

indirect steam system and water as heat transfer fluid, as it avoids many inconveniences.

In terms of sizing, the most limiting parameter is the available surface area, and conditions such as direct radiation and shading must be checked.

A design has been proposed for an experimental prototype, with solar power equal to 56.4 kW, whose performance will be studied through the planned operational tests.

Acknowledgements

The authors would like to thank Junta de Extremadura and FEDER (Fondo Europeo de Desarrollo Regional) for their support through the economic aid for research groups GR18137, as well as Research, Development and Renewable Energies for the improvement of the business clusters in Centro, Extremadura and Alentejo (0330_IDERCEXA_4_E).

References

- [1] M. Mokhtar et al, "Direct Steam Generation for Process Heat using Fresnel Collectors", *International Journal of Thermal & Environmental Engineering* (2015). Vol. 10, pp. 3-9.
- [2] S.H. Farjana et al, "Solar process heat in industrial systems - A global review", *Renewable and Sustainable Energy Reviews* (2018). Vol. 82, pp. 2270-2286.
- [3] International Energy Agency, *World Energy Outlook 2020*, OECD Publishing, Paris (2020).
- [4] J. Zhu and H. Huang, "Design and thermal performances of Semi-Parabolic Linear Fresnel Reflector solar concentration collector", *Energy Conversion and Management* (2014). Vol. 77, pp. 733-737
- [5] R. Abbas et al, "Design of an innovative LFC by means of optical performance optimization: A comparison with PTC for different latitudes", *Solar Energy* (2017). Vol. 153, pp. 459-470.
- [6] P. Boito and R. Grena, "Optimization of the geometry of Fresnel linear collectors", *Solar energy* (2016). Vol. 135, pp. 479-486.
- [7] E. Bellos, "Progress in the design and the applications of Linear Fresnel Reflectors - A critical review", *Thermal Science and Engineering Progress* (2019). Vol. 10, pp. 112-137.
- [8] R. Abbas et al, "PTC or LFC? A comparison of optical features", *Solar Energy* (2016). Vol. 134, pp. 198-215.
- [9] M.J. Montes et al, "A comparative analysis of configurations of LFC for concentrating solar power", *Energy* (2014). Vol. 73, pp. 192-203.
- [10] N. Kincaid et al, "An optical performance comparison of three concentrating solar power collector designs", *Applied Energy* (2018). Vol. 231, pp. 1109-1121.
- [11] S. S. Sahoo et al, "Analysis of heat losses from a trapezoidal cavity used for Linear Fresnel Reflector system", *Solar Energy* (2012). Vol. 86, pp. 1313-1322.
- [12] M. Cagnoli et al, "Analysis of the performance of LFC: Encapsulated vs. evacuated tubes", *Solar Energy* (2018). Vol. 164, pp. 119-138.
- [13] F. Huang et al, "Optical performance of an azimuth tracking linear Fresnel solar concentrator", *Solar Energy* (2014). Vol. 108, pp. 1-12.
- [14] J.A. Quijera et al, "Integration of a solar thermal system in canned fish factory", *Applied Thermal Engineering* (2014). Vol. 70, pp. 1062-1072.
- [15] T.G. Walmsley et al, "Integration options for solar thermal with low temperature industrial heat recovery loops", *Energy* (2015). Vol. 90, pp. 113-121.
- [16] R. Silva et al, "Modeling and co-simulation of a parabolic trough solar plant for industrial process heat", *Applied Energy* (2013). Vol. 106, pp. 287-300.
- [17] B. El Ghazzani et al, "Thermal plant based on PTC for industrial process heat generation in Morocco", *Renewable Energy* (2017). Vol. 113, pp. 1261-1275.
- [18] F.J. Sepúlveda et al, "Analysis of Potential Use of LFC for Direct Steam Generation in Industries of the Southwest of Europe", *Energies* (2019). Vol. 12, 4049.
- [19] A. Franco, "Methods for the Sustainable Design of Solar Energy Systems for Industrial Process Heat", *Sustainability* (2020). Vol. 12, 5127.
- [20] Soteris A. Kalogirou, "Solar thermal collectors and applications", *Progress in Energy and Combustion Science* (2004). Vol. 30, pp. 231-295.
- [21] G. Morin et al, "Comparison of LF and PTC power plants", *Solar Energy* (2012). Vol. 86, pp. 1-12.
- [22] N. El Gharbi et al, "A comparative study between PTC and LF reflector technologies", *Energy Procedia* (2011). Vol. 6, pp. 565-572.
- [23] K. Vignarooban et al, "Heat transfer fluids for concentrating solar power systems - A review", *Applied Energy* (2015). Vol. 146, pp. 383-396.
- [24] J. M. Sancho Ávila et al, *Atlas de Radiación Solar en España utilizando datos del SAF de Clima de EUMETSAT*, Agencia Estatal de Meteorología (2012).
- [25] M. Schlecht and R. Meyer, *Concentrating Solar Power Technology: Principles, Developments and Applications*, Woodhead Publishing (2012), pp. 91-119.
- [26] F.J. Sepúlveda et al, "Development and design of a software tool for optical simulation of Fresnel collectors", *V Congreso Ibero-Americano de Empreendedorismo, Energía, Ambiente e Tecnología* (2019).
- [27] J.A. Duffie and W.A. Beckman, *Solar Engineering of Thermal Processes*, third ed., John Wiley & Sons, New York (2006).
- [28] T. Sarver et al, "A comprehensive review of the impact of dust on the use of solar energy", *Renewable and Sustainable Energy Reviews* (2013). Vol. 22, pp. 698-733.