

Energy Analysis of an Ejector Based Solar Assisted Trigeneration System for Dairy Application

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Abstract : This paper presents an energy analysis of a solar assisted trigeneration system using an Ejector for dairy applications. The working fluid in the trigeneration loop is Supercritical CO₂. The trigeneration system is a combination of Brayton cycle and ejector based vapor compression refrigeration cycle. The heating and cooling outputs are used for simultaneous pasteurization and chilling of the milk. The electrical power is used to drive the auxiliary equipment in the dairy plant. A numerical simulation is done with Engineering Equation Solver (EES), and a parametric analysis is performed by varying the operating variables over a meaningful range. The results show that the overall performance index decreases with increase in ambient temperature. For an ejector based system, the compressor work and cooling output are significant output quantities. An increase in total mass flow rate of the refrigerant (primary + secondary) results in an increase in the compressor work and cooling output.

Keywords : trigeneration, solar thermal, supercritical CO₂, ejector

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