

Development of the drying room by solar thermal energy for hay production ⁽¹⁾

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Abstract

The purpose of this study was to develop an energy-saving drying system for hay production by taking into account the forage quality and the energy efficiency. Solar thermal energy was a rich and green energy and was the major energy used in this drying system to reduce fossil energy and electricity consumption. From the result of drying simulation by laboratory oven, it showed that the moisture content of fresh alfalfa thatch with 10 centimeter thickness could be reduced to a safe storage standard level with moisture content 15% after 8 hours drying at 50°C in the solar dryer. The prototype drying system was designed to include forage loading, drying and unloading systems, and could be operated by semi-automatic way. According to the records in the drying room, the temperature in the drying room could reach 50°C and the high temperature could last until 4:00 pm, when the outdoor temperature was 28°C at 9:00 am. The relative humidity was below 20% during this period. The design of air circulation and dehumidification devices could improve the uniformity of the indoor environment and increase hay drying efficiency. The average drying rate of alfalfa during the day could reach 6.1%/h. Compared with electric drying, the drying room could save 99% of energy consumption and reduce carbon emission. It was suggested that the solar dryer might have used solar thermal energy with high potential applied in producing high quality hay for pets and experimental animals.

Key words: Hay, Low-carbon energy, Solar drying.

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