

Modelling of airflow and temperature distribution in natural convection mixed mode solar dryer

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The efficient performance of solar dryer is mainly affected by distribution of temperature and airflow inside the dryer. This research focused on improving airflow and temperature distribution in a natural convection mixed mode solar dryer design is an adaptation of the design that was developed by Hohenheim University in Germany. The airflow and temperature distribution were simulated by CFD tools under different operation mode and in no load conditions whereby, existing and the new dryer design geometries were subjected to simulation. Models were created by using Solid Works software and Gambit tool was used for grid generation, followed by simulation with Fluent Package software. The design which predicts promising results was developed into three dimensional stakeholders and its features were adopted in modification of the existing dryer that was constructed in a previous study. Results obtained from computer simulation were compared to those obtained through experiments results. The percentage of error between experimental and simulation results for air heater and drying section was found to be 10.3% and 8.0% respectively. The existing design was found to have improved thermal and flow field distribution compared to the new designs. The design is therefore recommended for further improvements and applications.