

# **Simulation of A Localized Heating System for Broiler Brooding to Improve Energy Performance**

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## **Abstract**

The aim of this work is to evaluate the performance of an innovative localized solar-assisted pen heating system for brooding using a 3D computational simulation model of the heated space. The warm air-curtained pen ensures acceptable temperature, air velocity, relative humidity, and air quality that meet the ventilation and heat requirements for a typical pen of 100 chicks as recommended by the American Society of Heating Refrigeration and Air Conditioning Engineers and American Society of Agricultural and Biological Engineers. The supply flow characteristics and the simulated velocity and temperature field of the curtained region were determined such that they meet the ventilation requirements and comfort criteria. Results show that air supplied at 40\_C is capable of delivering the desired microenvironment at bird level while the heat input to the unit is 685W when outdoor temperature is \_5\_C. The system's energy performance was then analyzed using a prototype of 16 pens. The energy consumption of the new heating scheme consumed one third of the energy required by conventional non-localized system. Moreover, integrating the new design with a solar system utilizing parabolic concentrators provided 72% of the power load from solar energy during a winter flock operation and 100% during other seasons. Copyright © 2013 John Wiley & Sons, Ltd.