



CO₂ High-Temperature Heat Pump for Vegan Cheese & Dairy Alternatives

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Abstract

The vegan dairy producer New Roots AG in Emmental (Switzerland) has implemented an innovative energy concept featuring a CO₂ (R744) high-temperature heat pump (HTHP) to sustainably produce plant-based cheese and dairy alternatives. The HTHP technology provides both process heat and cooling without the use of fossil fuels, which is essential for processes such as pasteurization, fermentation, cleaning, and refrigeration during product manufacturing and storage.

The core system includes a transcritical CO₂ HTWP and a 40,000-liter stratified water storage tank, enabling efficient seasonal energy management and heat recovery from waste heat streams.

Since March 2021, the installation has demonstrated reliable operation, reducing CO₂ emissions by a factor of 10 compared to conventional vegan cheese production through targeted heat recovery and smart energy control. The CO₂ HTHP achieves heating temperatures of up to 105 °C and a cooling supply of around 10 °C, supporting diverse processing needs, including soft cheese, raclette, fondue, and yogurt alternatives. Excess low-temperature energy is discharged into groundwater, maintaining system balance.

This case exemplifies how advanced refrigeration and HTHP technology facilitate fossil-free, energy-efficient production of vegan dairy products, highlighting a scalable pathway for climate-friendly food manufacturing aligned with circular economy principles. Supported financially by EnergieSchweiz, this project demonstrates significant potential to decarbonize heat-intensive food-processing operations.

Literature references:

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