



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



DEVELOPMENT OF A SOLAR THERMAL STORAGE SYSTEM SUITABLE FOR THE FARMHOUSE HEATING IN NORTHEAST CHINA

MOON-KI JANG¹

¹Shenyang Agricultural Universtiy, China, jmk2000@daum.net

CSBE100884 – Presented at Section II: Farm Buildings, Equipment, Structures and Livestock Environment Conference

ABSTRACT A passive solar radiant floor heating system suitable for farmhouses in northeast China was designed and the heating performance of the system was analyzed. To design the passive solar radiant floor heating system, this study analyzed the weather data in this region (solar radiation, temperature, humidity, light levels, etc), the heating characteristics of the building materials (windows, doors, walls, roofs etc), and the indoor thermal environment of the existing farmhouse. Based on the analyzed weather data the heating load was calculated (9.86MJ/h) as well as the size of the thermal storage element (1.7m³ in volume) and the area of the collector element (11.23m²). The passive solar radiant floor heating system was designed to be used for heating during the winter and cooling in summer. To evaluate the heating performance of the system, the system was established in a standard energy saving-type farmhouse and the indoor thermal environment was analyzed. This study measured the indoor temperature and humidity in a room that used the system and was compared to measurements from a typical farmhouse room. The results of the passive solar radiant floor heating system design and it's heating characteristics analysis performed in this study would be beneficial to improve farming villages environment and the use of renewable energy.

Keywords: passive solar house; radiant floor heating system; energy-saving farmhouse; indoor thermal environment; pebble bed storage