

Title Experimental and numerical modelling comparison of thermal performance of expanded polystyrene and corrugated plastic packaging for fresh fish

Author Björn Margeirsson, Radovan Gospavic, Halldór Pálsson, Sigurjón Arason and Viktor Popov

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Abstract

Experiments were carried out to compare the thermal performance of wholesale fresh fish boxes made of corrugated plastic (CP) and expanded polystyrene (EPS). Free standing boxes containing whole, fresh fillets were exposed to dynamic thermal loads. The chilling effect of frozen ice packs was studied by including them in some of the boxes. The frozen ice packs proved efficient for protecting fresh fish fillets against temperature abuse. Furthermore, the results show that the insulating performance of EPS is significantly better than the insulating capacity of CP. Maximum fish temperature of 16.1 °C (CP) and 11.0 °C (EPS) were recorded inside the thermally abused boxes without ice packs, initially at 1.9 to 2.1 °C and stored for 6.1 h at a mean ambient temperature of 19.4 °C. The fish temperature distributions during thermal abuse were studied with a numerical model for both packaging types, applying effective thermal properties of the sandwich-structured CP box. The purpose of the model was to cost effectively improve the packaging design. A satisfactory agreement between numerical results and experimental results was obtained.