

HP State Cooperative Milk Production Federation

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General Information

Description of the company : HP Dairy State Co-operative has several milk plants across the state. The Duttanagar milk plant in Tehsil-Rampur Bushar, District Shimla, was built in 2011 and has a staff size of about 50 personnel. Between 34,000 and 40,000 litre milk are processed per day. Beside fresh milk products about half of the milk is processed to milk powder.

Type of Industry : Dairy

Location of the company : The solar system is installed on the roof of the milk plant at:
HP Mild Fed. Ltd.,
Milk Plant Duttanagar, Tehsil,
Rampur Busha, District Simla,
Himachal Pradesh.

Heat demanding processes : Steam is used for pasteurization, cream separation, hot water jackets for ghee production, butter making, in curd preparation, paneer preparation and evaporation in powder plant.



Conventional heat supply : A steam boiler with 2.5 TPH steam capacity generates steam at 110°C at a pressure of 6 to 7 kg/cm².
(TPH = tons per hour)

Conventional fuel used : High speed diesel (HSD) is used at the steam boiler, which costs about Rs. 57.5 per litre. On an average 700 litres of HSD is used per day in the boiler. This accounts to 255,500 litres of HSD per year considering 365 days of plant operation.

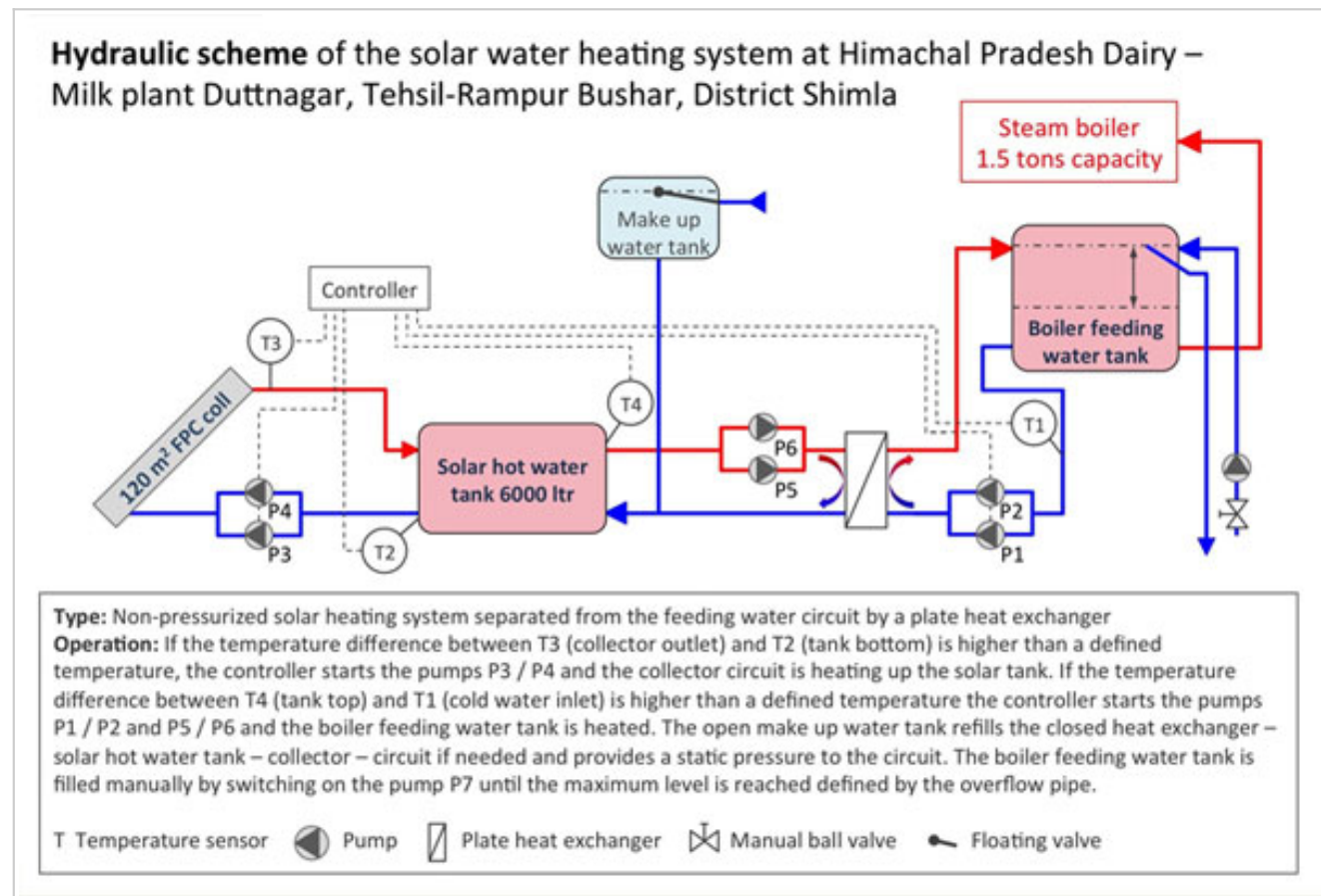
Motivation to use solar thermal energy : The increase in the fuel prices has motivated the management to go for other non-conventional applications of solar energy.



Description of the solar thermal system

Type of solar plant	:	Non-pressurized FPC solar water heater plant for preheating of steam boiler feeding water. The SWHS is designed to deliver about 6000 LPD hot water with 60OC. (FPC = flat plate collector, LPD = litre per day)
Year of installation	:	The SHIP was commissioned in 2013.
Solar collector field	:	 The SWHS has 60 FPC panels with selective coating of 2 X 1 m size with a total gross area of 120 m ² . The panels are installed over the flat roof of the plant. There are 5 collector fields connected in parallel. The collector field is oriented towards south-east.
Water storage tank	:	 The water storage tank has a volume of 6000 litre. It is insulated with rock wool of 100 mm thickness and protected by an aluminium cladding.
Water storage	:	The insulated water storage tank is of 6000 LPD capacity made of SS 304. It is insulated with a 48kg/m ² rock wool of 100 mm thickness and an aluminium cladding.

Hydraulic scheme and operation of the system



Supplier/ manufacturer of the solar system : The solar system was designed, delivered and commissioned by:
KotakUrja Pvt Ltd
No.378,10th Cross,4th Phase,
Peenya Industrial Estate,Bangalore
www.kotakurja.com

Data recorded : The plant maintains records for the HSD consumption each day.

Energy balance

Heat demand : In the average about 700 litre high speed diesel (HSD) is used per day or 250,000 litre per year. This corresponds to an energy demand of 5.5 Mio kcal or 6.4 MWh per day and 1990 kcal or 2300 MWh per year.

(Assumptions on HSD: Gross caloric value of 11,000 kcal/kg, density 0.71 kg/litre)

Solar radiation-on site : The site receives an annual solar irradiation between 3.4 to 5.0 kWh/m² per day.

Useful solar energy delivery : Will be calculated based on monitoring results

Fuel saved by solar energy : Will be calculated based on monitoring results

Solar fraction : Will be calculated based on monitoring results

Emissions saved : Will be calculated based on monitoring results

Economy

Investment costs : Investment costs of collector fields: INR 1.086 Mio (EUR 13,600) and for the 6000 litre storage tank: INR 0.581 Mio (EUR 7,300). Total investment costs: INR 1.667 Mio (EUR 20.800).
This corresponds to total investment costs of INR 14,000 (EUR 175) per m² collector area.

Subsidies : MNRE grant are INR 13,200 (EUR 165) per collector, which corresponds to INR 792,000 (EUR 9900) or 47.5% of total costs.

Economics of the SHIP

: The payback period is calculated as:

Payback period [years] = Net investment costs of owner [INR] / annual savings [INR/year]

The calculation will be based on the monitoring results

Experiences

Operation experience

: The system has been functioning well.

Statement of the owner

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Rakesh Kumar Chauhan (Production Manager): "I am very satisfied with the solar hot water system, the temperature of the collector field reaches typically 60°C as expected."

Statement of the supplier/manufacturer

: The manufacturer has also indicated that the plant has been functioning to their satisfaction.
