128°F. This was thirty percent higher than a non chemically etched solar collector of the same size standing right next to it. This chemically etched solar collector was not only easy to make and low cost but was also more efficient. The tests were duplicated several times and the results were the same.

The collectors had proven themselves so the next step was to make devices to make them useful. Two means were used. The first was the vertical mounted model. This was the most efficient way for a thermosyphon system and was easy to mount on a wall or a door(see plans). This was a permanent system and so the second device was designed to fit in a standard window. It was not quite as efficient and is susceptible to people running into it as it sticks out from the window, but it was removable. It was mainly designed for people living in Florida or other warm climate where heat is only needed for a month or two.

The hardest part was to come up with a means of education so people who wanted to build a chemically etched solar collector could do so. Two approaches were used, the first using the Bensun Solar Corp construction manual and the plans for the vertical and window mounted units, and the second using video tape. The written method is much more economical and seems to work quite well. The video tape makes things much clearer but has the cost going against it.

All of the project work is worthless unless the public is made aware of the benefits, after all that is why they call it "appropriate technology". I sent out press releases and

did interveiw with the Associated Press, radio stations all over the country, Science and Mechanics, Popular Science, and many trade publications. The publicity worked in that I have sent out thousands of letters to interested parties all over the world.

BENEFITS, ENERGY SAVINGS

The benefits of this project are tremendous. What it does is provide a low cost (about \$25/panel) easy to build solar collector. It does not take a large investment and the home owner can build one or twenty depending on the amount of money he has at the time. The educational materials make it easy to build and it can be retrofitted to older houses. The window model can be used by people who do not own their own home, taking it with them when they move. Since it is easy to build and was originally designed to be mass produced it is an excellent project for school or other groups.

The energy savings can be 100% for instances like my workshop where the heating load wasn't high to begin with and was only used during the day. Most homes would not be in this category so the energy savings would be mostly during daylight hours. When a low cost storage system is developed then excess heat can be stored, but as of now relative to the costs of the collector, storage is prohibitive.

CONCLUSIONS AND RECOMMENDATIONS

This is a very good appropriate technology project. It provides for the type of person commonly called a "handyman". The only problem is that most people are not "handymen" or do not have the time to be. The greatest amount of people will be helped by this project when it is finally mass produced. This will give millions of people the option of solar heating without it costing an arm and a leg.

The most important recommendation I can make is fund more projects.