

**DESIGN CRITERIA FOR ENERGY EFFICIENT VERTICAL AIR
CURTAINS IN DISPLAY CABINETS**

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ABSTRACT

Refrigeration accounts for half of the energy usage in a supermarket. Open vertical display cabinets have a large energy requirement and are commonly used. The reason is that a large open display area makes it possible to display a large amount of food products on a small surface area in the store. On the other hand, energy balance considerations and experimental results show that infiltration is the predominant heat gain of open display cabinets. The cooling demand of an open vertical display cabinet is strongly influenced by the specific enthalpy in the ambience. In order to design energy efficient vertical display cabinets with more uniform storage temperature, the most important task for the designer is to enhance the efficiency of the air curtain. The purpose of the present work has been to describe a method to evaluate the air curtain energy efficiency taking the storage temperature and the stability of the air curtain into account. Furthermore, the influence of the air curtain height, width and inlet velocity on the efficiency has been described. The work has been performed in a combination of experimental work and simulation with Computational Fluid Dynamics (CFD). The result shows that wide air curtains are more efficient than narrow ones. In order to achieve the stability of the air curtain and a proper storage temperature in the food, there is a minimum inlet velocity for every combination of height to width of the air curtain.