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SOUTENANCE DE THÈSE D'IDOWU IBRAHIM

Idowu IBRAHIM soutiendra sa thèse LISV en co-tutelle avec l'Afrique du sud (université Tshwane University of Technology) au LISV le 17 décembre 2020 à 10h heure française. La soutenance aura lieu en visioconférence.

Développement d'un Système Chauffe-Eau Solaire Avec Poursuite Pour la Maximisation du Rendement et Réservoir de Stockage avec Isolation en Matériaux composites

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La thèse d'Idowu IBRAHIM est une thèse en co-tutelle entre l'UVSQ/LISV et l'université Tshwane University of Technology d'Afrique du sud.

Title : Development of Smart Parabolic Trough Solar Collector for Water Heating and Hybrid Polymeric Composite Water Storage Tank

Keywords : Modelling, System optimization , System performance , Renewable energy

Abstract : In recent years, various energy sources and methods have been us ed to heat water in domestic and commercial buildings. The known sources for water heating include electrical energy and solar radiation energy in the urban regions or burning of firewood in the rural areas. Several water heating methods may be us ed such as electrical heating elements, solar concentrators, flat plate collectors and evacuated to be collectors. This thesis focus e s on ways to further improve the system's performance for water heating through the combine d us e of solar energy and solar concentrator technique. Furthermore, the study proposed an alternative design method for the hot water storage tank. The solar collector - supporting frame was designed and analysed using Solidworks ®. The forces acting on the structural members were simulated to determine th e capacity of the frame to sustain the load, and the possible regions on the supporting frame, which could potentially fail while in operation. Energy performance was simulated for five years of operation using Matlab Simulink ® software. This simulation was based on the use of three different data. The first is a five-year weather database of the City of Tshwane in South Africa. The second is a hot water consumption profile for a typical household. The third is the cost of additional heating with electricity depending on the time of use. This simulation allowed the validation of the choices of the different elements of the heating system. This study allowed the development of an approach for the design of a solar heating system by optimising the dimensions of the different elements for a typical household and a specific region. In addition, the use of polymeric materials and other materials like polyurethane, salt and aluminium is possible for the development of a hot water storage tank based on their inherent properties. Extending the findings in this thesis will further improve the designs for solar concentrator technologies and solar water heating systems. Therefore, some recommendations and suggestions are highlighted in order to improve the overall system design, analysis and performance.