

Increasing the competitiveness and sustainability of winemaking industry: An improved energy and process optimization strategy for solar heat integration

Y. Lara^{a,*}, A. Lozano^a, A.M. López-Sabirón^a, L. Royo-Pascual^a, P. Royo^a

^a*CIRCE Foundation: Parque Empresarial Dinamiza. Avda. Ranillas 3D, 1^a Planta, 50018 Zaragoza, Spain*

Abstract

The fast population growth is positioning the food and agro-industry as important energy intensive sectors, accounting for more of 25 % of the global energy consumption. These industries involve traditional processes that are very energy demanding and mainly dependant on fossil fuels which, currently, are forced to increase production ratios rapidly. Consequently, the agro-industrial sector requires well oriented actions, or even multipurpose measures, in favour to provide a sustainable growth of the sector. In this sense, there is a great potential of improvement considering two main aspects: replacing conventional energy sources by renewable energy and optimizing the energy flows within the processes. Combining both approaches under the same strategy is the real challenge to maximize energy savings and to reduce CO₂ emissions at these production sites. This work proposes and evaluates an efficient pathway based on pinch analysis for the process optimization of the total production site including the integration of solar technologies in the winemaking sector. This research faced with the challenges of pinch analysis, typically used in continuous processes, to manage the non-continuous demand and supply of heat existing in winemaking processes and solar energy. Under this situation, a holistic view based on methodological approaches for the identification of optimized integration points for coupling the supply and demand is required. As a result, an optimal integration pathway to maximize the solar heat integration and processes optimization within the plant is achieved.

Keywords: Solar integration, Agro-industry, Pinch analysis, Multi-objective optimization

*Corresponding Author

Email addresses: ylara@fcirce.es (Y. Lara), ailozano@fcirce.es (A. Lozano), lroyo@fcirce.es (L. Royo-Pascual), proyo@fcirce.es (P. Royo)