



Refrigeration Developments and Testing Ltd

RD&T Case Study

Developing and testing novel air guides for open fronted retail display cabinets

Company: Fridgeland

Background

Saving energy is always a target for retail display cabinet manufacturers. The technologies that have most overall benefit tend to be generic and are capable of being applied universally. The use of guides or deflectors on open fronted cabinets have the potential to reduce air infiltration and consequently energy. Their use has received limited development and therefore little information is openly available to prove their benefits. RD&T were therefore delighted to be approached by Paul McAndrew, the MD of Fridgeland (a supplier of commercial refrigeration equipment) who had developed an idea to apply a novel air guide to retail display cabinets. Paul wanted the concept to be independently assessed before making a decision to further develop the technology for sale.

The concept that Fridgeland proposed was to use air guides attached to the front of the shelves in an open fronted multi-deck cabinet to guide the air down the front of the cabinet. However, Fridgeland did not know whether the idea would work and, if it did, what the energy benefits would be. They also did not know what the optimum geometry of the guides would be and whether this was critical to the successful use of the air guides.

Mathematical modelling

RD&T suggested using computational fluid dynamics (CFD) to initially assess the idea and suggest any improvements to the design as this would be cheaper than testing a cabinet. It would also provide a greater understanding of how the cabinet air flow interacted with the air guides. As results were required within a short timescale a two dimensional CFD model of a multi-deck cabinet was created. The infiltration heat load of the model with and without the air guides was predicted.

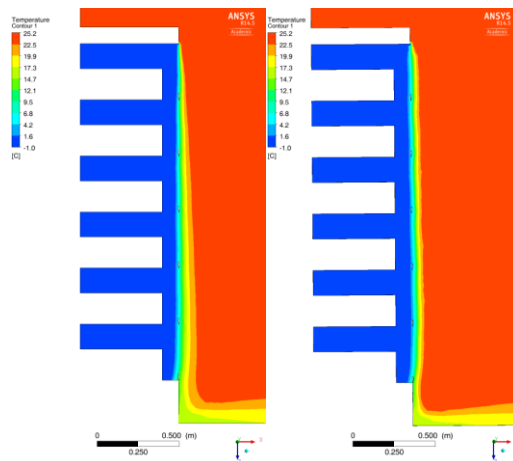
The picture below shows the temperature contours with (right), and without (left) the guides. More cold air is shown to spill from the cabinet (higher infiltration heat load) without the guides than when the guides were fitted. The reduction in entrainment was predicted to be 34%. As a multi-deck cabinet has an infiltration heat load of approximately 70%, this would equate to an overall reduction in heat load of 24%. Testing

Testing

It is always good practise to validate a CFD model with real tests, as a CFD model will use simplifications which may have an effect on the results. Therefore a cabinet was tested with and without the guides to the EN23953 test standard. The guides were retrofitted to the front of each cabinet shelf as shown in the picture below.

Adding the Fridgeland air guides to the cabinet reduced the maximum temperature test pack by 0.6°C as well as reducing the energy consumption by 15%. When the cabinet controller was adjusted so that the maximum pack temperatures were the same for the two tests, the air deflectors reduced energy by 17%. Following these positive results Fridgeland have applied for a patent for the air guides. Following the successful granting of a UK patent they will be applying for a global patent. Manufacturers can obtain a licence from Fridgeland in order to build their products with Fridgeland Air Guides. Fridgeland also offer retrofitted air guides for existing multi-decks.

For further information about how RD&T can help verify and validate your inventions or ideas, please contact either Alan Foster or Judith Evans.



The testing carried out by RD&T was independent; RD&T has no commercial link to Fridgeland or the air deflectors. RD&T do not endorse or recommend products.



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