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Energy balance and economic feasibility of shallow geothermal systems for winery industry

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The search of energy efficient solutions has not yet been accomplished in agro-food constructions, for which technical studies and orientations are needed to find energy efficient solutions adapted to the environment. The main objective of this investigation is to evaluate the effectiveness of using shallow geothermal energy for the winery industry.

World wine production in 2009 stood at 27100 millions of litres [1]. World spends 320 billion Euros on wine a year, according to industry insiders. On average, it is estimated that producing 1 litre of wine sold in a 75 cl glass bottle costs around 0.5–1.2 Euros /litre [2]. The process of ageing the wine could substantially increase production costs. Considering the time required for the aging of wine (months or years) and the size of the constructions, the use of an air conditioning system implies a considerable increase in energy consumption.

Underground wine cellars have been in use for centuries for making and ageing wine. Ground thermal inertia provides protection from outdoor temperature oscillation and maintains thermal stability without energy consumption [3]. Since the last century, production of wine has moved to buildings above ground that have several advantages: lower construction cost, more space, etc. Nevertheless, these constructions require a large energy consumption to maintain suitable conditions for the ageing and conservation of wine. This change of construction techniques is the cause of an increase in energy consumption in modern wineries. The use of shallow geothermal energy can be a good alternative to take advantage of the benefits of aboveground buildings and underground constructions simultaneously.

Shallow geothermal systems can meet the needs of heating and cooling using a single installation, maintaining low energy consumption. Therefore, it could be a good alternative to conventional HVAC systems. The main disadvantage of geothermal systems is the high cost of investment required. This paper analyzes the use of shallow geothermal systems in wineries, studying its feasibility versus conventional HVAC systems. A comparative analysis of six European locations will be performed.

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