

Dairy opts for concentrated solar thermal technology to reduce its heating costs

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 a 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 customised solution for their needs.

Solution

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

System Description

The concentrated solar thermal 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, the remote monitoring solution provided with the solar thermal installation makes it possible to monitor the performance of the system in real time/daily/monthly, anywhere, anytime.

Results

In a span of just 25 days in winter of 2017-18, this concentrated solar thermal installation produced 11 MWh_{th}, thus saving the dairy 1.12 tonnes of LPG and prevented emissions of about 3.3 tonnes of CO₂. Annually, this solar thermal installation will save the dairy nearly Rs. 1 million, and reduce its CO₂ emissions by about 47 tonnes.



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