

Integration of Solar Energy into Milk Processing

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Abstract

Milk processing plants are huge consumers of power because of the process heating and cooling required in the different processes e.g., pre-heating, pasteurizing, refrigeration and other processes like bottle filling and sealing. Take pasteurizing, for example, heating litres of water to 90°C using Kenya Power grid-tied electricity is costly leading to high operation costs. This poses a threat to the future of such industries. An evaluation of the total energy consumed in the Kiwama milk processing plant, located in Nanyuki, was done. For the pre-heating process of the milk, wood fuel and electricity are used. The use of wood fuel may not be sustainable due to the current climate change being experienced with one of the causes being deforestation. Other processes such as pasteurizing and cooling use grid-tied electricity which cost them a monthly average cost of KSh130,926 in 2021. To reduce energy costs, the installation of solar panels and a solar water heating system was recommended. For the solar PV system, 24 solar panels each rated 400 W would meet 57% of the facility's power demand. This translates to an average monthly savings of KSh74,181. For the solar water heating system, two solar water heaters are required each with a hot water tank capacity of

200L and flat plate collectors of area 2.5m². This will save the facility a monthly average energy cost of KSh6,726 and eliminate reliance on wood fuel. This way the facility will also be contributing to Kenya's Vision 2030 goal of having zero carbon emissions.

Keywords: milk processing, solar, pasteurizing