

Dairy reduces its heating costs using concentrated solar thermal technology

Background

A co-operative dairy operates a milk processing facility of 2,00,000 liters per day (lpd) capacity at Bellary, Karnataka, South India. The facility operates two furnace oil-fired boilers of 1 TPH and 2 TPH capacities and requires hot water at 90°C for the following process heat applications: boiler feed water, clean-in-place (CIP), crate washer, and pasteurization.

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 install a customised solar thermal solution for their needs.

Solution

After extensive discussions with the dairy on the process requirements, A.T.E. proposed a customised concentrated solar thermal (CST) solution to provide hot water at 90°C as feed water to the boiler, to the crate-washing and CIP sections, and to the pasteurisation process. The roof-mounted CST solution was designed with high-efficiency compound parabolic concentrators (CPC) and was sized to deliver an average 15,000 lpd of hot water at 90°C for 9 months of the year (283 MWh_{th} annually).

System Description

The CST 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. 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 early-winter of 2017, this concentrated solar thermal installation produced 30 MWh_{th}, thus saving the dairy 3.7 tonnes of furnace oil, and prevented emissions of about 11.5 tonnes of CO₂. Annually, this solar thermal installation will help the dairy save Rs 1.1 million, bolstering its bottom-line and also reduce its CO₂ emissions by about 108 tonnes.

