



Chapter 27 – Cocoa

27.1 Cocoa Beans

Cocoa beans are the dried seeds of the cocoa pod, which is the fruit of the cocoa tree. Cocoa trees are grown in tropical regions of the world. The average number of cocoa beans per pod is 30 to 40.

Following harvesting the cocoa beans are fermented and dried (mainly by the sun).

The cocoa bean is generally of a grey to dark brown appearance (the external grey appearance not necessarily being indicative of inferior quality). The outer shell is brittle and it is the inner 'nib' that is the important part of the cocoa bean. Cocoa beans emit an acidic odour, which varies according to origin. The nib has an odour reminiscent of chocolate.

Cocoa beans are primarily used in the food industry, with alternative uses in cosmetics and, to a limited extent, in pharmaceuticals. The shell is normally discarded, being more or less valueless. The inner nib is used to produce cocoa butter, cocoa liquor, cocoa cake and cocoa powder.

The ideal moisture percentage should be around 7% after drying; the effectiveness of the drying process depends on weather conditions. Cocoa beans are a soft commodity that easily give off moisture during transport from relatively warm countries to relatively

colder countries. It is generally accepted that a maximum moisture content of 7.5% is indicative of stable cocoa beans.

Typical problems with cocoa bean cargoes include:

- Damage due to condensation
- damage by seawater
- slack and missing bags
- damage by hydraulic oil
- infestation.

Traditionally, at the country of origin, cocoa beans are packed into jute bags of 60 to 70 kg per bag and are subject to sanitary certification prior to shipment. As cocoa beans and jute (or hessian or sisal, or even polypropylene from Central South American origin) bags are an ideal medium for harbouring infestation, fumigation is frequently carried out prior to shipment.



Figure 27.1: Cocoa beans packed into jute bags.

Ideally, cocoa beans should be shipped in well-ventilated conditions, particularly for transportation from warm tropical producing areas to colder destinations.

When shipped in traditional breakbulk stowage, adequate ventilation should be allowed, with ample dunnage. In particular, bags should not be stowed directly in contact with the ship's side or bare steelwork and they should be given adequate headspace for ventilation. It is imperative that vessels have ventilation capable of a sufficient number of air changes per hour within the cargo holds. The usual recommendation is between 10 to 20 changes per hour. Ventilation of a cocoa cargo requires that a proper regime, based on external air temperatures, cargo temperatures and relative humidities, is drawn up and implemented, with details recorded.

Respiration and post-fermentation factors result in cocoa beans evolving CO₂, so enclosed space entry procedures must be followed before entering cargo spaces.



Figure 27.2: Container lined with kraft paper.

When shipped in containers, it is preferable that fully/super ventilated containers are employed but these types of containers are not usually available.

All containers should be subject to careful inspection to confirm their integrity, cleanliness and freedom from taint. However, while neither shippers nor consignees can dictate to the carriers the stowage location of containers on board, under-deck stowage within cargo holds that are well ventilated is the best that can be offered.

When cocoa beans are shipped in non-ventilated or dry van containers, there is no control over ventilation of the contents. Dry van containers are subject to condensation problems resulting from cargo being loaded in warm climates with temperatures of 25°C upwards and then shipped to colder climates in Northern Europe, USA, etc. The main cocoa shipping season is during the European winter. The mechanics of condensation forming in containers are well understood and various attempts have been made to reduce the effects, but with limited success.

The recommended dressing is for containers to be lined around the side and front walls and over the floor with a single layer of double-wall corrugated board, and then with a double layer of the same over the top of the stow of bags.

Bags of desiccant (known as dri-bags) are then employed (suspended from lashing points at the top of the side walls in the containers) to absorb moisture during the period of transit.

The most effective desiccants are those that contain more than 65% of calcium chloride.

When cocoa beans are shipped with a higher than desirable moisture content, the incidence of condensation with resultant wetting and deterioration (mostly by way of mould to the cocoa beans) increases considerably.

When bags of cocoa beans are offloaded, any bags exhibiting external wet stains and/or external contamination are usually segregated by the receivers. Bags that have become wet damaged may be externally stained and/or mouldy, and cocoa beans within wet bags may show signs of external bloom (white spotting) as well as

subsequent mould growth development. In instances of heavy wetting, the beans will become blocked together.

If the bags are found to be contaminated with foreign substances, the contaminant should, wherever possible, be identified and/or analysed as to its likely properties, particularly as cocoa beans are generally destined for use in the human food chain.

Cocoa beans from wet damaged bags may be subjected to a reconditioning operation, but only if this is acceptable to the final receivers. If they are food manufacturers, they may be unwilling and/or unable to accept reconditioned cocoa skimmings, which have a lower value for use in alternative (normally non-food) outlets.

Cocoa beans may also be shipped in open or flat-rack containers, or bolsters, which are essentially containers without sidewalls or roof. The bags are stacked on the base of these containers and secured by lengths of timber, held in place by steel bands around the girth of the stow. Although not common practice, this is an effective method of shipping cocoa beans in bags provided that:

- The bags are well stowed on the flat-rack
- the securing timber is clean and dry
- the securing steel bands do not cut into the bags
- bags do not overhang the base section of the container
- tarpaulin covers are available at both the load port and the discharge port that may be used to cover the laden bolster or flat-rack container when rainfall is experienced.

Shipment of cocoa beans in bags on bolsters allows full all round ventilation and, therefore, allows for the dispersal of moisture from the cocoa.



Figure 27.3: Bags that have become wet damaged may be externally stained and/or mouldy and cocoa beans within wet bags may show signs of white spotting and mould.

Cocoa beans are also shipped in bulk within the cargo holds of ships or in bulk within containers. The reason for shipment in bulk is primarily economic, eg a standard 20 ft container can carry approximately 13 T of cocoa beans in bags but approximately 18 T in bulk.

In some instances, a crust of mouldy cocoa beans forms on parts or all of the surface of bulk cargo, which if possible should be removed and segregated to maintain the good overall quality of the bulk.



Figure 27.4: Bulk shipment of cocoa beans.

A crust may also form when cocoa beans are shipped in bulk containers. These are standard 20 ft, non-ventilated containers that are often plywood lined. However, it is very difficult (more or less impossible) to separate the crust within the container and it may reduce the quality of the bulk overall when discharging.

Care must, therefore, be taken in discussing with consignees/receivers ways of solving the problem effectively. It is possible for some receivers to blend cocoa beans, so an allowance for depreciation can be negotiated in respect of bags that contain a percentage of damaged cocoa beans. If cocoa beans are destined for storage for sampling and sale to the *LIFFE Terminal Market*, reconditioning is not permitted, as reconditioned cocoa beans will not be accepted.

Damaged cocoa beans generally retain a good salvage value.

When loading cocoa beans in bulk, special attention should be paid to the following aspects, in addition to normal bulk carrier practice:

- Fresh air should be ventilated over the top of the cargo. Generally speaking, this means that wooden ducts have to be made between the fixed ducts and the top of the cargo. It must be ensured that wooden ducts cannot collapse during the voyage
- the ballast condition should be such that no alterations have to be made during the voyage. Pumping cold ballast water in ballast tanks around the cargo space will result in damage. Good ballast management is important
- attention should be paid to excessive moisture, lumped cocoa beans and infestation
- sources of ignition, such as cigarette smoke, should be kept away from the cocoa beans as their high fat percentage increases the likelihood of them catching fire.

For bulk cargoes, when sailing from warm to cold regions the cocoa beans will lose considerable quantities of moisture. This warm and humid air has to be ventilated out of the hold, therefore the hold must be ventilated as often and for as long as possible. Ventilation openings on the weather deck can be protected from seawater spray in order to continue ventilation. When a vessel enters the discharge port, the covers have to be opened as soon as possible, all weather permitting.

During the whole voyage records should be made of weather conditions and what ventilation has taken place. Changing the ballast condition should be avoided during the voyage.

27.2 Cocoa Butter

Cocoa butter, in its pure prime pressed form, is produced by pressing the inner nib of the cocoa beans. Cocoa butter is the most valuable product of cocoa beans and usually has a distinctive chocolate-like odour. It is of a cream colour and is customarily packed into blocks of 25 kg and packed within polythene-lined fibreboard cartons. Cocoa butter is normally shipped within containers in such packaging.

Cocoa butter is susceptible to the effects of heating and will become soft and malleable at 30 to 32°C and will melt at 32 to 35°C. Having become warm or molten, it can retain the latent heat and remain in such a condition down to as low as 17°C. Depending on the structure of the constituent fats, the effect of heating cocoa butter is to raise the FFA (free fatty acid) level which, in turn, affects the fat structure and the shelf life of the cocoa butter, and any product that it is used to produce. If severe, it will cause the cocoa butter to become rancid. When heated, the cocoa butter will expand which may, in turn, cause it to burst the polyliner packaging of the cartons and seep out, staining adjacent cartons.

Cocoa butter retains its latent heat for a long period of time, aggravating the extent of any damage or stain.

Bacteria will develop on the fat-stained cartons and may well affect the cocoa butter, rendering it unacceptable to manufacturers of human food chain products. If wet damage is sustained to cartons of cocoa butter and if the water is able to ingress into the blocks of cocoa butter within the inner poly packaging, it will cause the cocoa butter to discolour. Wetting of cocoa butter cartons can also result in microbial contamination, rendering the product unfit for human consumption.

If cartons of cocoa butter are found to be infested, fumigation should not be carried out as the chemical residue will be absorbed by the butter and render it tainted and unfit for use in the human food chain. It is preferable to arrange for a careful stripping, examination and sorting of cartons and their contents according to the degree of infestation.

Other grades of cocoa butter are frequently carried in a molten condition in heated stainless steel tanks at a minimum temperature of 35°C, at which cocoa butter remains liquid, and a maximum temperature of 45°C.

Ships' tanks have to be inspected carefully before shipment to confirm their cleanliness and suitability for carriage of cocoa butter. Details of the ship's previous three cargoes should be established.

Similarly, receiving shore tanks should be inspected.

27.3 Cocoa Liquor/Powder/Butter and Cake

Cocoa liquor is produced from roasted cocoa nibs ground to a paste. The heat of the process causes the cocoa butter in the nibs to melt, forming cocoa liquor. It is similar in all respects to cocoa butter, with the exception that it is a much harder product with a lower fat content than cocoa butter and, therefore, is lower in value. It is otherwise subject to the same difficulties.

Cocoa liquor may be pressed to separate it into cocoa butter and cocoa cake. Cocoa powder is produced from ground cocoa cake. It is customarily packed in multi-ply paper bags, which must be handled carefully to avoid tearing/loss of contents. Cocoa powder is more or less inert, although, if it becomes hot, it may smoulder or burn owing to the residual fat content of the powder.

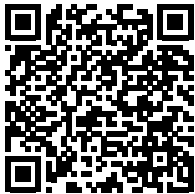
27.4 Issues with Regard to Shipments of Cocoa Carried in Containers

Cocoa products are prone to mildew damage if wet, so great care is required in handling. It is important to line the inside of ventilated containers to absorb moisture. Moisture, before stuffing or shipment, should be below a certain percentage (typically around 7.5% but advice should be sought from the charterer). During the beginning of the cocoa season, the moisture levels are very high and shipowners often ask for a letter of indemnity from shippers.

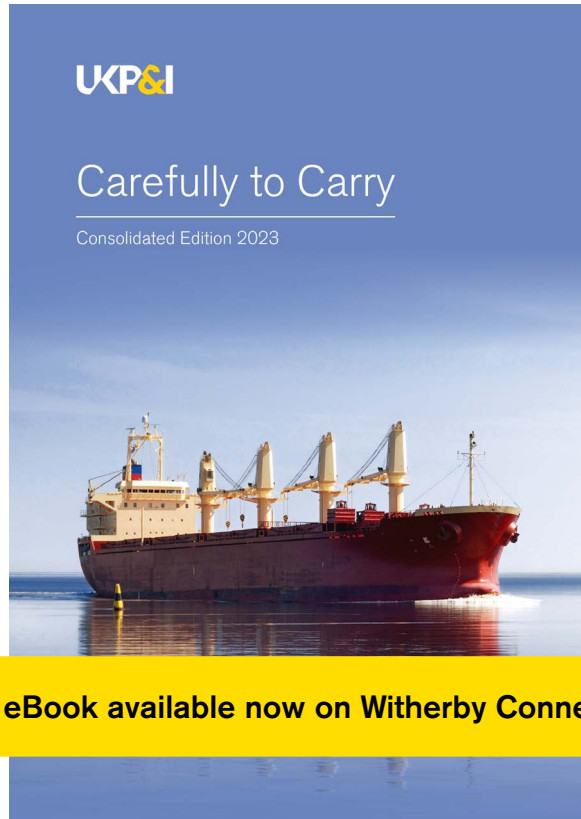


Carefully to Carry

Consolidated Edition 2023



Price: £95



Full eBook available now on Witherby Connect

This comprehensive publication, compiled by the UK P&I Club, details best practice for the carriage, loading and storage requirements of a wide range of cargoes. It also contains essential information on draught surveys and preparing cargo plans.

Outlining and expanding on all major international cargo regulations and guidelines, it also includes detailed checklists, information on draught surveys and guides to preparing cargo plans. Cargoes covered include timber, gas, grain, steel and other metals, bulk goods and refrigerated goods.

WITHERBYS

Purchase the complete title in print and eBook format at shop.witherbys.com