LoT-NET Seminar

Design, develop and prototype a novel building integrated solar thermal vacuum flat plate collector for water and space heating

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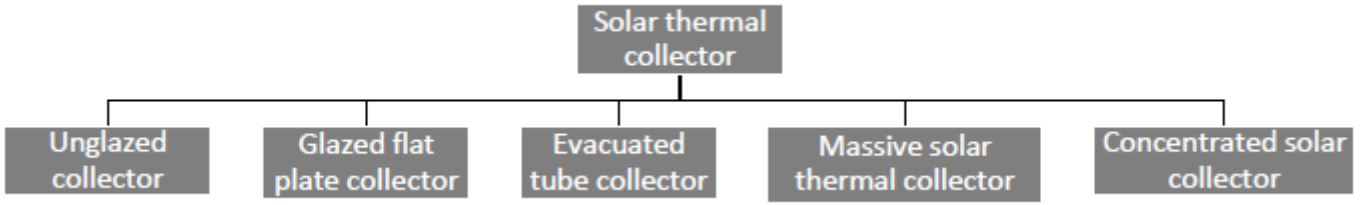
My PhD work

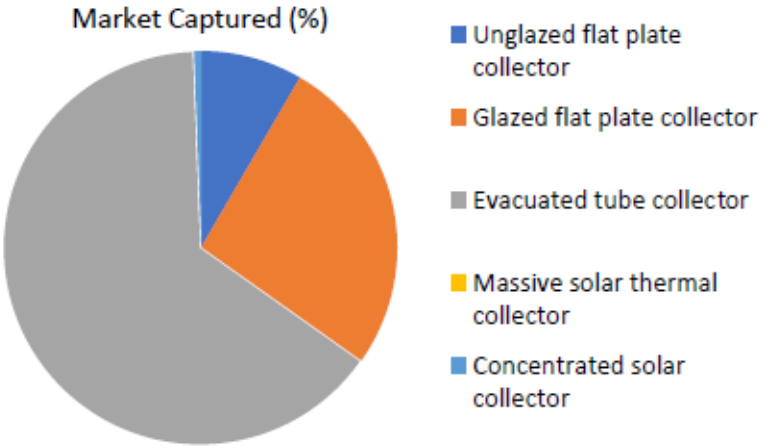
- Design, development and prototype of a novel solar thermal collector which can
  - potentially deliver a working fluid at 150-200^{o}C efficiently
  - minimise heat losses using vacuum insulation technology
  - retain the vacuum for a minimum 15-20 years
  - be easily integrated in the building envelope facades or on the roof.

- Applications
  - provide heat to charge a compact thermal storage unit
  - direct utilisation for water and space heating
  - provide heat to drive absorption chillers
  - industrial drying and cooking

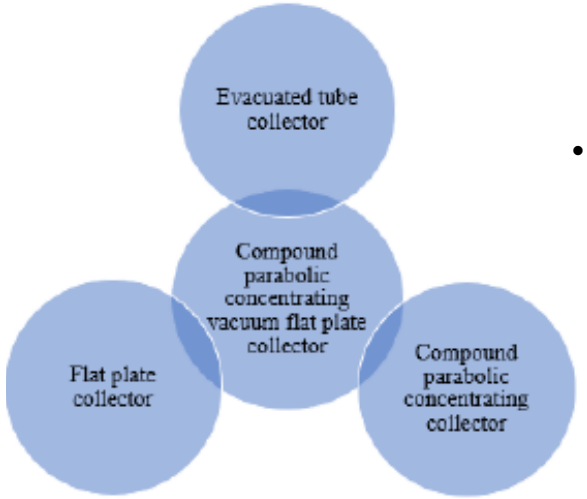
Design Concept



Types of solar thermal collectors



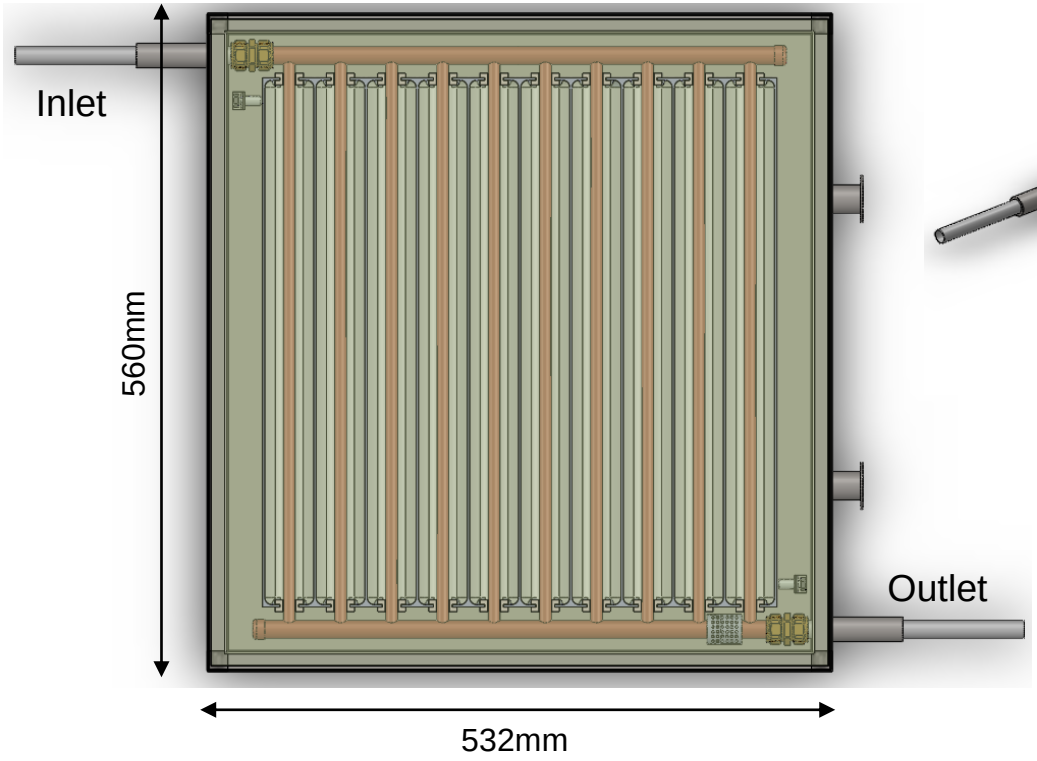
Market captured by various thermal collectors

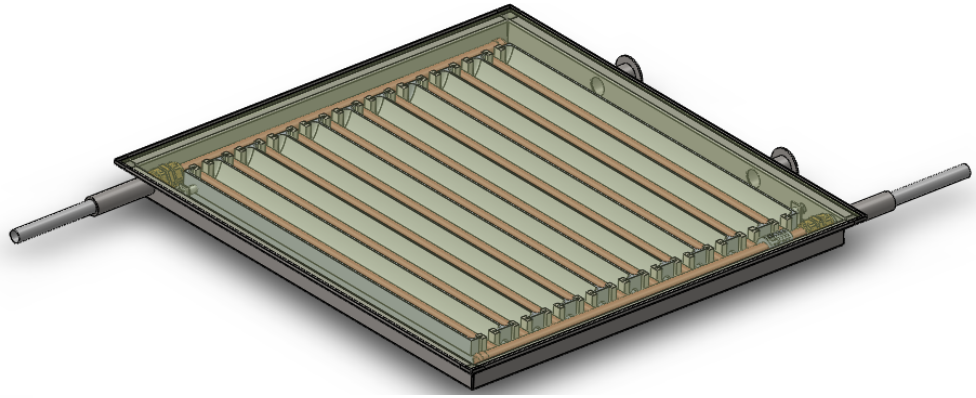


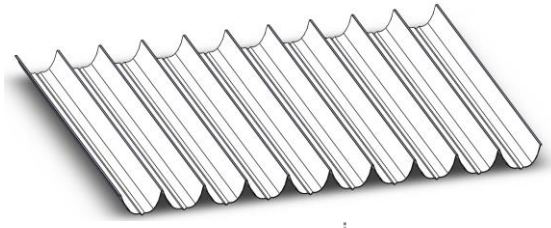
Novel design concept for solar thermal collector

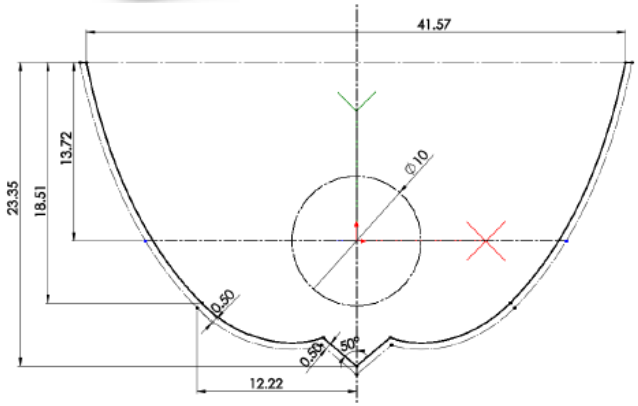
- Flat plate collector + Concentrator = Novel Solar thermal collector
- Compound parabolic concentrator can work without tracking requirement and also manufacturing imperfections don't affect solar radiation distribution to a greater extend
- Using vacuum insulation of evacuated tube to minimise the heat losses

Assembly Design Details

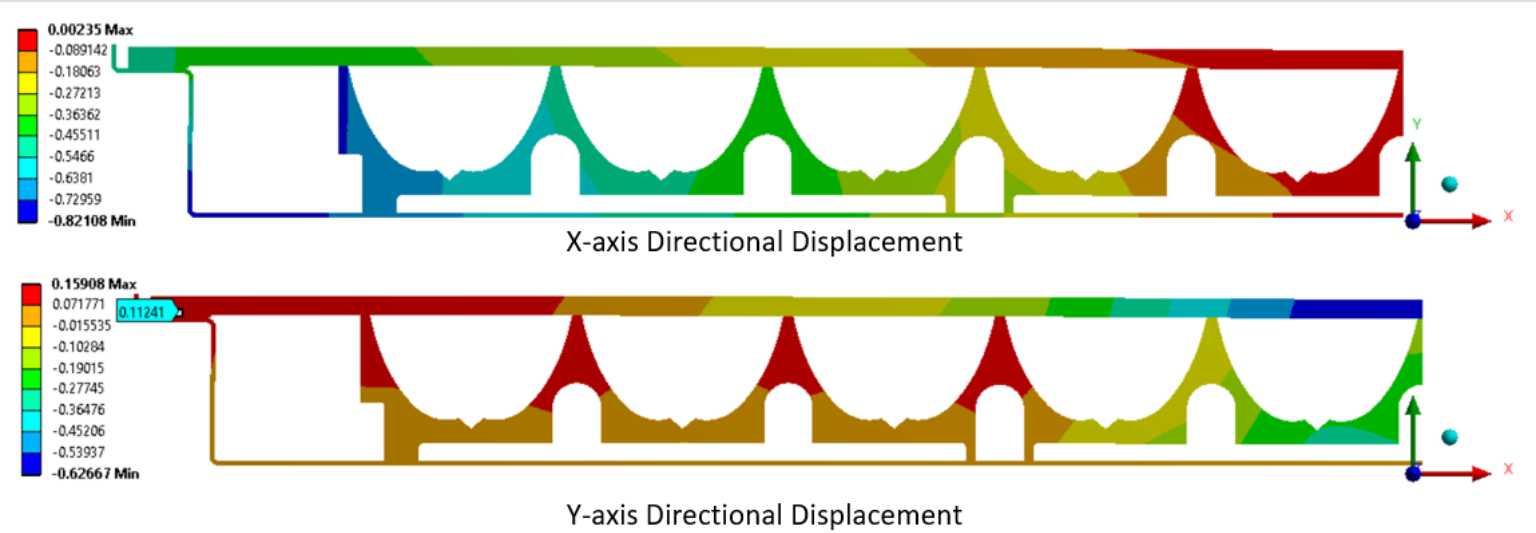




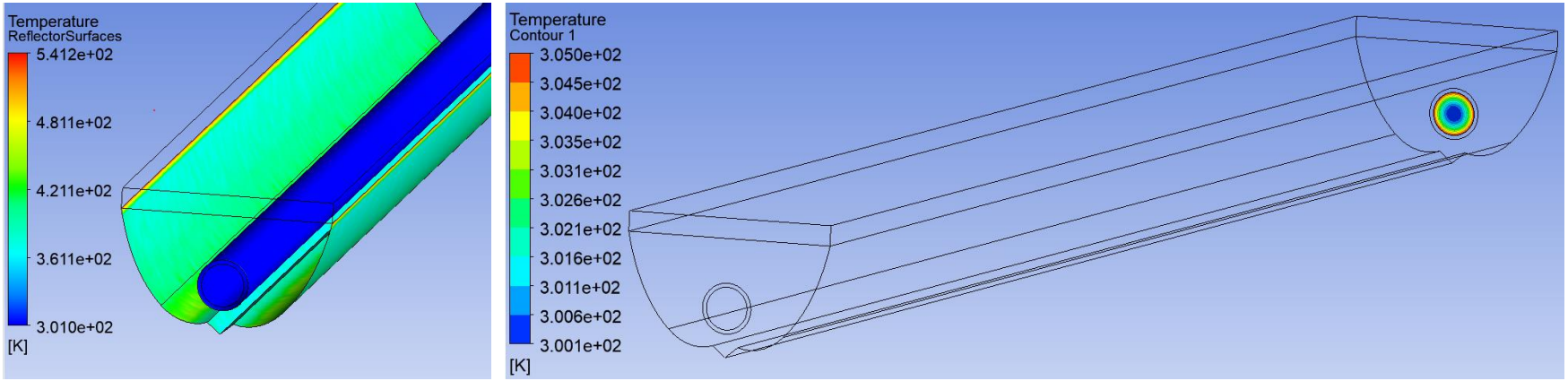




Simulation Results



Thermo-Structural simulation results – FE Analysis



Radiation model simulation results – CFD Analysis

Thank you for the attention!

Any questions?