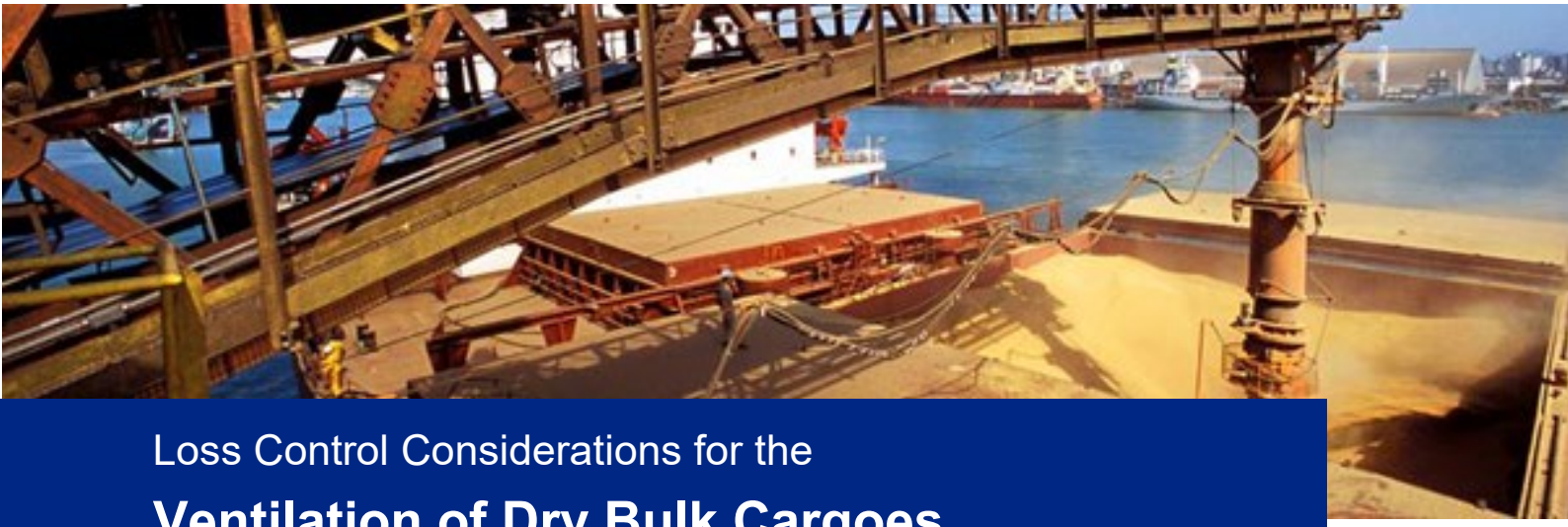


Loss Control Considerations for the

Ventilation of Dry Bulk Cargoes

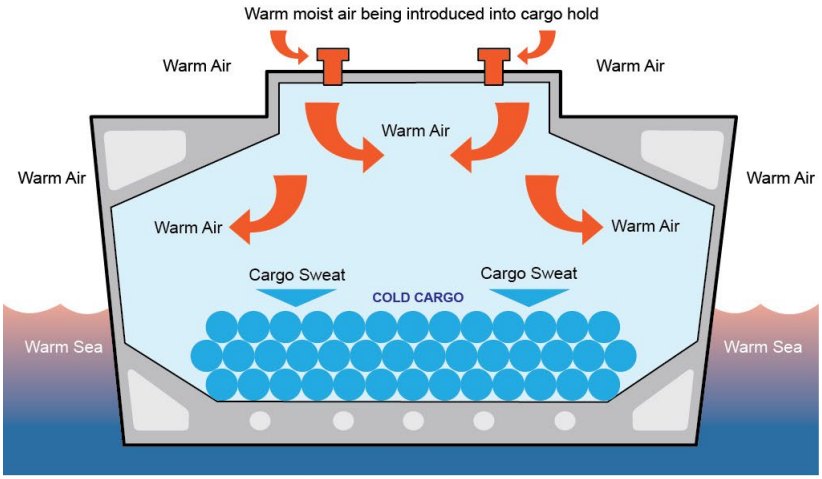
Effective cargo ventilation is a critical aspect of maritime transport, safeguarding goods against damage and ensuring their safe delivery. This guide provides cargo owners with a comprehensive overview of cargo ventilation, its importance, governing principles, and essential considerations.

Cargo and Ship Sweat

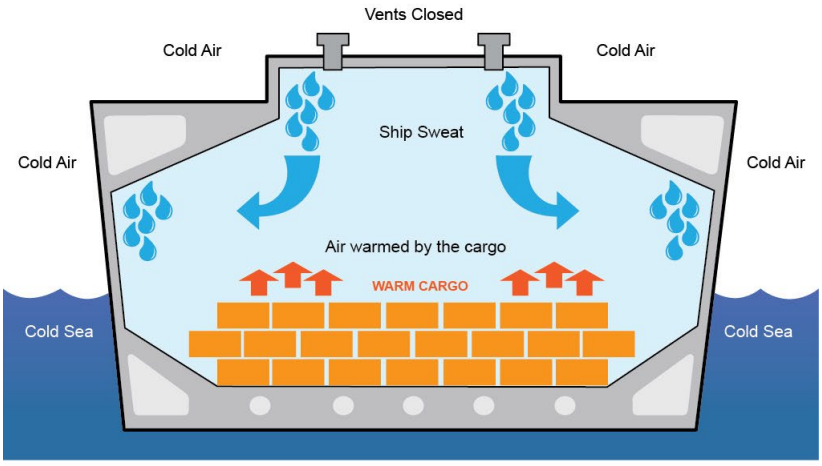
One of the primary reasons for cargo damage claims is the formation of condensation, commonly referred to as "sweat". Understanding the two main types of sweat is crucial for effective prevention:

Cargo Sweat occurs when warm, humid air enters a cargo hold containing cooler cargo, leading to moisture condensation directly on the cargo's surface. This is often summarised by the rule of thumb, "Cold to Hot – Ventilate Not".

Ship Sweat forms on the ship's internal structures (e.g., hull, steelwork) when the air within the cargo hold becomes warm and humid, contacting colder surfaces as the vessel moves into colder climates. Water droplets from ship sweat can then drip onto the cargo, causing damage. The principle here is "Hot to Cold – Ventilate Bold".



Cargo Sweat



Ship's Sweat

Ventilation Beyond Moisture Control

Proper ventilation serves multiple vital functions in preserving cargo integrity and ensuring safety:

- Ventilation directly removes excessive moisture, minimising the formation of both cargo and ship sweat, thereby preventing associated damage such as rust, staining, caking, clumping and damage to packaging.
- For certain cargoes, ventilation is essential to disperse hazardous gases like carbon dioxide, carbon monoxide, and methane, which can be emitted by the cargo itself. This also helps restore safe oxygen levels and removes toxic fumigation gases.
- Adequate ventilation can prevent or slow down microbiological activity (e.g., mould growth, putrefaction, fermentation) by lowering the cargo's moisture content, particularly for agricultural products.
- While ventilation is generally beneficial, it's important to note that for cargoes prone to self-heating (e.g., some grains, oil seeds, coal), continued ventilation may worsen the situation as these processes require oxygen. The IMSBC Code schedule should always be consulted for specific requirements.

When to Ventilate

Two primary rules guide the decision-making process for cargo ventilation:

The Dew Point Rule

Ventilation should occur only when the dew point of the outside ambient air is lower than the dew point of the air inside the cargo hold headspace. A lower dew point indicates less humidity, making outside air suitable for drying the cargo space.

Advantages: This method is accurate when properly executed and requires less organization at the load port.

Disadvantages: Accurate dew point measurements often require access to the hold headspace, which can be difficult or unsafe during a voyage. Specialized equipment like whirling or aspirated hygrometers are needed, and consistent, accurate measurements and calculations can be challenging.

The Three Degree Rule

Ventilation is recommended when the outside ambient dry bulb temperature is at least 3°C lower than the mean cargo temperature at loading. The underlying assumption is that if the ambient air is at least 3°C colder than the cargo, its dew point will be lower than the dew point in the cargo space.

Advantages: This rule is generally easier and safer to perform during the voyage as it does not require repeated access to the cargo spaces for measurements. Complex calculations are also not required. The cargo temperature is generally assumed to remain constant due to its large mass.

Disadvantages: This rule primarily applies to hygroscopic cargoes, such as agricultural products. It necessitates a reliable initial cargo temperature measurement at loading, which might require a surveyor or specific equipment. If cargo temperature significantly changes during the voyage (e.g., due to cold weather), the rule's assumptions may become invalid.

Beyond these rules, charter party agreements may contain specific ventilation instructions, which must be strictly followed. "Ventilate whenever possible" means ventilating only when temperature or dew-point data and weather conditions are suitable.

The Importance of Detailed Ventilation Logs

Ventilation logs are vital documents for evidencing proper cargo care throughout the voyage. In the event of moisture damage claims, logs can be instrumental in determining if the shipper ventilated as they should have. Depending on the ventilation rule followed, the following should be recorded:

- Cargo temperature at loading.
- Dew point for outside air, and for air in each cargo hold (at least once per watch), along with dry and wet bulb temperatures.
- Whether ventilation was needed.
- Seawater temperature.
- Start and stop times for ventilation in each hold, including reasons for suspension (e.g., weather conditions or fumigation).

Inconsistent or poorly recorded data can be useful when pursuing the shipper for a cargo claim.

Practical Aspects of Ventilation

While counter-intuitive, the best time to ventilate may often be during the hours of darkness when temperatures are lowest. Ventilation can also continue in the rain, provided the ventilation system prevents water ingress and the ventilation rule requirements are met.

During fumigation, cargo holds must remain sealed for a prescribed period, preventing ventilation. Normal ventilation can only resume after the holds are certified gas-free.

Different cargoes have varying ventilation requirements based on their properties, especially their hygroscopicity (ability to absorb or release moisture).

Ventilation primarily aims to prevent condensation (cargo sweat) and associated rust or staining. For cold-to-warm voyages, ventilation may not be necessary and could even be detrimental for non-hydroscopic cargoes

Ventilation focuses on reducing humidity and preventing ship sweat. Hydroscopic cargoes often require ventilation whenever possible due to continuous moisture release.

Ventilation may be required to maintain safe oxygen levels or remove hazardous gases for hazardous cargoes. Always refer to the IMSBC Code schedule for specific requirements.

Accurate measurement of humidity and dew point using calibrated hygrometers (e.g., psychrometers, electronic hygrometers) is vital, and these measurements should be meticulously recorded.

For further information, please contact your local Marine Risk Consultant.