

AV+
Automatic ventilation



OPTION

AV+ "More for less"

Let your Star Cool unit take care of fresh air ventilation. Set the desired Oxygen (O₂) or Carbon Dioxide (CO₂) levels and worry no more, but enjoy the energy cost savings and higher relative humidity helping to minimize water loss.

Safe cargo transportation with Star Cool AV+

An important goal in the transport of fresh produce is to ensure that it is in perfect condition when it reaches the supermarket, and that shelf life is as long as possible.

This is achieved first and foremost through accurate temperature control without large fluctuations. Star Cool reefer units take care of this through a narrow range of control (+/- 0.25° C).

The second aspect of safe cargo transport is the right amount of ventilation of the cargo – we call this AV+.

Cargo Respiration

Fresh fruit, vegetables and flowers are all alive and respiring, carrying out a conversion of internal sugars and starches with O₂ from the air, releasing heat, CO₂, water vapor (and sometimes ethylene).

A reduction in O₂ and/or an increase in CO₂ can have detrimental effects on produce. It is necessary to have a process to allow the internal atmosphere of the container to remain the same as the outside air or control the level of O₂ and/or CO₂.

Fresh air

Fresh air brings with it ambient heat and humidity which needs to be removed or conditioned, and which can result in increased evaporator coil frosting, uneven temperature distribution, changes in relative humidity, longer pull-down times for cargo and greater energy consumption.

Manual settings - why run the risks?

The traditional method of the manually adjustable fresh air vent (FAV) opening shows air exchange volume in cubic meters per hour

(CMH), cubic feet per minute (CFM), or percentage open (%).

However, many factors influence the actual air exchange when the reefer is loaded: i.e.

- *Power supply* 50 Hz (vs. 60Hz) and *energy savings software* programs in use today influences the speed of evaporator motors
- *Methods/types of cargo packaging* (pallets, vented cartons, liners etc.) varies the total resistance to air movement in the container
- *The volume of air exchange* on manual FAV settings varies between reefer unit brands
- *The cargo itself* can vary in terms of respiration rates depending on cultivar, stage of maturity, seasonal differences, temperature and handling

Flexible control and added benefits with AV+

AV+ intelligently monitors the concentration of O₂ and CO₂ gases inside the container. If concentrations rise beyond the set levels, a valve automatically opens to let in fresh air. The result is the optimum atmosphere and safe transport of the valuable cargo.

The added benefit of automatic control is improved energy efficiency, as far less warm, humid air enters the container.

Less air needing cooling = less energy consumed = \$\$\$ and carbon foot print reduction.

AV+ always a benefit

AV+ can be beneficial for two groups of commodities; those that are sensitive to elevated CO₂ levels and those that benefit from elevated CO₂ and low O₂ (see overleaf for commodity examples).

Even if you are unsure about the correct levels for your cargo, those that are usually shipped

with the vent "open" without knowing the true ventilation requirements, AV+ can easily take care of the cargo by using the minimum CO₂ set point of 1%. This will ensure the container atmosphere remains almost the same as it is outside, without excessive air exchange and the associated problems.

ADVANTAGES

Power saving

Exact amount of air actually needed is allowed to enter the container. The reduction in ambient air exchange results in less air to cool down & less condensation, resulting in significant reduction in energy use

Temperature control

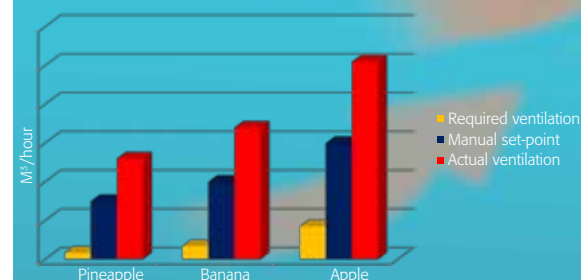
Less time spent defrosting = more time spent at keeping accurate temperature control

Higher humidity

Due to less ice built up, the evaporator runs at higher temperatures and the air is thereby not dehumidified

Faster pull-down

By controlling the entry of ambient air rather than allowing a constant high air exchange, the pull down times can be dramatically reduced



Most cargoes transported today are "over ventilated" resulting in energy waste and possibly reduced cargo quality.

The natural respiration of fruit and vegetables will increase CO₂, while reducing O₂ if left in a closed environment.

AV+ ensures that a safe atmosphere is maintained while minimising the amount of fresh air.

The AV+ valves will open and close to maintain the CO₂ level below, or the O₂ above their corresponding set points.



The CO₂ and/or O₂ set points can be entered via the simple user panel, in the same way that the temperature set point is selected.



Feature

The fresh air valves are activated via the sensor and controller. If required, you can also switch to normal fresh air intake by turning the butterfly wing



Balancing the CO₂/O₂ levels

Perishables will increase the CO₂ level until the control point is reached, whereafter fresh air will be allowed to enter the container

OPTION

Cool performance with AV+



The purchase price is only a fraction of the true cost of owning and operating a reefer

Reducing the Total Cost of Ownership (TCO) for Star Cool reefer machines involves many different aspects.

Your TCO will be reduced by using AV+ through:

- Reduced energy costs due to the reduction of excessive fresh air entering the container
- Better cargo quality as a result of faster pull down and regulated respiration gasses
- Less need for defrosting which gives better cooling performance and reduced energy costs
- A low additional up-front cost



AV+

Products requiring ventilation will benefit from the accurate control of AV+.

Non-exhaustive examples of products which can benefit from AV+, subject to variation in cultivars, region, state of maturity, packaging etc.

Cargoes which benefit from elevated CO₂/lower O₂. (Please refer to your cargo experts for exact O₂ or CO₂ settings)

Group A	Asparagus	Chili Pepper
	Avocado	Lime
	Bananas	Kiwi
	Berries (Blackberry, Blueberry, Raspberry, Strawberry etc.)	Mango
	Broccoli	Melon
	Citrus fruits (Lemon, Lime, Oranges)	Nectarine/Peach
		Papaya
		Pineapple
		Tomato

Cargoes, which are sensitive to elevated CO₂ levels. Here a "safe" AV+ setting is 1% CO₂ max. in order to keep container atmosphere close to ambient atmosphere.

Group B	Apples	Lettuce
	Cucumber	Pear
	Eggplant	Plum

Manual fresh air vent mode required for



Flower bulbs
Other commodities with extremely high fresh air demands

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