The International Safe Containerised Cargo Organisation

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CINS Guidelines for the Carriage of Cocoa Butter in Freight Containers

A Publication of CINS, the Cargo Incident Notification System

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Contents

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CINS Guidelines for the Carriage of Cocoa Butter in Freight Containers

Introduction

These Guidelines for the carriage of cocoa butter in freight containers have been prepared by a working group comprising Members of CINS Organisation (the Cargo Incident Notification System). The guidance provided seeks to apply the principles set out in the IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code) .

This 2026 edition is an update of the January 2018 version.

It reflects the significant improvements made by the cocoa butter industry and container carriers over the past eight years. It takes into account the unique, easy-to-melt nature of cocoa butter, cargo damage cases observed in recent years, and the increased understanding now available regarding how container temperatures interact with ambient conditions.

Based on these developments, a revision of the previous version was necessary to provide updated information and recommendations.

This version takes into account the comments and concerns of cocoa butter shippers. The objective is to continuously improve the overall quality of cocoa butter container transportation worldwide and to ensure that the CINS Cocoa Butter Guidelines continue to provide clear, relevant, and practical guidance to users.

Acknowledgements

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- ONE (Ocean Network Express)
- PIL
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- TT Club
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1. Cargo Nature

Cocoa butter is derived from whole cocoa beans which are fermented, roasted, and then separated from their hulls. About 54–58% of the residue is cocoa butter. It contains various amounts of saturated fats (57-64%) and unsaturated fats (43-36%).[1]

Cocoa butter becomes soft and malleable at high temperatures and can melt between 30°C and 37°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.

Upon heating, cocoa butter expands and may cause it to burst the packaging and seep out, staining adjacent cartons (see **Appendix II**) and possibly leaking outside of the container or causing damage to the container structure. There have been incidences of cocoa butter melting on board ships, resulting in the clogging of ships' bilges. The figure below left shows a ship's cargo hold bilge well clogged by melted cocoa butter stowed under deck.

A ship's cargo hold bilge significantly clogged by melted cocoa butter

Leaking packages

2. https://www.cargohandbook.com/Cocoa_Butter

2. Freight Container Selection

2.1 General

The majority of cocoa butter is exported from equatorial and tropical countries and transported along routes that are close to or cross the equator. Therefore, it can be expected that the container will experience long periods of high ambient temperatures.

Studies have shown that the air temperature inside the container can be substantially higher than the ambient temperature outside the container. During a sunny day, the temperature can in fact easily reach 20°C above the ambient temperature, i.e. sometimes more than 50°C. (For details, see **Appendix I**)

2.2 Standard Freight Containers

Cocoa butter is generally transported in standard dry freight containers, provided that expected ambient temperatures throughout the transport chain are taken into account when determining appropriate packaging and packing arrangements.

The container used for transport must be structurally sound and cargo-worthy, clean, dry, and completely free from odour, with no signs of pest contamination and no residual odours or allergen traces left by previous cargo, to prevent contamination.

Shipper preferences regarding container selection should also be carefully considered, including the provision of a dry, clean, food-grade (Grade A) freight container specifically suitable for cocoa butter shipments.

Particular attention should be paid to the condition of the container floor, as a wet floor may contaminate pallets and cocoa butter packaging, potentially leading to condensation that can weaken the outer carton packaging. For this reason, containers with wet floors should always be avoided when transporting cocoa butter.

2.3 Reefer Containers

Particularly when transporting through hot climate zones it is recommended that cocoa butter is shipped in reefer containers as it ensures a stable cargo quality throughout the whole transport chain.

It should also be noted that this cargo may be carried in non-operating reefer containers[3], since the insulation may provide sufficient reduction in thermal transfer. Long exposure to sun light may however still permit some heat transfer, resulting in the outermost cartons softening.

When a non-operating reefer container is considered, the potential for heat accumulation inside the container must be carefully evaluated. The heat accumulation phenomenon, which can lead to elevated internal temperatures during transit, is explained in **Appendix I (Section 4)**.

Where it is decided to utilise operating reefers, this will successfully limit the heat transfer to the outermost cargo, so long as an air gap is appropriately maintained around the cartons.

Similar to standard dry containers, refrigerated containers must be inspected prior to stuffing to confirm their suitability for the intended cargo.

3. See http://www.cinsnet.com/wp-content/uploads/2016/01/COA_CINS-NOR-Guidelines-1-August-2017.pdf

2.4 Tank Containers

In specific cases, tank containers are used for the transport of cocoa butter. Such tanks shall be dedicated food-grade, fitted with food-approved seals and gaskets, and provided with a serviceable heating system and intact insulation jacket.

3. Freight Container Packing

3.1 Packaging and Quantity

Cocoa butter shall be packaged in sealed plastic bags and placed within robust cardboard cartons. When transported in dry containers, it is imperative that the cartons are engineered to withstand the total stacked weight, including scenarios in which the cocoa butter may soften due to elevated temperatures. A standard packing method involves placing 25 kg blocks in sealed bags within cartons measuring 40 × 30 × 25 cm. In a 20-foot standard container, up to 800 cartons may be stowed, typically in 8 tiers, resulting in a gross container weight of approximately 22 tons. Stack heights must not exceed the load-bearing capacity of the bottom-most cartons.

To prevent direct contact between the cargo and the container sidewalls and to reduce heat transfer, it is recommended to use a food-grade liner or plywood sheets along the container walls. Additionally, the placement of plywood sheets above the fourth tier can help distribute pressure, mitigate the risk of crushing, and contain any potential leakage from upper cartons. However, it is important to ensure that the liner material used does not retain heat.

As noted in section 2.3, reefer containers will provide protection from radiant heat. Where the refrigeration machinery is operating, it is important that the cartons are packed to allow appropriate air circulation .

In less common cases, cocoa butter may be transported using a Flexitank. If this option is selected, it is strongly recommended to follow the Container Owners Association (COA) Code of Practice for Flexitank use, particularly with regard to the selection of the Flexitank and its compatibility with the commodity. The use of a Flexitank for cocoa butter is always subject to the Carrier's approval.

Illustrations 3.1: Typical inner and outer packaging

3.2 Recommended cargo inspection

A container vanning inspection should be conducted to ensure that cocoa butter is packed and stowed in a manner that preserves its quality during transit. This includes random checks of cartons and their inner linings, with the use of a food-grade polyethylene (PE) liner recommended; the liner should be properly sealed, either by heat sealing or securely folding and taping. The temperature of the packaged cocoa butter should be measured using a probe or thermal thermometer at the time of stuffing.

All cartons should be in good condition, dry, and free from signs of expansion, tearing, or damage. While carton strength may be indicated by an Edge Crush Test (ECT) certificate, this is not mandatory for cocoa butter cartons, and packers may rely on supplier-provided strength data. Stack heights must not exceed the load-bearing capacity of the bottom-most cartons. Inner liners or plywood should be used to prevent direct contact with container walls and to reduce heat transfer, and cargo should be stowed to minimize movement and distribute weight evenly.

4. Transport

4.1 Terminal Operations

A recent study indicates that, whether exposed to direct sunlight or radiant heat while positioned in a shaded location, the internal temperature of a container may remain at undesirably high levels for approximately 6 to 10 hours per day during its stay at a marine terminal in high-ambient-temperature environments.

As illustrated in **Appendix II**, the quality of cocoa butter shipments may be significantly affected during terminal dwell time when ambient temperatures reach 30 °C or higher. The Appendix presents an overview of a cargo damage case involving a shipment exported from Malaysia, transhipped via Taiwan, and delivered to Japan during the summer season.

Terminals rarely offer shaded storage for containers. Dry containers carrying this cargo should be packed and transported to the load port terminal as late as practically possible to minimise the exposure time to sun/heat before being loaded on board the ship.

An additional risk factor to be considered by cargo packers is the time in transhipment hubs where containers are exposed to various weather conditions. The entire routeing of the container should be considered in determining appropriate actions to take in reducing the risks.

Carriers are encouraged to advise shippers to minimize prolonged container dwell times at both the Port of Loading (POL) and the Port of Discharge (POD), in order to reduce potential exposure to adverse weather conditions. Where operationally feasible, Carriers should also seek to limit multiple rollovers at transshipment ports and consider flagging cocoa butter shipments for prioritized loading due to product quality considerations. These measures are intended as operational guidance and should not be interpreted as legally binding obligations.

4.2 Vessel Operations and Stowage

Shipping lines generally expect that cargo has been packed appropriately for the intended carriage and do not provide any guarantee regarding a specific stowage position on board the vessel.

Stowage on deck is recommended to facilitate monitoring and cleaning in the event of spillage, preferably in a shaded area to minimize heat exposure.

When cocoa butter shipments are loaded under deck, they should be kept away from heat sources and not stowed in the same cargo hold with live reefers to prevent them from being affected by radiant heat. The best practices for operating the shipboard bilge system should be followed to prevent bilge system damage in the event of cargo leakage. Before deciding to load cocoa butter shipments under deck, a cargo inspection, as noted in section 3.2, is highly recommended to ensure the risk of melted cocoa butter leaking outside the container is low and at an acceptable level.

5. Cargo Information Exchange

All parties involved in the transport chain must be informed of the contents of the containers to ensure correct stowage and to enable timely inspections for potential leakages.

Effective communication of cargo information among all parties is essential. The use of the SMDG attribute code list in EDI exchanges is strongly recommended. In cases where comprehensive cargo details in the BAPLIE format may not be available, a dedicated special cargo list for cocoa butter shipments should be provided to the Master of the vessel to facilitate proper cargo custody and monitoring at sea.[4]

6. Container’s Internal Temperature (Climate)

Understanding how the container’s internal temperature (climate) behaves during transportation may help stakeholders manage the risk of heat-sensitive cargo damage.

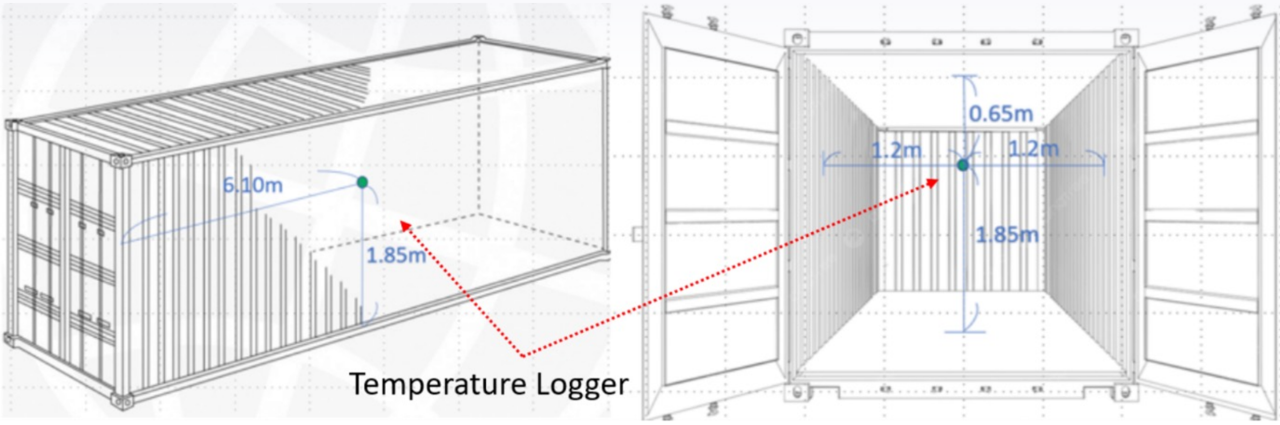
4. SMDG HANDLING, STOWINS, ATTRIBUTES Code Lists | SMDG e.V.
https://smdg.org/documents/smdg-code-lists/smdg-handling-stowins-attributes-code-lists/

Appendix I Container Temperature

I. Container Temperature

APPENDIX I provides references on how container temperatures interact with ambient conditions under various stowage scenarios and in the presence of direct sunlight.

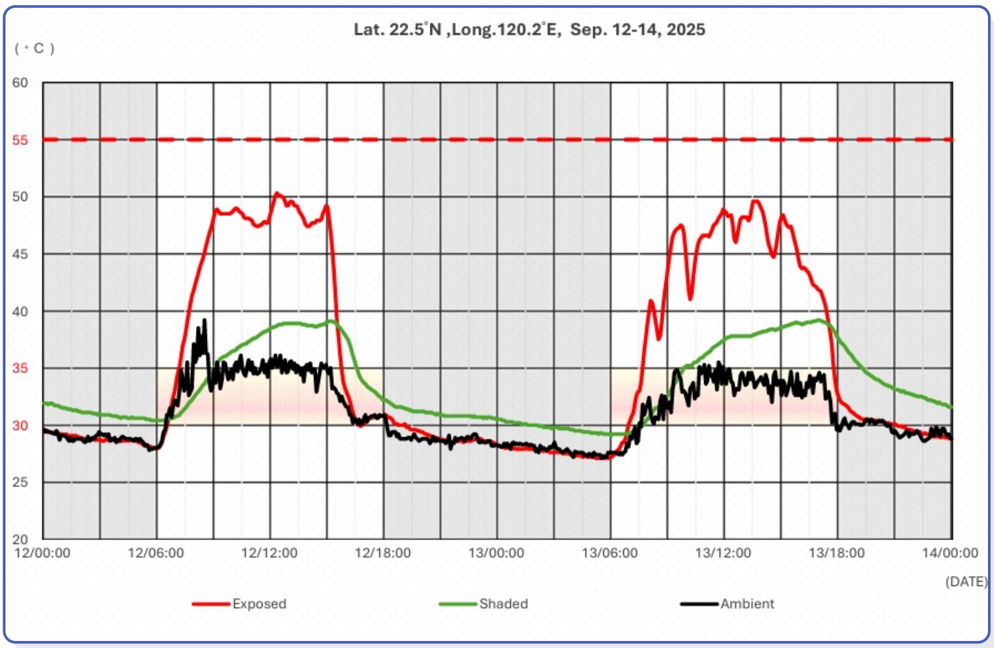
As shown in the illustration below, container internal temperature readings in this appendix were recorded 65 cm below the container ceiling. Please bear in mind that, when interpreting the graphs in this Appendix, the ceiling temperature, under direct sunlight exposure, is typically more than 10 degrees higher than the logging point temperature shown in the graphs.



1. Direct Sunlight Effect: Exposed to vs. Shaded from

Graph: The red line represents a container stowed at an exposed-to-direct-sunlight position, the green line represents a container stowed at a position shaded from sunlight, and the black line represents the ambient temperature in the adjacent area to these two containers.

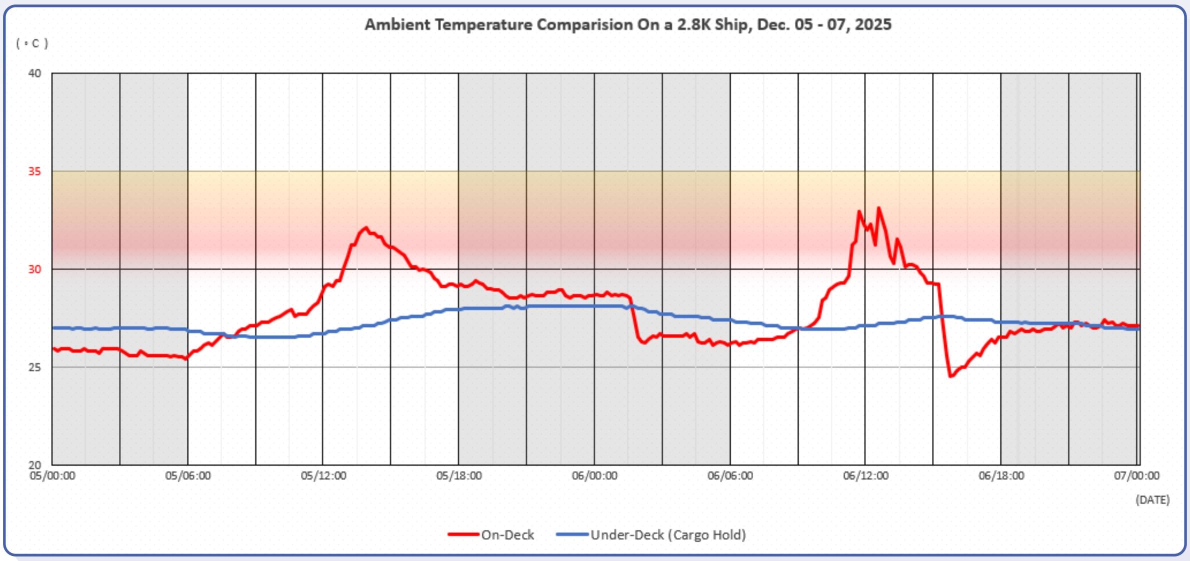
This graph shows a 48-hour record. It explains why containers carrying heat-sensitive cargo, such as cocoa butter or other hazardous cargo, should be stowed away from direct sunlight and other heat sources during transportation, whether on land or at sea. It also indicates the differences in how temperatures inside a container interact with the ambient during the daytime with sunlight and at night.



2. Difference of the Ambient Temperature: On Deck vs. Under Deck

The temperature readings were taken in December 2025 from a 2,800 TEU vessel navigating the waters of the Strait of Malacca.

Graph: The red line represents the on-deck ambient temperature, the blue line shows the cargo hold temperature (under deck).



This is a 48-hour record of on-deck and under-deck ambient temperatures. Under-deck stowage position without heat sources nearby, the ambient temperatures are generally stable and favorable for stowing heat-sensitive cargo compared with the on-deck environment. However, records in the next session suggest it may not always be the case.

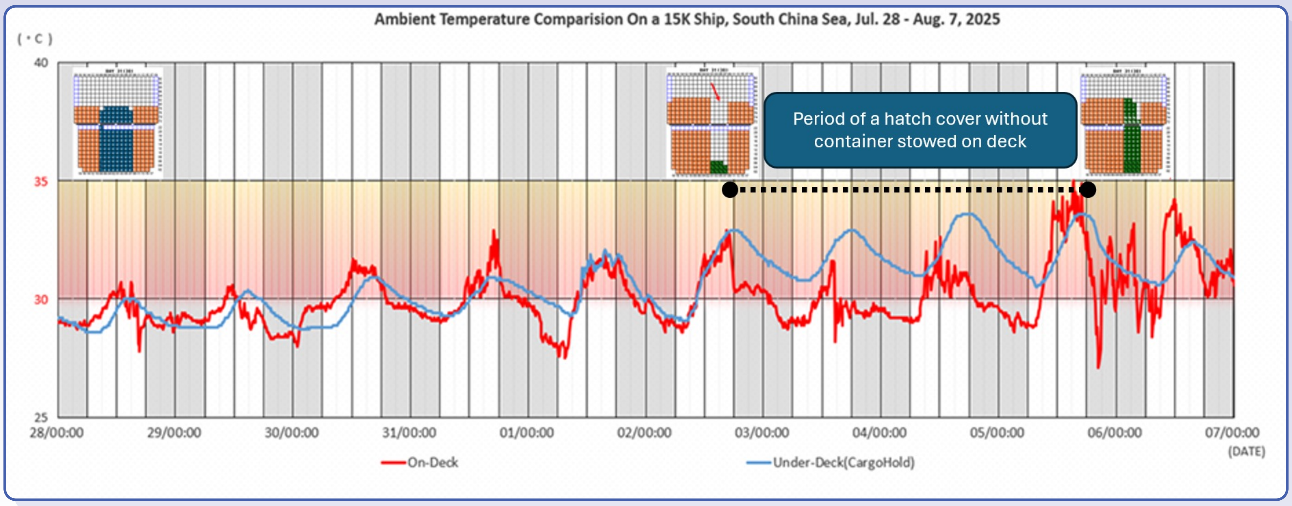
3. Exceptional Warm Period When Stowed Under Deck

The condition of deck container stowage may vary each time a ship sails from a port after cargo operations, in some cases, potentially affecting heat-sensitive cargo stowed under deck that require cooler storage at sea.

This ten-day ambient temperature graph of on-deck vs. under-deck was recorded from July 28 to August 6, 2025, on a 15,000 TEU vessel navigating the South China Sea, contrasting the ambient environment difference if containers stowed on deck with the others positioned under deck in the cargo hold away from heat sources

Graph: The red line represents the on-deck ambient temperature, the blue line shows the cargo hold temperature (under deck).

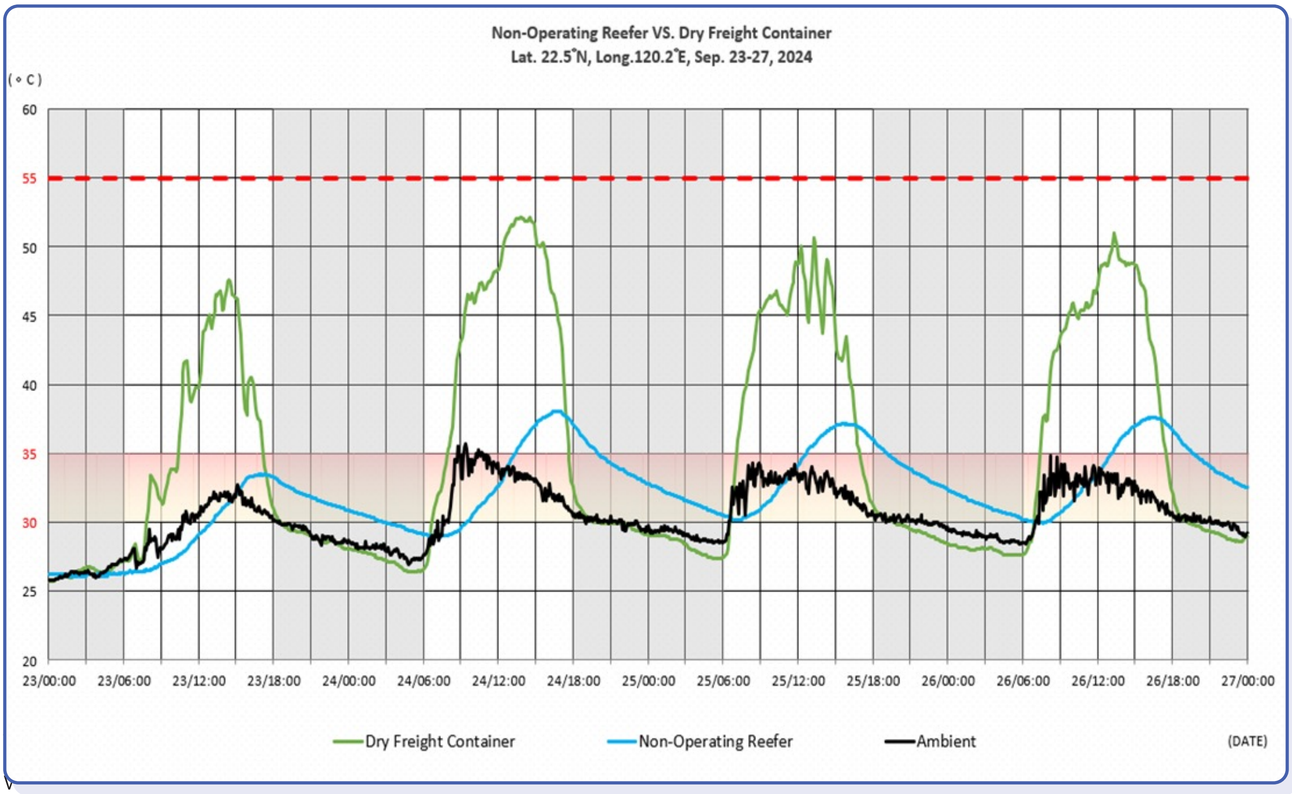
It is worthwhile to note that during the period, as the black-dash line indicates in the graph, a hatch cover without containers being stowed on top of it, the hatch cover becomes heated by the sunlight during daytime, as a consequence, the cargo hold ambient (under-deck stowage positions) turns out to be much warmer than on-deck, even without a heat source in the cargo hold. Under such circumstances, heat-sensitive cargo stowed under deck may be adversely affected.



4. The Heat Accumulation Phenomenon inside a Non-Operating Reefer

As stated in section 2.3, when considering the use of non-operating reefers, heat accumulation must be taken into account.

The following was recorded at a marine terminal in Kaohsiung over the period 23–27 September 2024. The blue line shows how the temperature cycle inside a non-operating reefer is impacted by heat accumulation. The black line represents the ambient temperature, and the green line shows the internal temperature change of a nearby standard freight container.

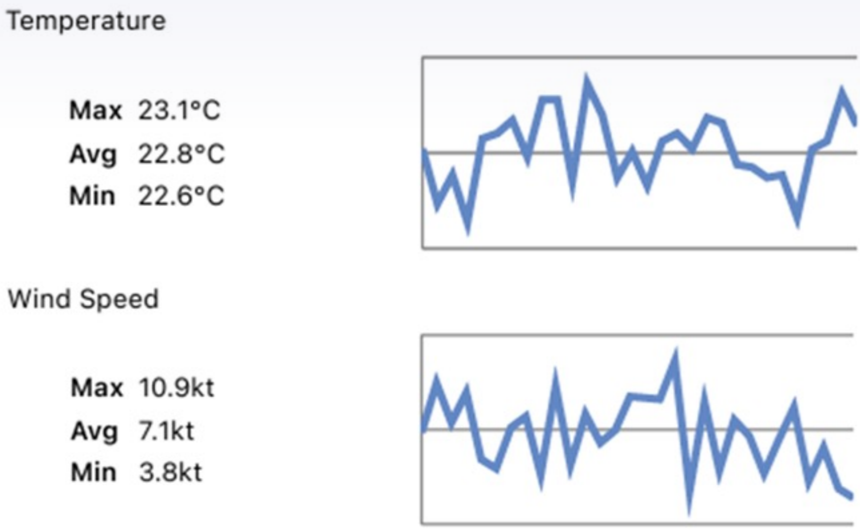


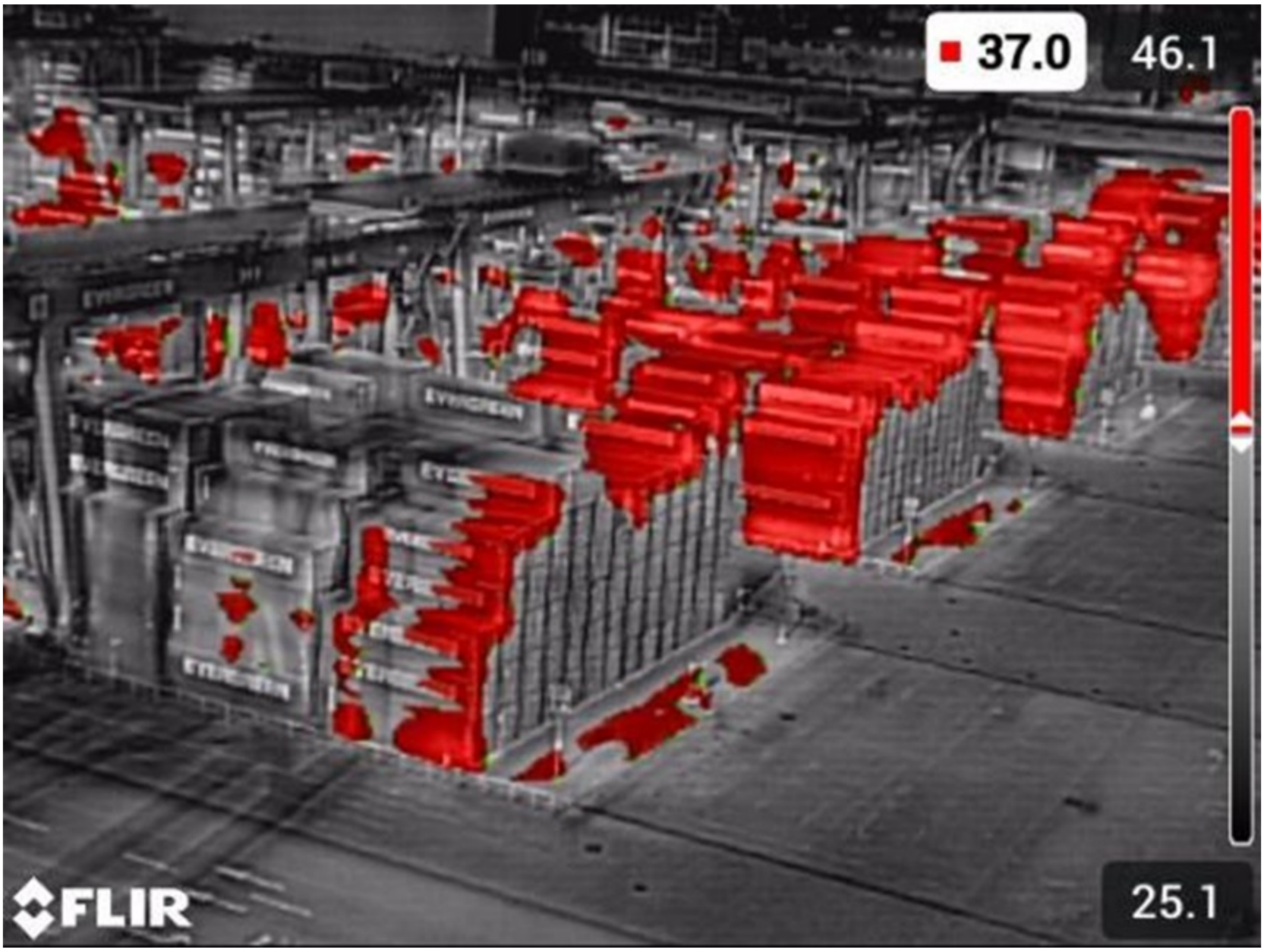
The graph shows the difference in temperature accumulation between a non-operating reefer container and a dry freight container. The dry freight container absorbs significantly more heat during the daytime than the non-operating reefer; however, it loses most of this heat during the night, and its internal temperature drops to a level close to the ambient temperature.

In contrast, the non-operating reefer container accumulates heat more gradually and to a lower peak temperature during the day. However, once heat is accumulated, it is retained for a longer period, resulting in a slower and relatively smaller reduction in temperature during the night.

5. Thermal Imaging Observation

A thermal image taken at the marine terminal shows that the surface temperature of dry freight containers may exceed the melting point of cocoa butter (37 °C), reaching up to 46.1 °C. The photograph was taken on January 15, 2026, at Taipei Port. At the time of observation, the average daytime ambient temperature was 22.8 °C, and the average wind speed was 7.1 kt.





Appendix II Cargo Damage Case

1. A typical cargo damage case: The following illustrations show the cocoa butter shipments damaged by high ambient temperature during transportation.

2. Possible Cause Analysis

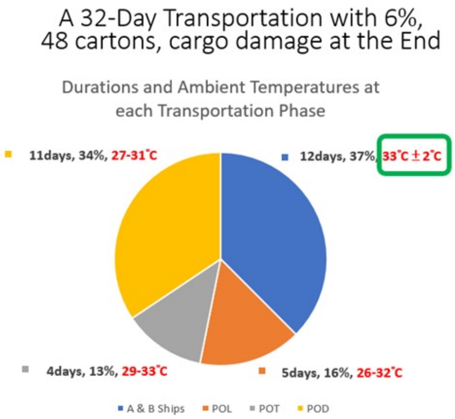
It was a 32-day voyage, starting from gate-in at the port of origin, via a transshipment port, to the port of discharge. The ambient temperature during the shipments' stay at the terminals was generally warmer than during the period on the ships.

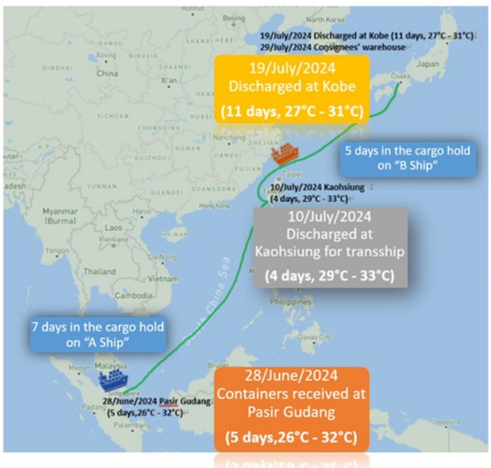
Sea conditions on both legs of the voyage were relatively calm, indicating that the ship's motions were unlikely to be the primary cause of the carton damage. During the 32-day journey, containers spent 12 days—approximately 37% of the time—stowed under deck and away from any heat sources on both legs, an environment considered free from radiant heat, with container internal temperatures estimated to remain within the 31–35 °C range.

For the remaining 20 days, or 63% of the journey, containers were at three marine terminals. In these locations, internal container temperatures could exceed 50 °C (and potentially reach 70 °C or higher) for about 10 hours per day if exposed to direct sunlight or exceed 35 °C (up to 40 °C or higher) due to radiant heat when positioned in shaded areas protected from direct sunlight.

Referring to the temperature dataset in Appendix I, this cocoa butter melting was very likely to have occurred during the period spent at the three (3) terminals. As stated in section 4.1 Terminal Operations, it is advised that both shippers and carriers take feasible prevention actions to avoid long terminal dwell time to minimize the risk of cargo damage.

The illustration below is a recap of this cargo damage case for the reader's review.





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CINS – Cargo Incident Notification System

CINS is a shipping line initiative, launched in September 2011, to increase safety in the supply chain, reduce the number of cargo incidents on-board ships and on land, and highlight the risks caused by certain cargoes and/or packing failures. CINS develops and uses a continuous improvement model to enhance the safety of cargo carriage.

CINS permits analysis of operational information on all cargo and container incidents which lead to injury or loss of life, loss or serious damage of assets and environmental concerns. Data relating to any cargo incident on-board a ship, in terminals etc. is uploaded to the CINS database. The data includes information on cargo type, nature, packaging, weight, journey (load and discharge ports), type of incident and root cause.

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