

The Britannia Steam Ship Insurance Association Limited

Cargo Matters – Ventilation and Fumigation



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Timetable:

- 0930 - 0935 Welcome and introduction
- 0935 -1015 Presentations
- 1015 - 1025 Q&A
- 1030 - Close

Ask questions using the **Questions tab**

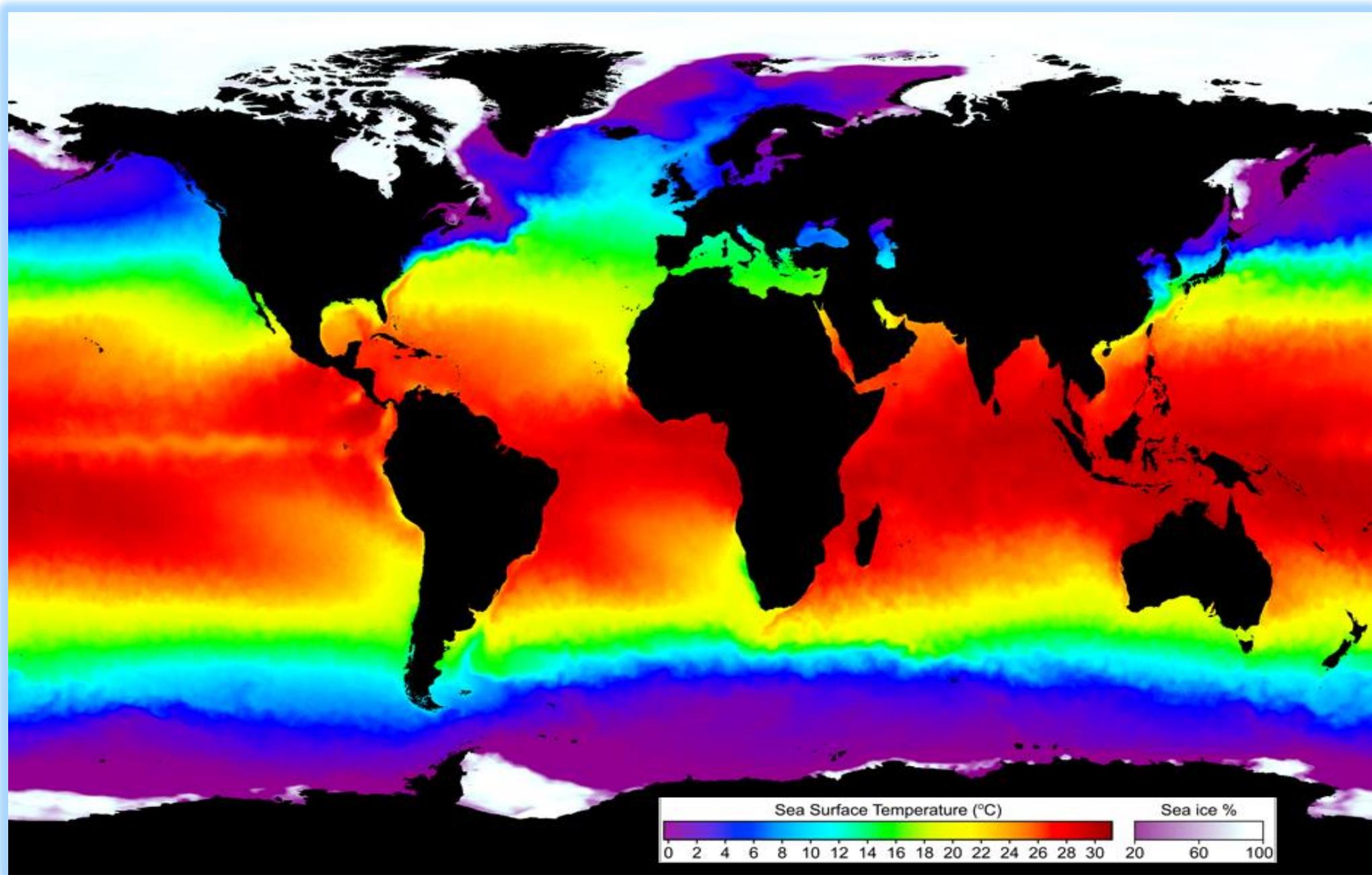
- Many cargo claims arise due to inadequate ventilation of the cargo
- Moisture damage to bagged or bulk agricultural and food products, can also lead to cargo claims
- Claimants usually allege that the cargo damage was due to a failure by the ship (shipstaff) to care for the cargo and ventilate correctly

- A **Hygroscopic** cargo contains moisture naturally, and based on the surrounding environment, can absorb, retain or release moisture
- Mainly agricultural products, grains

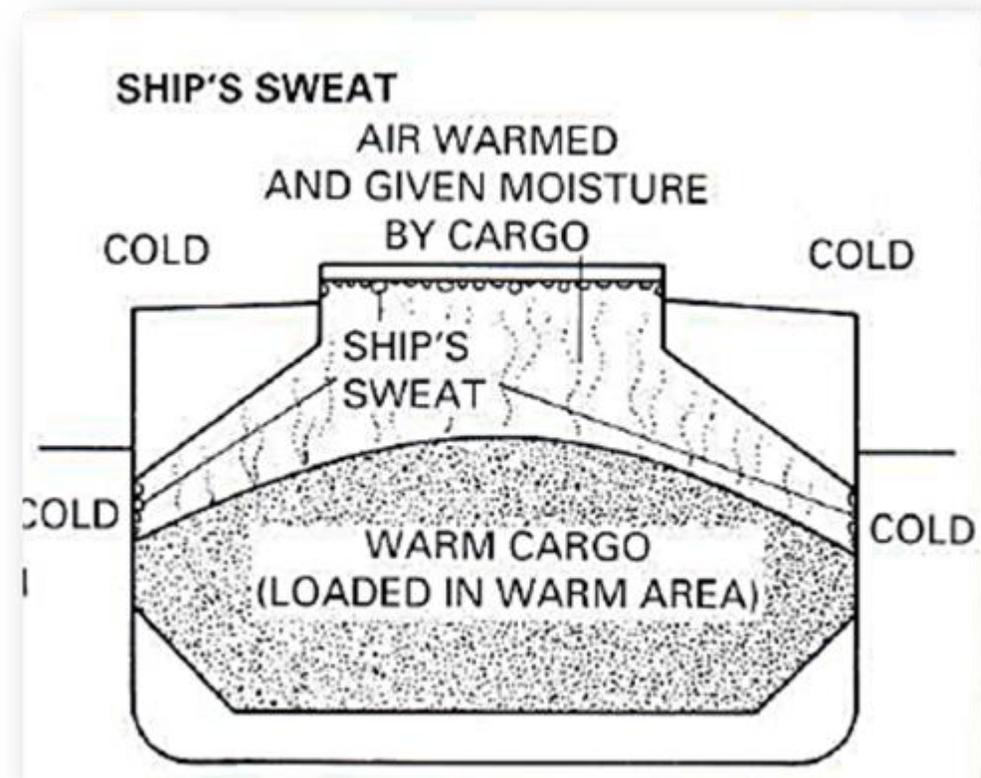
- A **non-Hygroscopic** cargo does not contain moisture naturally, but may be damaged by cargo sweat
- Solid cargoes, Steel etc.

- To reduce the incidence of ship's sweat
- To avoid cargo sweat

- The cargo temperature at the time of loading
- The temperature differences between loading and the voyage and/or disport
- Ventilating incorrectly



- A change in temperature leading to condensation forming on cooled steelwork which drips down onto the cargo surface



Cargo and Ship Sweat (Bulk Carrier Practice 1993, p.182)



Common Voyage: South America to China



Common voyage: South East Asia to West Africa

- Condensation run off down the sides of the hold
- Moisture moves down a temperature gradient from warmer to cooler regions of the stow



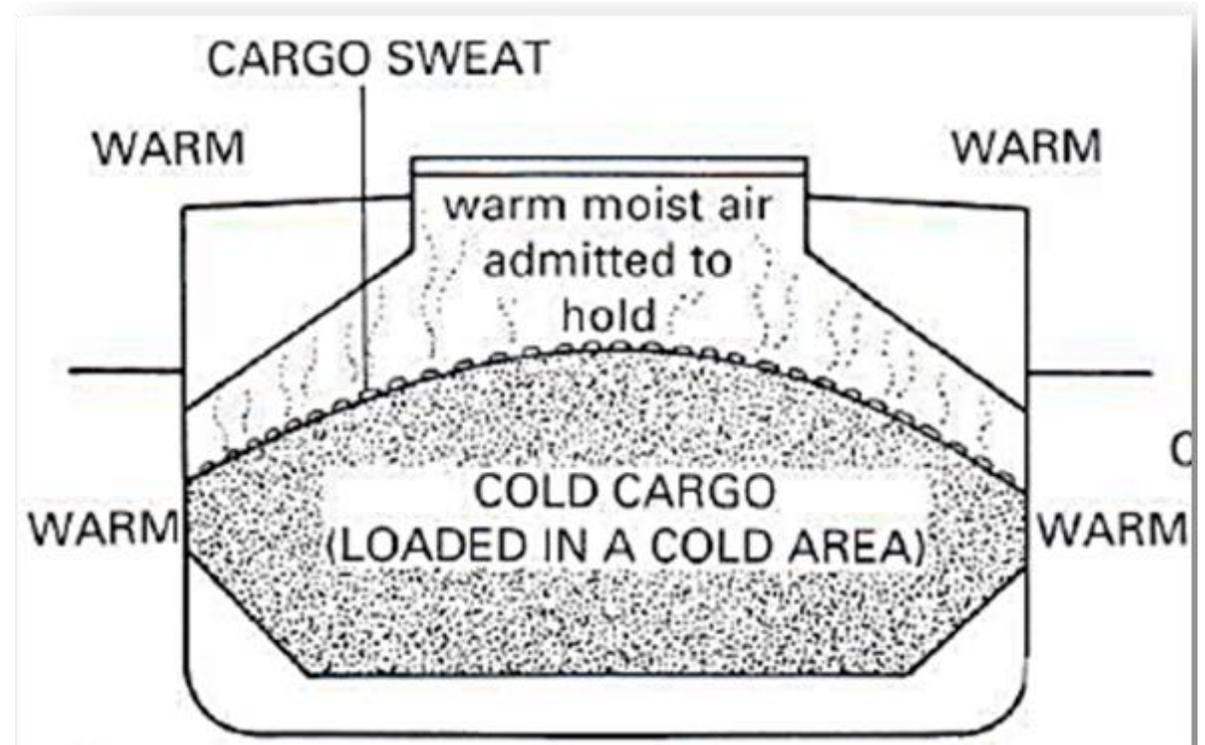
- Warm air rising from a self-heating cargo will lead to condensation forming on cooled steelwork which drips down onto the cargo surface
- Ventilation will not reduce the temperature of a self-heating cargo



- Self-heating occurs when parcels of grain / oilseeds are loaded at optimum moisture content and temperature to facilitate mould growth
- Mould grows, releasing heat and moisture, which initiates self-heating
- Oilseeds/ seedcake cargoes (soya beans) will experience higher temperatures due to the combined effect of mould growth (microbiological heating) and oil degradation (chemical heating)



- Warm air enters headspace and moisture vapour condenses on cooler cargo surface



Cargo and Ship Sweat (Bulk Carrier Practice 1993, p.182)



Common Voyage: Northern China in Wintertime to West Africa

Dew point: The dew point is the temperature to which air must be cooled to become saturated with water vapour. If it is cooled further, the airborne water vapour will condense. If this occurs through contact with a surface colder than the air, the vapour will condense on the surface.

Hygrometers: Dew point is measured by comparing the temperature indicated by a set of a dry-bulb and wet-bulb thermometers. Measurement inside a cargo hold requires a sufficient air flow around the wet bulb, which is achieved by using a whirling, or aspirated hygrometer.

Dew Point Rule: A cargo hold should only be ventilated when the dew point of the outside ambient air is lower than the dew point of the air inside the headspace of the hold.

Three Degree Rule: A cargo hold should only be ventilated when the outside ambient dry bulb temperature is at least 3°C lower than the mean cargo temperature *at loading*.

Advantages:

- Accurate if done well
- Requires less organisation at load port

Disadvantages:

- Requires access to the headspace to obtain accurate dry/wet bulb temperatures, which during a voyage is rarely safe/ feasible
- Wet bulb temperature needs to be measured using a whirling or aspirated hygrometer to be accurate
- Requires regular measurements and calculations which are sometimes performed incorrectly

- In practice, the ship staff obtain dry/wet bulb temperature from the temperature pipes in the hold or from the access manholes, which can lead to inaccurate and non-representative measurements
- Digital dew point meters that are fixed in the hold headspace could allow for better and easier measurements, but can be expensive

Three Degree Rule: A cargo hold should only be ventilated when the outside ambient dry bulb temperature is at least 3°C lower than the mean cargo temperature *at loading*.

- For example, if the mean cargo temperature when loaded is 30°C, the crew need to ventilate when the ambient temperature is 27°C or lower
- Understanding the cargo temperature at loading can also provide valuable information as to whether seedcake cargoes may be heating at the time of loading

Advantages:

- Easier to perform in practice than the dew point rule during voyage
- No access to the headspace is required
- Safer for shipstaff working on deck, particularly at night, as measurements from the hold are not required
- Complex calculations not required

Disadvantages:

- Need to appoint a surveyor at the load port to obtain the cargo temperature for each cargo stow during loading

- If ventilation is impossible because of prevailing conditions, all significant aspects of weather and sea conditions need to be fully recorded
- In some cases, the surface ventilation may not be practical or effective due to stowage requirements in relation to the design of a ship's ventilation system
- For example, for stability reasons grain cargoes may require that holds are fully loaded to the tops of hatch coamings – in which case surface ventilation may become difficult or impossible

- All agricultural cargoes require fumigation to eliminate the risk of transmission of diseases carried by insects
- Normally carried out by trained fumigators, who have the correct training, qualifications, experience and equipment
- Fumigant gases are toxic to humans, and inhalation may cause respiratory problems, nausea and suffocation
- In-transit phosphine fumigation permitted while methyl bromide fumigation in-transit is strictly against IMO regulations

- Fumigation exposure period allows the fumigant to reach a lethal concentration to allow for an efficacious kill of insects
- USDA recommends that the holds remain sealed for the entire voyage
- Master obliged to follow Fumigator's recommendations
- Longer fumigation exposure compromises ventilation regime
- Question the Fumigation company/ Charterer as to why holds must remain sealed



- Temperature and humidity: dew point control essential
- Rust intensity can increase significantly in a 2-6 week voyage if strict control of hold atmosphere is not maintained
- Record temperature and humidity throughout voyage and ventilate only when conditions are appropriate

- Rusting of steel cargoes is one of the most significant source of claims against the vessel owner and/or charterer
- Many of these claims are readily rejected as causation is often a result of exposure to rain water or sea spray before the cargo is loaded
- Good quality preloading reports showing the extent of preload exposure to rain/sea spray, together with high quality photos highlighting the extent of rust on the cargo at each stage of the loading operations, can lead to a robust dismissal of a claim

- Most steels are readily subject to rust formation, so control of the atmosphere within the hold is vital to avoid moisture condensing on cargo during the voyage
- The need for ventilation depends largely on the temperature of the steel as loaded and the dewpoint of the air temperature during the voyage

- A substantial proportion of global steel exports sail from China where loading temperatures are relatively low for most of the year
- The voyage quickly enters the tropics where high temperature / humidity makes the ventilation of cargo holds very undesirable
- The steel temperature will not increase significantly during the voyage, making ventilation undesirable for much of the voyage

- Ventilation should only be done on the basis of regular dewpoint measurements demonstrating safe conditions
- Be aware, from a claims perspective, of the potential for damage caused by other cargo/moist cargo stowed above the steel cargo

- Fresh water damage – rain water was found in packaging
- Caused wet damage to the cargo, but good ventilation records enabled defence of the claim

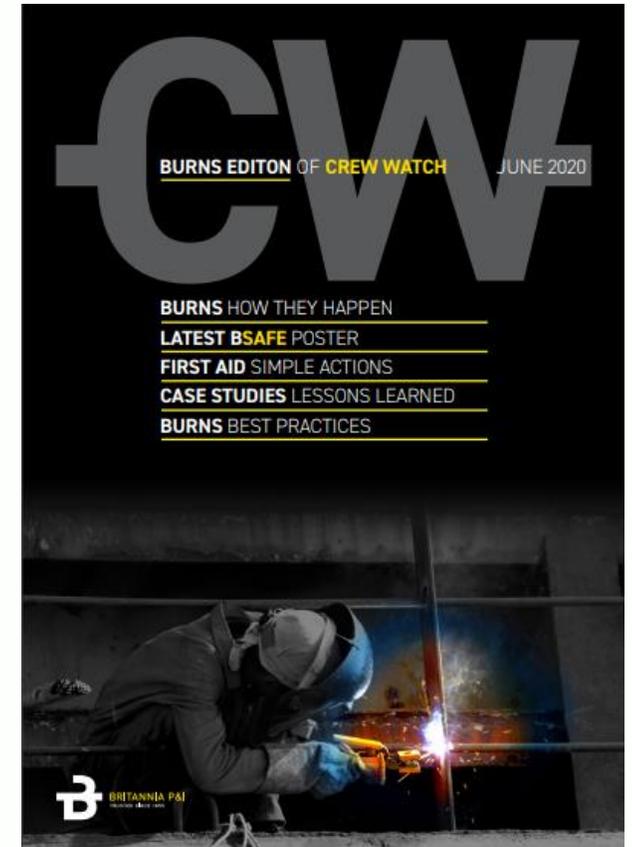


- Review the voyage - will there be a significant change in temperature?
- Which Ventilation Rule will be followed?
- Checks, tests and maintenance of hatch covers and ventilation system
- Obtain cargo temperatures at loading, calculate average temperature per hold

- Monitor the temperatures every watch and adjust ventilation according to the applicable Ventilation Rule
- Record keeping is essential
- Check hatch cover drainage pipes for signs of condensation run off

Loss Prevention publications

- Risk Watch (Claims and Legal)
- Crew Watch
- Posters
- Circulars, Bulletins
- Britannia News Summary (BNS)
- New Knowledge area on:
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