

Title Analysis of heat transfer in insulation package during transportation
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Abstract

Introduction: The use of insulation package is increasing in distribution of heat sensitive goods including chillen foods, fresh produce products, pharmaceuticals and horticulture products in order to maintain the desired temperatures and preserve product quality. In this study, we describe a mathematical model for the thermal experience of product in expanded polystyrene (EPS) box in the presence of a gel refrigerant with packing cover during transportation. **Materials and Methods:** To simulate the temperature response of a product during transportation, water in a plastic container was placed with or without a packing cover inside the EPS box. The temperature profiles of water were measured under various ambient temperatures (25°C, 30°C and 35°C). The temperature data from various positions were collected using 10 k-type thermocouples connected to a data logger. **Results and Discussion:** The heat transfer for the system consists of a combination of convection, conduction and radiation. A mathematical model was derived using basic heat transfer principles. The calculated overall heat transfer coefficients for 25°C, 30°C and 35°C are 0.682, 0.798 and 0.803 W/m².K, respectively. In the presence of the packing cover, they are 0.556, 0.519 and 0.546 W/m².K, respectively. The model was validated by comparing predicted temperature with measured value, and to use this model, we can conjecture the product temperatures in various external conditions of ambient temperature.