



# Agricultural Engineering Update



Structures &  
Environment



Soil & Water



Energy



Safety



Crop Processing



Power &  
Machinery

AEU-10

## RESIDENTIAL SOLAR HEATING IN KENTUCKY

BY

RICHARD S. HIATT

EXTENSION AGRICULTURAL ENGINEER

### COLLECTOR:

Q1. Is solar heating economically feasible in Kentucky?

A1. Solar heating can be economically feasible in Kentucky, but only under a specific set of conditions. Several other questions should be asked to give an accurate answer:

- A. What type of solar heating are you considering? (domestic hot water, space heating, swimming pool heating)
- B. What type of fuel will be replaced? (electricity, L.P. gas, natural gas)
- C. How will the cost of fuel rise over the life of the solar system?
- D. What percentage of your heat will be provided by solar?
- E. How much will the proposed system cost?

In general, solar heating will show a positive return on investment for most pool heating and domestic hot water heating. This is especially true when electricity is the alternate fuel. When considering space heating, passive solar principles should be used first (glazing on

south side of house with appropriate heat storage.) Active space heating is presently not cost effective unless the home owner is willing to provide his own labor.

- Q2. What would be the cost of the solar system that is illustrated on this display?
- A2. Strictly in terms of materials cost, the solar collector illustrated on this display would cost between \$3.00 and \$4.00 per square foot. This cost does not include the ducting system, heat storage system, controls, or fans for the rest of the installation. The individual will require very good mechanical skills to construct this collector properly. Commercially available solar space heating systems cost between \$12,000 and \$20,000 installed. This is a total system cost including labor.
- Q3. How much collection area is needed?
- A3. Solar space heating: For every square foot of heated living area, there should be 1/3 to 1/2 square foot of solar collection surface. For example: a 1500 square foot house would require about 625 square feet of solar collection area for space heating.  
Solar water heating: Approximately 20 square feet of collection area per person.  
Solar pool heating: For every square foot of pool surface area, there should be 1/2 to 2/3 square foot of solar collection area.
- Q4. Are two layers of glazing (glass, plastic, or clear film) really needed on a solar system?
- A4. For a space heating solar system, a minimum of two glazed surfaces are needed to insulate the collector from outside temperatures. This is particularly true for systems which use air as the heat transfer fluid. For solar domestic hot water systems one layer of glass or rigid plastic is typically sufficient. For pool heating systems used only during the summer months, adequate temperatures can be reached with no glazings over the solar absorbing surface.
- Q5. Which is better, a liquid-type or air-type solar system?
- A5. This depends upon what you are trying to heat. For domestic hot water systems and pool heating systems, collectors which use a liquid as

the heat transfer fluid are best. For space heating, the performance of the liquid-based and the air-based system are equivalent if both are well constructed. However, maintenance and the risk of freezing, corrosion, and leak problems is greater with the liquid system.

Q6. What are the differences between good and bad systems?

A6. There are generally three criteria for judging the quality of a solar heating system. Most important is the longevity or durability of the entire system. All economic arguments for solar heating are based on amortizing the cost of the solar system through savings in conventional fuel. If the system breaks down before its projected life is up, the added cost of repairs will change its economic feasibility. The performance or efficiency of the collection and storage system is the second criteria for evaluation. Performance can be stated in several ways so be certain that you use the same terms when comparing two designs.

The appearance of the installed system is the final item for consideration. The appearance not only reflects the quality of work provided by the solar installer, but can also affect the value of your home for resale.

STORAGE:

Q1. How much rock storage is needed?

A1. For residential heating, the rock storage should be sized to provide 1/2 to 3/4 cubic foot of rock storage for each square foot of solar collector. For a 1500 square foot home with 625 square feet of collector area, there should be approximately 400 cubic feet of rock storage. Q2.

Q2. What size stone is best?

A2. Rock heat storage beds are not designed according to a particular rock size, but according to a reasonable pressure drop through the bed. This pressure drop can be adjusted by changing the flow area, depth, stone size and amount of packing of the stone. As a very general range, the stone will be from 1/2 to 4 inches in diameter.

NOTE: This to be used with the solar display board housed at Public Information.

3/1/82