



# Carefully to Carry

## Agricultural products in non-refrigerated containers

A wide variety of agricultural products are carried in non-refrigerated containers, either ventilated or standard dry boxes. These include cocoa, coffee, tea, tobacco, dried fruit, rice, nuts, oilseeds, pulses and spices. Fresh fruit and vegetables are more commonly carried in refrigerated containers, although produce such as melons, oranges, potatoes, sweet potatoes, yams and onions are sometimes carried in ventilated or open containers. Careful consideration should always be given to ensure that the choice of container, packaging and dunnage is appropriate for both cargo and voyage. Two frequent causes of major cargo damage are condensation and taint.

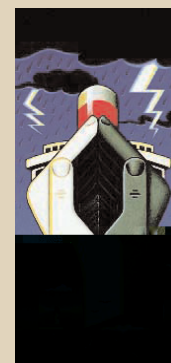
### Condensation (sweat)

Almost all agricultural products have a considerable intrinsic moisture content. These are hygroscopic cargoes; they are in equilibrium with the air in the container and can emit as well as absorb moisture. The amount of water available within a container of such cargoes is much larger than for manufactured goods. Translocation of a comparatively small proportion of the total moisture available may cause substantial condensation problems.

Hygroscopic cargoes change temperature comparatively slowly. Thus, when a container is shipped across climatic zones, the cargo adjusts to the changing ambient temperatures much more slowly than the container walls and the air. This delay can cause considerable temperature differences within the container; these are a major driving force for moisture translocation and condensation.

### Ventilated containers

Ventilated containers include those with passive ventilation openings, open containers and mechanically-ventilated containers. However, these are all comparatively rare, the vast majority of containers having no effective ventilation provision. Although the small air-expansion holes in the walls of standard dry boxes are sometimes called 'ventilation-holes', the air flow through them is insufficient to provide significant protection against condensation.



"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules,  
Articles iii, Rule 2

### Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website [www.ukpandi.com](http://www.ukpandi.com) for more information, or contact the Loss Prevention Department.

The International Cocoa Organization recommends using ventilated containers for all containerised cocoa shipments. Some coffee and cocoa shippers use such containers; however, this is not the standard throughout the trade.

The air inside ventilated containers is largely common with the surrounding air. This may present such additional problems as more ready transmission of taints, and the stowage location onboard requires careful consideration.

### **Desiccants**

During carriage of hygroscopic cargoes in non-ventilated containers, condensation could in principle be prevented if the relative humidity of the air inside the container was kept sufficiently low that its dew point was always below the ambient temperature. This ideal situation is often unrealistic, but the dew point may be lowered, and the risk of condensation reduced accordingly, by using desiccants.

Desiccants (such as silica gel, Møler clay or certain polymers) are water-absorbent and remove moisture from the surrounding air. They may be supplied in bags, specially-lined sheets or as polymer-based paint. Once the maximum absorption capacity of such products is exhausted, they have no further beneficial effect. Thus, when using desiccants, their type and amount must be chosen carefully for the type of cargo and the voyage.

Because of their potential for significant moisture exchange with the air inside the container, hygroscopic cargoes place much greater demands on the capacity and sustained absorption rate of desiccants than do non-hygroscopic cargoes. Desiccants alone are unlikely to prevent condensation in the event of rapid temperature changes of large magnitude.

### **Dunnage, sheets and linings**

A basic precaution for cargoes sensitive to condensation damage is to apply suitable dunnage to separate the cargo from the container's walls and floors. This cannot prevent the formation of condensation, but can greatly reduce its commercial implications. It is often recommended to use kraft paper or similar material to line the walls and floors of containers or as protective sheets on top of the cargo. Since these become quickly saturated they cannot afford significant protection against severe sweat, although they can absorb small amounts of condensation and in some circumstances prevent or reduce staining and similar damage. Sheets placed atop the cargo must be readily permeable to air; plastic is unsuitable for this purpose, as condensation could form between sheets and cargo.

## **Taint**

Many foodstuffs can absorb chemicals and foreign odours from the air. This typically affects their taste and severely affects their commercial value even when there are no significant toxicological implications.

Coffee, tea and cocoa are particularly susceptible to taint. They are traded primarily on their delicate flavour balances, with sophisticated tastings of every consignment being carried out at various stages. A comparatively minor off-flavour or odour causes commercial damage to these high-value cargoes.

Some basic considerations to protect against taint damage are:

- Inspect containers prior to stuffing for odours, previous cargo residues and staining of floorboards. The container should be kept closed for some time until immediately before inspection.
- Containers which have recently been used for the carriage of odorous chemicals should not be used for foodstuffs, even if no detectable odour remains. More generally, operators should consider keeping separate pools of containers designated for chemicals and for foodstuffs.
- Stow containers containing foodstuffs away from strong odours onboard. This is particularly relevant when using ventilated containers, where the air-exchange rate, and thus the potential for transmission of external taints, is much greater than for non-ventilated containers.
- Floorboards, pallets, crates, etc. are often treated with fungicidal wood preservatives containing chlorophenols. These are also contained in mould-inhibitors used on jute bags and the adhesives in some fibreboard cartons. Chlorophenols are themselves a potential source of taint. Although the levels used are usually insufficient to cause commercial problems, they can be converted to chloroanisoles by certain micro-organisms, especially in the presence of excessive moisture such as may result from condensation. Chloroanisoles are an extremely potent source of taint, causing a characteristic musty odour and flavour even in very minute proportions.

This article gives only a general introduction to the potential problems associated with the containerised carriage of agricultural products. Condensation in particular is a complex topic. The above may be of some assistance in identifying key areas of concern. However, if in doubt, specialist advice should be sought.