

# Accepted Manuscript

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

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PII: S0140-7007(17)30403-6

DOI: <https://doi.org/doi:10.1016/j.ijrefrig.2017.10.019>

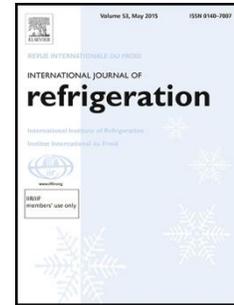
Reference: IJIR 3787

To appear in: *International Journal of Refrigeration*

Received date: 30-3-2017

Revised date: 10-10-2017

Accepted date: 11-10-2017



Please cite this article as: Demetris Parpas, Carlos Amaris, Savvas A. Tassou, Investigation into air distribution systems and thermal environment control in chilled food processing facilities, *International Journal of Refrigeration* (2017), <https://doi.org/doi:10.1016/j.ijrefrig.2017.10.019>.

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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 CO<sub>2</sub> 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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