

## EVACUATED TUBE SOLAR COLLECTORS

Solar thermal systems refer to devices that use solar energy in the form of heat as the main source of energy

The main application areas of solar thermal systems are:

1. Cooking
2. Water heating
3. Absorption / adsorption refrigeration
4. Electric power generation

At the heart of a solar thermal system is the solar collector. It absorbs solar radiation as heat, and transfers useful heat to the solar system. There are different design concepts for collectors such as flat-plate collectors, evacuated flat-plate collectors, evacuated-tube collectors and concentrating collectors.

Evacuated tube collectors (ETC) are the most efficient (conversion efficiency of over 90 %). The collectors are usually made of parallel rows of transparent glass tubes. Each tube contains a glass outer tube and inner glass or metal tube attached to a fin as the absorber. Air is removed, or evacuated, from the space between the two tubes to form a vacuum, which eliminates conductive and convective heat loss.

They are being used in all the application areas and have high growth potential.

### **Proposal:**

ETCs are being used for lower temperature and higher temperature applications.

The lower temperature (70 to 150 degree C) applications comprise of, water heating for domestic and commercial purposes, Steam generation for cooking and steam generation for refrigeration.

High temperature (up to 400 degree C) applications are mainly for power generation. This is the right time to enter this area to build a significant presence in the next five year period. The boom may start any time now.

### **Product mix:**

It is recommended that a start may be made with the low temperature application.

Glass in glass ETC	100000 Square Meters (1000, 000 Tubes)
Metal in glass ETC	10000 Square Meters

**Market:**

Potential for hot water systems in India is estimated at 140 million square meters. Against this about 1 million Sq. M. installation is achieved so far. The pace is likely to increase now.

Community cooking systems based on solar energy are also being installed to serve hostels, hotels. Refrigeration applications also likely to start in the near future.

China is dominating ETC production. It may be difficult to compete with them initially. This aspect has to be carefully examined.

**Manufacturing process:**

There are two main operations in manufacture of ETCs (assuming the tubes are procured from outside sources)

1. Coating of the inner tube -- The manufacturing process takes place in a high vacuum chamber and the coating process involves three stages, stabilizing layer coating, semi-conductor layer coating (radiation absorbent layer) and anti-reflection layer coating
2. Sealing the joints – When the inner and outer tubes are glass, joining and evacuating the annular space are simple. If the inner tube is metallic, joining and sealing needs special attention with regard to selection of materials and processing.

**Technology:**

Main technology involved relates to coating of the inner tube. “Sputtering” is the latest coating technology, used for selective coating of metallic particles on surfaces like glass. This technology is available from a number of sources.

**Plant and Machinery:**

Main plant and machinery consist of, coating line, sealing and assembly plant and testing line. The coating plant has to be imported.

**Raw materials:**

Glass tubes of different diameters, coating materials are the main raw materials. Coating materials have to be imported.

**Utilities:**

Power is the main utility.

**Project cost:**

Initial investment of Rs. 20 crores may be required

**Turnover and profitability:**

Initial sales can be in the range of Rs. 50 crores with net profit margin of 10 %

**Suggested location:**

In proximity to Natural gas pipe route, so that glass tube manufacturing can be added as backward integration.

**Entrepreneur profile:**

This project is suitable for existing industrialists who are considering diversification into solar energy field. This project can be used as an entry point into higher value products, particularly into production of parabolic trough concentrators for application in refrigeration and power generation

**Apitco's consultancy**

1. Market survey
2. Technology tie-up