

Dairy reduces its heating costs using solar thermal technology

Background

A co-operative dairy operates a large milk processing facility of 1,200,000 litres per day (lpd) capacity at Bengaluru, Karnataka, South India. The facility has two LPG-fired boilers and one furnace oil-fired boiler, each of 4 TPH capacity.

Problem

As part of their continuous improvement drive, the management of the dairy wished to save on process heating costs. They invited A.T.E. to develop and install a customized solar thermal solution for their needs.

Solution

After an audit and extensive discussions with the dairy on the process requirements, A.T.E. proposed a solution to provide hot water at 90°C as feed water to the boiler. The solar thermal solution was designed with high-efficiency compound parabolic concentrators (CPC). The system was sized to deliver on average 8,500 lpd of hot water at 90°C for 9 months of the year (160 MWh_{th} annually).

System Description

The system comprises a primary circuit with the array of CPC modules, a secondary circuit with storage tanks to store the heat and a process integration circuit. The heat transfer liquid (water treated by reverse osmosis) circulating in the closed-loop primary circuit is heated in the CPC modules, and then exchanges its heat with softened water in the secondary circuit. This hot water in the secondary circuit is stored in stainless steel tanks. When the temperature of the water in the tanks exceeds a

threshold value, process pumps transfer the hot water to the applications. The entire system is designed for reliable and automated operation including start-up and shut-down to maximise the use of solar energy. In addition, a remote monitoring solution permits instantaneous, daily, and monthly performance to be viewed at a glance.

Results

Over a period of 25 days in winter of 2017-18, this solar thermal installation produced 11 MWh_{th}, thus saving the dairy 1.12 tonnes of LPG and avoids about 2.4 tonnes of CO₂ emissions. Annually, this solar thermal installation will save the dairy nearly Rs. 1 million, and reduce its CO₂ emissions by more than 34 tonnes.



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