

# Carefully to Carry

SEPTEMBER 2006

## Refined (crystal) sugar

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The Committee is aware that although guidance on the carriage of raw or semi-refined sugar is readily available, little or no information has been published on the carriage of refined sugar.

Not infrequently, substantial claims have arisen on shipments of bagged refined sugar, where the complaint often relates to stickiness or caking of the product, sometimes wrongly attributed to conditions encountered during the voyage.

Unlike semi-refined or raw sugar, refined sugar is always carried in bags. In the past, jute outer bags were widely used with a polythene film inner bag. Nowadays the outer bags are often made from woven polypropylene. The purpose of the plastic inner bags is to keep out moisture but because the outer and inner bags are often stitched together, the seal is not always effective.

Refined sugar is normally a dry, free flowing commodity with very low moisture content.

If the sugar is found on delivery not to be free flowing, it is important to establish whether this is due to:

- Pressure compaction
- Adhesiveness (stickiness), or
- Caking (agglomeration).

Pressure compaction usually occurs as a result of static pressure exerted by the weight of the sugar itself, especially when bags are stacked high. This condition can readily be corrected when the bags are handled and transported. However, adhesiveness and caking of refined sugar are both the result of too high a moisture content and possibly, to some extent, the temperature of the cargo at the time of bagging.

Adhesiveness, resulting in poor flow characteristics, occurs as a result of



**“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.

high moisture content, either initially or after packing. Caking may occur when over-moist sugar dries out.

If the product comes into contact with extraneous moisture such as cargo sweat, this may lead to limited, superficial adhesiveness and to subsequent caking of the sugar at the mouth of the bags. This may also occur where bags have been damaged by stevedores' hooks. Extensive adhesiveness and caking may be caused by excessive moisture at the time of packing, particularly if the caking is found at the centre, extending towards the periphery of the bag, with the sugar crystals at the periphery adhering. This condition may be further affected if, at the time of packing, the temperature of the sugar is high, relative to the ambient temperature. Thus, it is vital that correct practices are observed during the manufacturing process.

It is of crucial importance that, immediately after production, the amounts of so called 'free water' and 'bound water' are at satisfactorily low levels. After processing, sugar is normally left in storage for a relatively short period, with appropriate ventilation, in order to 'condition' or 'mature' the product. The aim of this is to ensure that when the sugar is bagged, its moisture content is at an acceptable low level. If it is not, comparatively hard caking and possibly some adhesiveness can be expected to occur during subsequent storage and transport. When sugar is bagged with a low moisture content (0.02% or less) then there is no risk of adhesiveness or caking being caused by moisture migration. Some sale contracts stipulate a moisture content of '0.1% maximum' but it should not be assumed that such levels are acceptable if caking is to be avoided. Adhesiveness and caking do not affect the chemical nature of the sugar but may not be acceptable depending upon its intended use.

Because most marine reference books are silent on the carriage of refined sugar, it is often assumed that it is a relatively simple product to handle, subject only to the most general stowage and ventilation recommendations. Tight block stowage without height limitation is the customary and acceptable method, the height of the stow being limited only by the height of the cargo compartments. Cargo battens are not necessary as it is generally accepted that a separation of paper or cardboard sheets or of polyethylene or polypropylene cloth between the ship's structure and the bags is sufficient. Ventilation of refined sugar is not necessary under any circumstances. The purpose of cargo

ventilation is to prevent or restrict the formation of condensation or moisture on the ship's internal structure. However, such condensation originates from within the cargo and will occur only when the cargo itself is moist and damp. Because refined sugar has a low moisture content and is enclosed in plastic film, there is no risk of sweat. Under certain circumstances, ventilation may even be detrimental, for example when holds loaded with cold cargo are ventilated with warm air, this can lead to the formation of sweat. Sugar has a low thermal conductivity which means that during the voyage, it tends to remain at the same temperature at which it was loaded, at least in the interior of the stow. If the sugar is loaded cold and later discharged in a relatively hot area, there is a risk of condensation forming during the discharge, on any bags having a temperature lower than the dew point of outside air. In such cases, rapid discharge is necessary in order to avoid any adverse consequences.

## Summary

- The ship's hold before loading, should be clean, dry and free from any noticeable smell.
- Bags should be loaded only if outwardly dry with no apparent lumpiness of the contents.
- No bags to be loaded during any form of precipitation, including rain or snow.
- Cargo battens are not essential; where no battens are fitted, measures should be taken to prevent damage from any protruding cargo batten hooks or fittings.
- A separation of polyethylene or polypropylene cloth or paper sheeting between the ship's structure and the bags is sufficient.
- Tight block-stowage is the customary and acceptable method of stowage.
- If additional cargo is to be carried in the same hold as refined sugar, then this should be 'dry' cargo.
- The hold should not be ventilated; all ventilators and other openings should be sealed.
- The rapid discharge of any bags which may have been loaded at substantially lower temperatures than at the discharge port is necessary, in order to prevent or restrict unwanted condensation on the bags during discharge.