PROJECT DETAILS

Project Title

Energy, Exergy Analyses and Thermal Improvement of Parabolic Solar Trough Collector

Project Summary: aims, significance, expected outcomes and potential research impact.

This study proposes a new performance enhancement method using a twisted tube in the absorber section of the parabolic trough solar (PTC) collector instead of a smooth tube. For this, a couple of twisted tubes with different pitch numbers are chosen to improve the heat transfer/fluid dynamic characteristics and to improve the overall efficiency of the PTC. The use of mono and hybrid nanoparticles in the heat transfer fluid is another important enhancement technique topic that will be covered in this study. Experiments are set and will be conducted in-door and out-door in similar working conditions to better understand the geometrical parameters of twisted tube, nanoparticle mixing ratio and working conditions such as inlet temperature and flow rate. The magnetic field effect on the nanofluid is also covered in this study, and parameters such as magnetic field strength and frequency will be studied by generating the electromagnetic field near the absorber tube. In this way, thermal and hydraulic boundary layers are disrupted, and it is expected that this study will provide considerable heat transfer improvement, which has a significant impact on lowering the surface temperature of the absorber tube and increasing the overall performance. This improvement in performance enhances utilization ratios in various purposes of PTC such as water heating, space heating/cooling, refrigeration, industrial process heat, electric power generation, distillation, drying, cooking, desalination, and refrigeration. However, electricity generation is more important for utilizing PTC as Australia's energy relies on traditional sources, with coal and gas accounting for around 70% of electricity generation.

Preferred applicant skill set, describe the capabilities of the HDR applicant (*maximum 100 words*)

This PhD proposal needs a self-motivated PhD candidate with excellent organisational and time management skills, problem-solving and project management skills. The PhD candidate with strong quantitative skills including knowledge in heat transfer/fluid dynamics with high interest and passion in solar energy research and familiarity with experimental design and method is desired.

Contact person for the project:

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