

PROJECT PROFILE

ON

SOLAR WATER HEATER

Month & Year

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**PREPARED BY
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SOLAR WATER HEATER

INTRODUCTION

Solar water heaters—also called solar domestic hot water systems—can be a cost-effective way to generate hot water for your home. They can be used in any climate, and the fuel they use—sunshine—is free.

The solar water heating system consists of a solar collector, toughened glass, insulated storage tank, cold water supply tank and insulated piping. The sun rays penetrate through the glass and fall on the absorber. The heat of the sunrays is absorbed by the cold water inside the absorber thereby increasing its temperature. The heated water gets collected inside the insulated storage tank either through the thermosyphon or the forced flow system. In the Thermosyphon system up to 3000 liters per day can be installed, however, for higher capacities it is necessary to use the forced flow system. The water temperature can be raised up to 85C. The solar water heating system can be used for bathing, washing, boiler feed water and similar other purposes where hot water is required in domestic, commercial and industrial sectors. The cost of the solar water heating system range from Rs.130/- to Rs.200/- per litre, depending upon the capacity of the system and the investment made can be recovered in 4 to 6 years time. The life of the system is around 10-15 years if maintained properly. The operation and maintenance cost is negligible.

Basic Requirements for installation of Solar Water Heating System :

- Plenty of sunshine during most part of the year.
- Availability of space either on ground or on terrace, free of shadow for at least 0800 hrs to 1600 hrs a day.
- Reasonably soft water.
- Electricity for operation of the pump in the forced flow system.
- A 100 Liters per day (LPD) system needs around 3-4 sq.mt. area.
- If the system is to be installed on terrace it is necessary to check the load bearing capacity of the slab.

The space selected should be very close to all use points in order to save on piping.

- The solar collectors are installed facing due south with a tilt equal to the latitude of that place plus 15 deg.
- The hot water insulated tank shall be at least 50 cm above collector top and cold water tank shall be at least 50 cm above hot water tank in the case of the thermosyphon system.

PRODUCT USES AND SPECIFICATIONS

-Solar water heating is a most efficient and techno-economically viable technology for meeting the hot water requirement in 60 to 120 degree temperature ranges.

- These systems are suitable for Hotels, Dairies, Hospitals, Restaurants, Homes and Process Industries where hot water is required.

- It works for almost 300 sunny days in a year.

- A solar water heater works on the principle of the property of black bodies to absorb heat faster. A collector has a specially black coated copper sheet which absorbs the solar energy and transfers it to the water flowing through tubes on its back side. The hot water being lighter rises up and is stored in the insulated hot water tank. This hot water can be used when required.

A 100 litres per day system costs about Rs. 21,900/-.

- Saves about Rs. 2200/- units of electricity annually.

- The payback period ranges from 3 to 5 years depending upon the use and fuel replaced.

- In addition to this, a 100 litre per day solar water heating system prevents the emissions of 1.5 tonnes of CO₂ annually

MARKET POTENTIAL

The market in India for energy efficiency and renewable energy (RE) is estimated at Rs.12500 crores(\$2.5 billion) and is growing at an annual rate of 15 percent. The new RE policy of the Government of India (GOI) that aimed at generating 10,000 mw by 2012, through renewable and non-conventional sources, is expected to further boost the growth rate of this sector.

India receives a good level of solar radiation, the daily incidence ranging from 4 to 7 kilowatt-hours per meter square (Kwh/m²) and can utilize this to generate power and thermal applications. Only a fraction of the aggregate potential in renewable resources and in particular solar energy is being used so far. There is a high market potential for processed raw material for solar cells, large capacity solar photovoltaic (SPV) modules, film solar cells, SPV roof tiles, inverters, and charge controllers.

The investment in RE is estimated to be about Rs.15000 crores (\$3 billion). India has not been successful in keeping pace in this sector, despite a large demand-supply gap with respect to energy requirements and ample renewable resource availability. The GOI has now implemented many programs to invest in solar energy.

A survey conducted in a typical city of India amongst users of solar water heating system would give a breakup somewhat along the following lines.

- 100% of the users are in the middle higher to higher income group
- 70% and above prefer systems with electrical backup while less than 30% opted for stand alone solar water heaters
- More than 80% of the users bought the systems directly from the manufacturer without any third party financing or loan

- More than 90% of the users found a solar water heating system to be satisfactory, especially in saving fuel costs.

More than 90% of users would have liked "subsidy" to be available on solar water heating systems. In fact most have purchased the system under subsidy scheme.

Water heaters fuelled by solar energy are cost effective and operate on proven technology. A five-member household using three bathrooms needs a system of 100 litres per day solar water heating system that costs about Rs.18, 000. If they purchase geysers it would cost Rs.15,000 for all the bathrooms, whereas the energy saved by tapping solar energy will be equivalent of about 4 units a day or about 1,700 electricity units a year. The savings at the rate of Rs.3 per unit will work out to Rs.5, 500 annually. Since the systems conform to ISI specifications, there is little to worry in terms of their quality — the life of the solar water heating system is about 20 years. Yet another specialty of the systems is the back-up heaters that come in handy to heat water during rainy days. Depending on the requirement, there are different solar power water heater models — low, (like heating water up to 40 degrees Celsius for swimming pools) medium (up to 65 degrees C) and high (120 degrees C for process steam) temperature applications.

INSTALLED CAPACITY

The installed capacity of the proposed unit is manufacturing of 180 nos of solar water heaters per annum on single shift basis. The capacity per month is 15 nos. The unit can manufacture the Water heaters with capacities ranging from 100 litres per day to 5000 litres per day.

PLANT AND MACHINERY

The following items of plant and machinery are proposed to be installed.

	Items of machinery	Nos	Value-Rs lakhs
1	Welding machine	1	1.50
2	Brazing machine	1	0.30

3	Rolling machine	1	0.10
4	Buffing machine	1	0.30
5	Drilling machine	1	0.40
6	Compressor	1	0.50
7	Hydro testing machine	1	0.20
8	Furnace	1	1.80
9	Grinders	2	0.40
10	Engineering tools	Lumpsum	0.30
11	Bench grinder	1	0.20
12	Lathe	1	2.00
	Total value		8.00

MANUFACTURING PROCESS

The manufacturing involves the following sequence of operation

Fabrication of Panel and storage tanks

V

Assembly of tank, panel coil and other components

V

Inspection and commissioning

Solar Water Heating System consists of solar collector, insulated hot water storage tank, insulated pipings, control and instrumentation etc. Solar Energy incident on the absorber panel coated with selected coating transfers the heat to the water flowing in the riser pipe underneath the absorber fins. The water passing through the raiser is then delivered to the insulated storage tank and the same water is re-circulated through the collector throughout the day till the maximum temperature is achieved.

It is available from minimum 100 LPD (Litre per day) Capacity for both domestic and commercial application. It can deliver hot water at 60 Deg. C for domestic application and 80 Deg. C for commercial application.

It is available in the multiples of 100 litres in the market. For 100 LPD (Litre per day)

Capacity Solar Water Heating System, we need 1 no. of Solar Collector of 2 sq. mtr area. It requires 4 sq. mtr shadow free area for installation on the roof.

RAW MATERIALS

The raw materials required for a typical 100 litres per day solar water heater is given below.

	Items required		Total value
	Copper plate		
	Aluminum plate		
	MS sheet		
	Pipes		
	Glass fibre		
	GI sheets		
	Thermostat		
	Insulation materials		
			Rs10400

LOCATION LAND AND BUILDING

The infrastructural facilities required for the project by way of land and building are the following.

Built up area-Sq.ft	1000
Rent p.m.-Rs	10000
Advance-10 months. Rs	100000

UTILITIES

The utilities required for the project are the following

POWER

Three phase	KW	8.00
Power charges	Rs.lakhs p.a	1.01
Water-For process-	Litres per day	0
For human consumption		200

MANPOWER

The manpower requirement for the project is given below.

		Monthly wages	Total
Skilled	1	6000.00	6000.00
Helpers	2	4000.00	8000.00
Accountant	1	5000.00	5000.00
sub total			19000.00
Add benefits	20%		3800.00
Total per month			22800.00
TOTAL PER ANNUM-Rs. lakhs			2.74

SCHEDULE OF IMPLEMENTATION

The project can be implemented within a month's period after making arrangements for the finance.

COST AND PROFITABILITY

Assumptions

Installed capacity	180 Solar Water heaters per annum
Capacity utilisation	Year-1 -60% Year -2 -70% Year-3 onwards- 80%
Selling price	Rs.17000 per water heater
Raw materials	Rs.10400 per piece

Power	Rs.1.00 lakh per annum at 100%
Wages and salaries	Rs. 2.14 lakhs with increase 5% every year.
Repairs and Maintenance	Rs.0.30 lakh per annum
Depreciation	Written down value method -15 % on machinery
Selling general and administrative expenses	Rs.8000 per month
Interest on Term loan	12% per annum
Interest on working capital	12 % per annum
Income tax	33.22 % on profits

NOTES:

1. Soft loan is available from Indian Renewable Energy Development Agency Limited (IREDA), New Delhi under MNES Interest Subsidy Scheme. Loan can be extended for both domestic and commercial application for any capacity of Solar water heating system. The principal with the interest is repayable in 6 years (including one year moratorium period).

Ministry of Non Conventional Energy Sources (MNES) is providing Interest Subsidy to promote the solar water heating systems through IREDA and few Nationalized Banks so that end users/ customers can take soft loan at lesser interest rate.

Apart from the above, few states are providing additional subsidy to promote the solar water heating concept and made mandatory for certain buildings, government buildings etc. to use solar water heating systems.

The Government of India (MNRE) is providing soft loan @ 2% to domestic users, 3% to institutional users not availing accelerated depreciation and 5% to industrial / commercial users availing depreciation through IREDA and Public / Private sector banks etc. Capital subsidy equivalent to upfront interest subsidy @ RS.1100/- per sq.m of Collector area will be available to registered institutions and Rs.825/- per sq.m. of Collector area to registered Commercial establishments that do not avail soft loans.

The Tamilnadu State Government had also earlier provided subsidy to domestic and institutional users for installing the Solar Water heating systems. But now, it has been restricted to providing 100% cost for installation in Government institutions.

For technical guidance please contact

1. Secretary

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3. Solar Energy Centre, MNRE, B-14, CGO Complex Lodhi Road, New Delhi – 110003. Telefax : 0091-11-24360331?

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Opportunities for Collaboration

The Solar Energy Centre invites individual professionals working in solar energy or institutions having an interest in similar activities to build-up a mutually beneficial relationship through joint projects which could exploit each others strengths. The Centre has been working jointly on a number of projects with National Institutions such as the IITs, the NPL, the Indian Agricultural Research Institute, the Energy & Resources Institute, etc. It is also collaborating with reputed international institutions such as the National Renewable Energy Laboratories (NREL) of USA in the photovoltaic area; University of Stuttgart, Germany in the area of solar thermal testing; and with Inter-solar Centre of Moscow in the area of solar energy.

4. School Of Energy, Environment & Natural Resources, Madurai Kamraj University, Madurai 625021

FINANCIAL ASPECTS

1. COST OF PROJECT

	[Rs.lakhs]
Land & Building (Advance)	1.00
Plant & Machinery	1.00
Other Misc. assets	0.10
Pre-Operative expenses	0.20
Margin for WC	0.17
	<u>2.47</u>

2. MEANS OF FINANCE

Capital	1.72
Term Loan	0.75
	<u>2.47</u>

3. COST OF PRODUCTION & PROFITABILITY STATEMENT

	[Rs.lakhs]				
Years	1	2	3	4	5
Installed Capacity	180	180	180	180	180
Utilisation	60%	70%	80%	80%	80%
Production/SalesNos	108	126	144	144	144
Selling Price	Rs.17,000	per Solar cooker			
Sales Value (Rs.lakhs)	18.36	21.42	24.48	24.48	24.48
Raw Materials	11.23	13.10	14.98	14.98	14.98
Power	0.60	0.71	0.81	0.81	0.81
Wages & Salaries	2.74	2.79	2.85	2.90	2.96
Repairs & Maintenance	0.30	0.33	0.36	0.40	0.44
Depreciation	0.15	0.13	0.11	0.09	0.08

Cost of Production	15.02	17.06	19.10	19.18	19.26
Selling, Admin, & General exp	2.40	2.52	2.65	2.78	2.92
Interest on Term Loan	0.09	0.08	0.06	0.06	0.06
Interest on Working Capital	0.04	0.04	0.04	0.04	0.04
Total	17.55	19.70	21.85	22.06	22.28
Profit Before Tax	0.81	1.72	2.63	2.42	2.20
Provision for tax	0.00	0.57	0.87	0.80	0.73
Profit After Tax	0.81	1.15	1.76	1.62	1.47
Add:	0.15	0.13	0.11	0.09	0.08
Depreciation					
Cash Accruals	0.96	1.28	1.87	1.71	1.55
Repayment of Term Loan	0.00	0.19	0.19	0.19	0.18

4. WORKING CAPITAL:

	Months Consumptions	Values	%	Margin Amount	Bank Finance
Raw Materials	0.50	0.47	25%	0.12	0.35
Expenses	1.00	0.05	100%	0.05	0.00
		0.52		0.17	0.35

5. PROFITABILITY RATIOS BASED ON 80% UTILISATION

$\frac{\text{Profit after Tax}}{\text{Sales}}$	=	$\frac{1.76}{24.48}$	7%
$\frac{\text{Profit before Interest and Tax}}{\text{Total Investment}}$	=	$\frac{2.73}{2.82}$	97%
$\frac{\text{Profit after Tax}}{\text{Total Investment}}$	=	$\frac{1.76}{1.72}$	102%

Promoters Capital

1.72

6. BREAK EVEN LEVEL

Fixed Cost (FC):

	[Rs.lakhs]
Wages & Salaries	2.85
Repairs & Maintenance	0.36
Depreciation	0.11
Admin. & General expenses	2.65
Interest on TL	0.06
	<hr/>
	6.02

Profit Before Tax (P) 2.63

$$\text{BEL} = \frac{\text{FC} \times 100}{\text{FC} + \text{P}} = \frac{6.02}{8.66} \times \frac{80}{100} \times 100$$

56% of installed capacity