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# Experimental analysis of heat transfer and airflow in a closed refrigerated display cabinet

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## Abstract

This study presents the experimental investigations on heat transfer and airflow in a closed refrigerated display cabinet. Air and product temperatures and air velocity were measured with thermocouples and a hot-wire anemometer, respectively. Temperature variation in the cabinet depends on the positions. The front areas contributed to higher temperature, whereas the rear areas were at a lower temperature. Benefits of doors were also examined by comparing the results of air and product temperatures with the case without doors. The cabinet with doors provided less temperature heterogeneity ( $\Delta T_{\max} = 2.1^{\circ}\text{C}$ ) compared to the case without door ( $\Delta T_{\max} = 4.9^{\circ}\text{C}$ ). The maximum air velocity in the air curtain of  $0.6 \text{ m}\cdot\text{s}^{-1}$  was observed at the discharge grille. The horizontal air velocity from the perforated plate was low ( $< 0.2 \text{ m}\cdot\text{s}^{-1}$ ) for all shelves. The loading percentage in the cabinet did not significantly affect the airflow rate through the perforated plate.

**Keywords:** Closed refrigerated display cabinet; Heat transfer; Temperature; Airflow; Velocity; Experimental study

## Nomenclature

A Area,  $\text{m}^2$

$D_h$  Hydraulic diameter ( $D_h = \frac{4A}{P}$ ), m

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