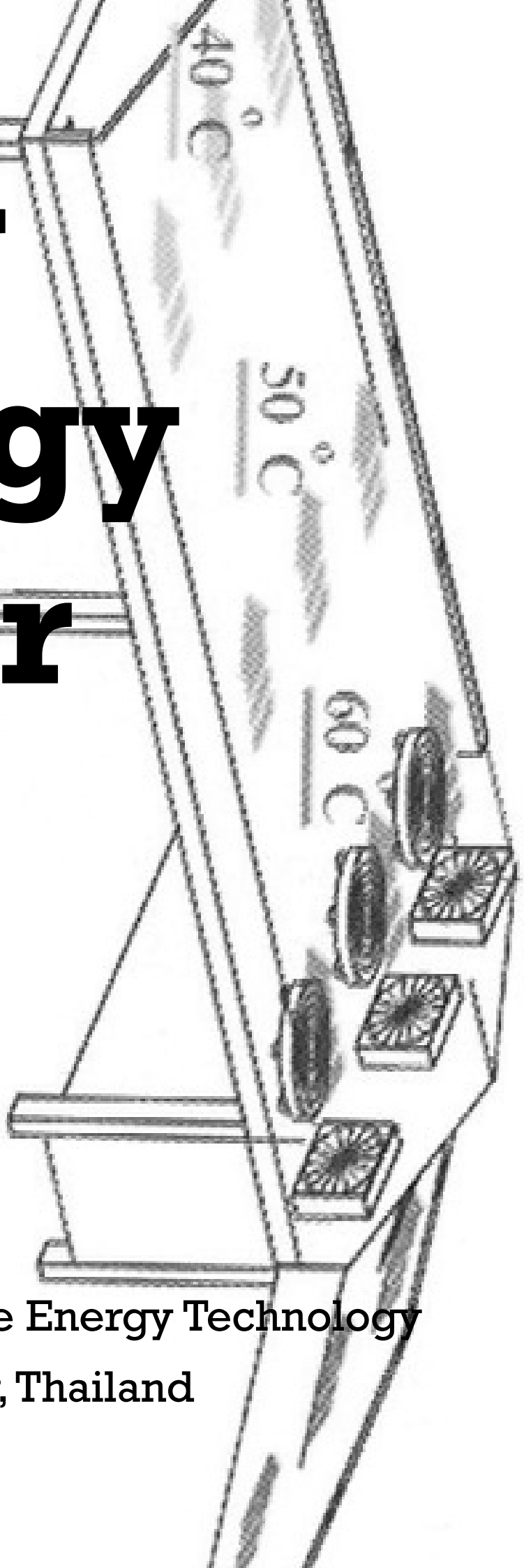


Solar Energy Dryer

School of Renewable Energy Technology
Naresuan University, Thailand

April 2007



Description

Solar Tunnel Dryer is suitable for almost every kind of agricultural produce, especially fruit and meat. The Solar Tunnel Dryer receives thermal energy directly from the sun and additional thermal energy from a solar collector which comprising of a ventilator to transfer thermal energy and eliminate humidity from produce. Moreover, this dryer can also be operated without solar energy by using electric energy.

Materials

1. Rectangular metal tube size 3 x 1.5 inches
Qty. 20m.
2. Square metal tube size 3 x 3 inches
Qty. 10m.
3. Square metal tube size 0.75 x 0.75 inches
Qty. 60m
4. Square metal tube size 1.5 x 1.5 inches
Qty. 15m.
5. Metal Angel size 0.75 x 0.75 inches

Qty. 30m.

6. Aluminium size 0.5 x 0.15 inches

Qty. 25m.

7. Corrugated sheets size 4 x 8 ft.

Qty. 10 sheets

8. Transparent plastic sheet size 20 sqm.

Qty. 1 sheet

9. Screw size 0.5 inches 1 inch height

Qty. 1 box

10. Transparent glass size 1.8 x 3.2 m with 5mm thickness

Qty. 1 sheet

11. Fiber optic size 20sqm

Qty. 1 sheet

12. Matt black paint colour

Qty. 1 bucket

13. Thinner

Qty. 1 bucket

14. Door hinges

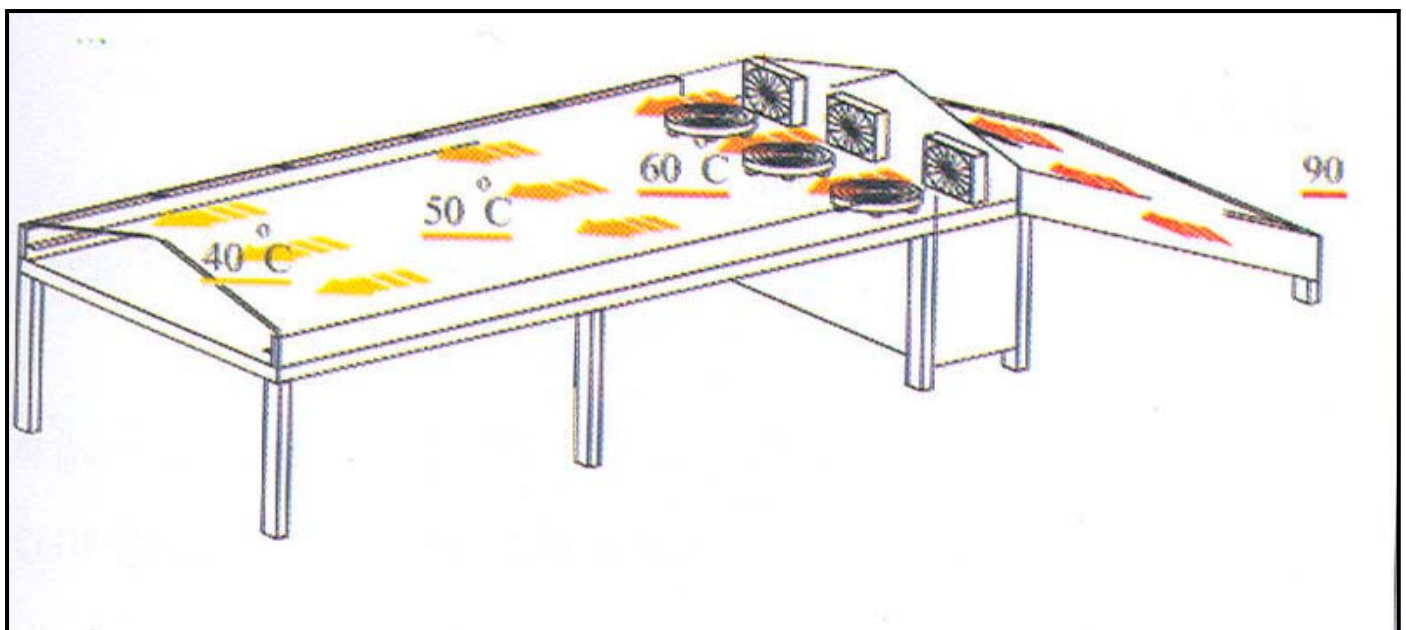
Qty. 6 sets

15. Fan size 3.5 inches

Qty. 4 fans

16. Heater(s)

Qty. 1-3 heaters



Characteristics and construction

The size of the Solar Tunnel Dryer is about 10 m*2m. Mainly, the structure is made from steel pipes and corrugated metal sheets. The 3 main structures are consisted of;

1. *Drying Chamber.* This is the area that acts as an oven, drying the produce. It resembles a dining table. It is 1.8 m in width, 5m length and 1m height. It is lined with fiber glass insulation and covered with a corrugated metal sheet. There is a frame for a plastic or glass roof on the top. Both ends are installed with wire mesh to prevent the produce from being contaminated by insects and dirt.

2. *Solar radiation collector.* This is the part that generates thermal energy from solar radiation. It is 1.8m in width, 3.2 m length and 1 m height, and reclines at an angle of 18°. The absorbing surface is a flat metal sheet. The upper surface is a matte black painted corrugated metal sheet. A glass roof with is placed above the absorber. A wire mesh is installed at the lower edge.



The collector comprises the following components

- A Transparent glass cover to prevent thermal energy to release to the environment when the wind flows through the collector

- A space between the glass roof and the collector act as a film for prevent the loss of thermal energy
- An absorber made of a matte black painted corrugated metal sheet
- An Insulation to prevent the loss of thermal energy at the bottom and on the sides of the collector

3. *Auxiliary thermal energy cabinet.* The cabinet is connected to the drying chamber and the collector. It is consisted of a metal box and corrugated metal sheets. Size 0.5m x 1.8m x 1.15m. The shelf for electric heater is 0.8 m above the cabinet's floor and can be installed 1-3 electric heater as prefer. Inside the cabinet, on-off switches, fans and heaters.

How the Solar Tunnel Dryer works

This solar thermal energy dryer generates 2-way thermal energy from the direct thermal energy of solar radiation through its glass roof and thermal energy from its solar radiation collector.

The solar energy will pass through the glass roof to the collector, generating hot air. The ventilation system installed in the system will force the air flow passing through the drying chamber.

This drying system can be operated by solar energy and/or electric power to allow drying during non-uniform sunlight or high humidity.

Usage Guidelines

1. Set the solar tunnel dryer in a north-south direction and set the collector to the south (facing the sunlight)
2. Place produce in to the trays in the drying chamber, leaving some space between produce
3. Turn on the ventilization system, 1-3 fans as preferred, to distribute hot air
4. In temperature, environment, it can also be operated together with auxiliary thermal energy
5. For the most benefits, the operating time should be between 8.00-17.00 hrs

at all times to maintain their efficiency

2. The auxiliary thermal energy cabinet and the fans should be checked at least once a month



Maintenance

1. Cleaning
 - The drying chamber and trays should be cleaned at least once a week
 - The collector and the glass roof must be clean