

Fundamentals of reefer transport

What is the technology behind the shipping of perishable commodities? How can fruits and vegetables reach consumers in perfect condition, asks *Gino Baldissare*.

Consumers do not usually wonder why bananas harvested in Ecuador or kiwis from Australia get to the corner store in a suitable condition for consumption. A sea crossing of 4 to 6 weeks, in addition to land transport at both origin and destination, seems to be a big challenge. But certain issues relating to procedures and technology are taken into account to ensure product quality for the consumer.

Container Inspection

Before reefer containers are released to receiving customers, they must always pass through a pre-trip inspection, which consists of a long and extensive check of the container and the operation of the reefer machinery. The goal is to ensure that the customer receives only clean and undamaged containers with reefer machinery in perfect condition.

Air circulation

Internal air circulation is essential for maintaining prescribed temperatures in reefer containers. Cold air is constantly circulated through the cargo space to dissipate transmitted heat. This air is blown in at the bottom of the refrigeration unit through the gratings in the ducted floor and then drawn off again below the container ceiling. The circulating fans then force the air through the air cooler, which also acts as the evaporator in the cold circuit, and back through the gratings into the cargo.

Each commodity has different air flow requirements. Inside a reefer container the air flow is influenced by the type of packaging and the method of stuffing used. In reefer containers, there are two standard loading patterns for perishable products: block stow of break bulk cargo and palletized cargo stowage. The height of the cargo must not exceed the red cargo load line, which shows the maximum allowed cargo height, so that ample free space is left above the stow to ensure proper air circulation around the load.

Fresh air ventilation

During transport, fresh fruit and vegetables continue to respire and thus produce gases such as carbon dioxide and ethylene. As these respiratory gases can lead to cargo damage such as uncontrolled ripening, ageing and turning off-flavour, they have to be removed from the container atmosphere. Depending on the respiration rate of the commodity, ventilation vents of a reefer container are usually opened at defined set-points in cbm/h for most fresh fruit and vegetables.

Proper temperature control is the most important factor in maintaining the quality of perishable commodities, because once temperature deviations occur, they cannot be reversed.



For optimal quality, it is therefore critical to maintain proper temperatures from origin all the way to the end consumer.

Atmosphere management

Modified Atmosphere (MA) and Controlled Atmosphere (CA) have become effective means of securing and preserving cargo quality. During transport, post-harvest processes on fruit and vegetables are generally minimized through temperature control and fresh air ventilation. In order to reduce them even further, MA and CA containers have been developed. This special type of reefer equipment can specifically change the gas composition of the container atmosphere in order to enhance the effect of refrigeration and thereby prolong product shelf life. MA is a partly controlled change of air composition, while CA means the technology for constantly measuring and actively maintaining the atmospheric conditions in a reefer container throughout the journey of the shipment.

