

SOLAR CROP DRYING DEMONSTRATIONS SUMMARY

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This project was to demonstrate the potential for using solar energy to dry crops grown in California. These demonstrations were done with the assistance of the California Air Resources Board, and showcased how low-cost, unglazed transpired solar collectors can be used to displace fossil fuels in agricultural drying processes. The transpired solar collector system, termed SOLARWALL, has been installed in over twenty countries primarily for heating commercial and industrial buildings. These demonstrations were the first applications of the transpired collector technology in the USA for crop drying.

The project involved site selection, design, installation and monitoring of five solar drying demonstration installations in California. Projects include drying of walnuts, pecans, prunes and herbs. All projects were successfully completed and are currently being used to dry their respective crops. A brief summary of each of the five jobs is listed below:

Sunsweet Dryers – Prune Drying Yuba City, CA

The demonstration consisted of 1,200 square feet of solar panels were installed at Sunsweet, which is the largest prune drying company in the United States. The Solarwall system preheats the air to the tunnel dryer and delivers 10,000 cfm of an estimated 50,000 total cfm required in each of the dryers. The measured energy savings was 8.7% of the normal gas usage for 24 hours of operation.

Carriere and Sons – Walnut Drying Glenn, CA

Walnuts are dried at relatively low temperatures, from 35% moisture content to 10% moisture content with a maximum temperature of 110°F. 3,200 square feet of solar panels were installed on the roof of the drying building at Carriere. The system delivers 25,000 cfm of air to the 70,000 cfm blower. The energy savings for two months of operation during the drying season was over 3,800 therms.

Keyawa Orchards, Inc. – Walnut Drying
Chico, CA

The system is the largest solar drying project in California. After the owner observed how well the solar dryer was working at the neighboring Carriere farm he had 9,300 square feet of panels installed on the roof of his new drying building, which delivers the equivalent amount of heat as a 500kW heater. This translates into fuel savings of 1431 million BTU per year, and a corresponding cost savings of \$13,800.

Korina Farms – Pecan Drying
Corning, CA

Pecans are a delicate and very heat sensitive crop that are dried at a maximum temperature of 80°F. 5,200 square feet of panels were installed on the new drying building, and the heat generated from the panels is ducted to the fans, rated at 37,000 cfm. The energy savings were projected to be 354 million BTUs per year.

Sonoma County Herb Exchange – Herb Drying
Sebastopol, CA

This company worked is a clearing house for top quality organic herbs. When they decided to venture into a new area of drying herbs, they were very receptive to the idea of using solar heat as the primary drying mechanism. They installed an eight panel residential kit with 105 square feet of solar collectors on the roof of the drying house. This yields a peak temperature of 40°F over ambient. The air is ducted from the panels into the bottom plenum of the dryer, up to the herbs being dried, and then it is exhausted out the top. The system will give the Sonoma Herb Exchange energy savings of 31 million BTU by displacing 325 gallons of propane that would have been required if fossil fuels were used instead of solar.

Conclusion

These demonstration jobs have been beneficial because they have shown how crops, and especially delicate crops, can be dried effectively using solar technology. The heat generated is uniform, and preserves the quality of the produce, while reducing fossil fuel usage. The combined CO₂ savings for just these five solar drying projects is estimated to be over 135 tons each and every year. The feedback from the owners and operators of the farms has been very positive; they are all pleased with the systems, and will continue to use them. There is an enormous potential for further crop drying ventures in California.

The Innovative Clean Air Technologies (ICAT) program was instrumental in demonstrating solar crop drying in California and in the USA. Without the financial and moral support of the Air Resources Board, there would be no recent solar drying installations. Demonstrations such as these are essential to the introduction and commercialization of new technology and new applications. Programs such as this can

advance air pollution control and add to the State's economy. As these objectives have been met, the solar drying demonstrations can be considered a success.