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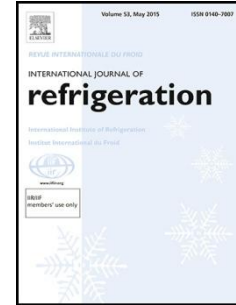
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Investigation into air distribution systems and thermal environment control in chilled food processing facilities

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Abstract

Air flow distribution in chilled food facilities plays a critical role in maintaining the required food products temperature but also its impact on the facility energy consumption and CO₂ emissions. This paper presents an investigation into the thermal environment in existing food manufacturing facilities, with different air distribution systems including supply/return diffusers and fabric ducts, by means of both in-situ measurements and 3-D CFD simulations.

Measurements and CFD simulations showed that the fabric duct provides a better environment in the processing area in terms of even and low air flow if compared to that with the diffusers. Moreover, temperature stratification was identified as a key factor to be improved to reduce the energy use for the space cooling. Further modelling proved that air temperature stratification improves by relocating the fabric ducts at a medium level. This resulted in a temperature gradient increase up to 4.1 °C in the unoccupied zone.

Keywords: Air distribution systems, Temperature stratification, Refrigeration, Chilled food factories, Computational fluid dynamics (CFD).

Highlights

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