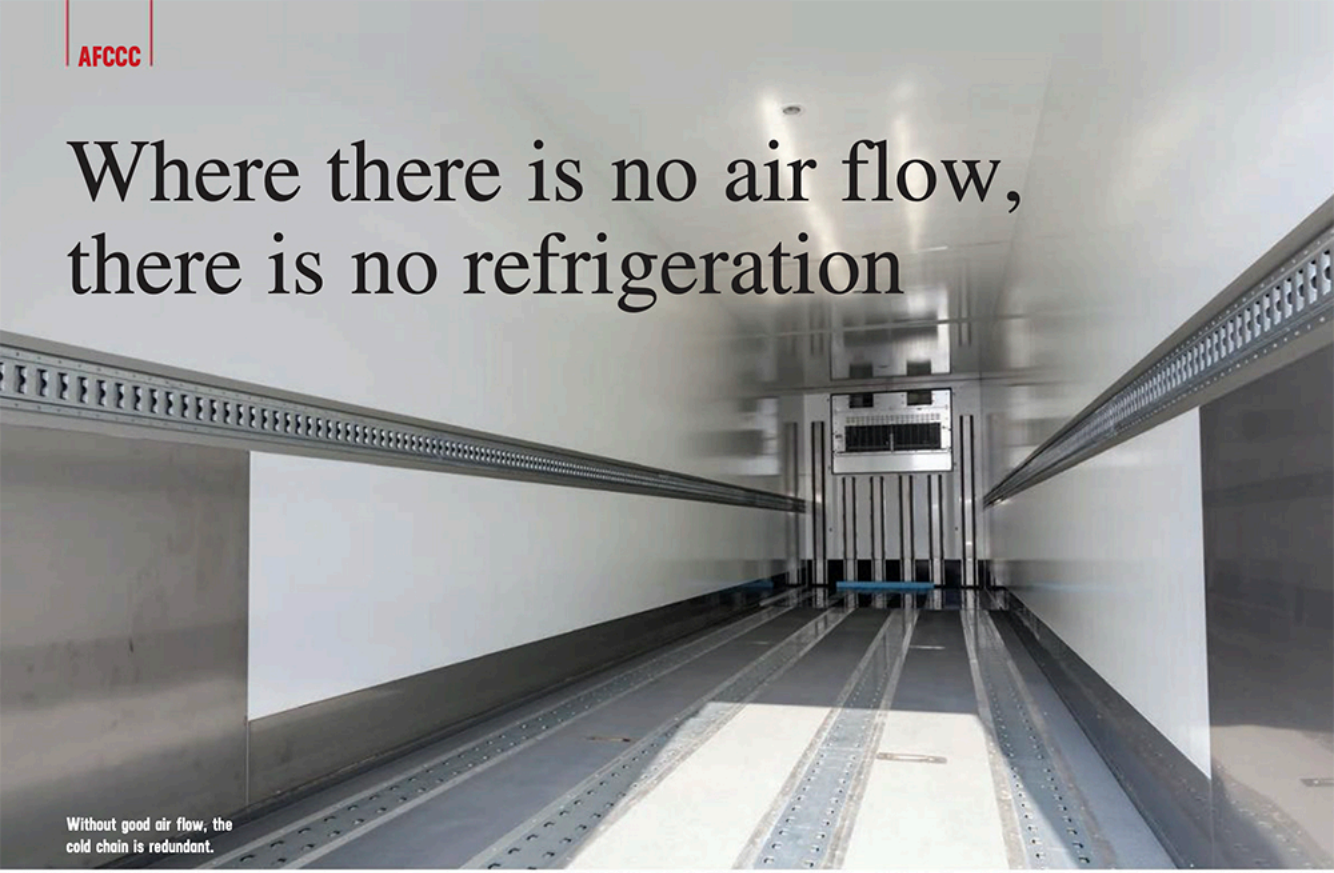
Where there is no air flow, there is no refrigeration



Without good air flow, the cold chain is redundant.

Good air flow is key to the food cold chain. AFCCC chair Mark Mitchell explains why.

At a recent conference devoted to food packaging, I issued this tongue in cheek challenge at the end of my presentation 'before we land on Mars in 2030, surely cold chain logistics must be capable of allowing refrigerated air to flow through a secured carton of food in a truck'.

I had earlier suggested that there was an opportunity for the packaging industry to become the air flow people. Perhaps you can sense the frustration of trying to convince the food and transport industry of the importance of airflow and the role played by packaging, packing, stacking and wrapping.

These four things play a vital role in temperature compliance and they are four very different things. Any of them can block airflow sufficiently to negate convection and introduce conduction, and eliminate the efficiency of good refrigeration.

In so many food transport cases, where we have been called in to investigate temperature abuse, we are astounded to see a perfectly efficient refrigeration system working away trying to maintain temperature in a truck or trailer load of pallets that are jam packed, not only against each other, but against the walls. How do they expect the refrigerated air to circulate?

Good air flow in a truck produces heat convection. This is an essential principle in the refrigeration process, which is crucial for maintaining product temperature during transport. Moving air is what we call forced convection, while still air is free convection. So it follows that where there is no airflow, there is little or no refrigeration.

The minimum refrigerated air velocity to maintain temperatures in intermodal containers (IMC) and trailer applications throughout the whole refrigerated space has to be a minimum of half a metre of air per second. Down at the rear end of a badly packed IMC or trailer, and even in some storage facilities, forced air convection velocities can drop to one-tenth of a metre per second which is barely enough flow to maintain refrigeration capacity.

Responsibility is often unclear when things go wrong, such as temperatures not being maintained because boxes loaded high on a pallet move during transport and touch the wall, or worse, the entire pallet is stacked against the wall. Pallets that are stacked too close to each other will deliver the same temperature failures.

When the Federal Government released the first comprehensive study on food waste attributed to breaks in the cold food chain last year, it listed pallet configurations, and things like stabiliser sheets that can block air flow and create hot spots, as contributing to the staggering $3 billion cost of food waste in fruit and vegetable production alone.

Contributing to the $670 million worth of meat loss was packaging failure in transport and in the retail end of the food chain, such as supermarkets and butchers.

Also quoted in the food waste study was the schedule of commonly observed failures leading to food waste, compiled by the AFCCC.

It won't surprise anyone to note that poor packing, stacking and wrapping was on the list, as was poor airflow in the trailer and poor air distribution in the refrigerated space.

A lack of insulation specifications was singled out by the government study as being one of the main reasons for poor equipment performance. Australia has thermal insulation specifications and regulations covering the majority of built structures via the National Construction Code, yet there are no regulated insulation specifications for walk-in coldrooms, refrigerated vehicles or cold storage facilities.

Also impacting on air space in an IMC or trailer loaded with pallets of food, is the difference in truck widths in Australia compared with other parts of the world. The maximum width of trucks in Australia is limited to 2.5 metres, compared to 2.6 metres in Europe and the United States. This impacts the internal space needed to accommodate international standard pallet widths. This means container walls are limited to 38mm of insulation if two pallets are to be stacked side by side and with pallets at 1,170mm square, only 28mm of clearance is left between pallet and wall, hardly enough for proper air flow. F