FACT SHEET 02/93   **February 1993**

CONDENSATION IN CONTAINERS

Moisture damage can affect a variety of commodities transported in a confined space, such as a shipping container. It is not restricted to hygroscopic commodities, such as coffee, cocoa, etc.

Commodities carried in containers can be subjected to two main types of condensation:

- **Container condensation** occurs when the skin of the container is cooled to a temperature below the "dewpoint" of the air inside the container.

  This causes water droplets to form on the inside walls and roof, which may run down into lower areas of the stow or fall onto the top of cargo.

- **Cargo condensation** occurs when the surface of the cargo is cooler than the dewpoint of the air outside the container.

  This causes water droplets to form on the cooler areas of the cargo stow.

Three specific conditions must all exist simultaneously for condensation to occur inside a container:

- a source of water vapour must be present, and
- a temperature difference must occur, and
- a pathway must exist to move water vapour to the cold surface.

Sources of water vapour are:

- water left in the container after cleaning;
- ambient air;
- fibreboard cartons and water-based glues used in forming cartons;
- labels;
- wooden pallets;
- timber flooring, dunnage, etc.

Temperature difference may occur between:

- individual cartons in the stow;
- cartons and containers during loading;
- changes of temperature and/or air flow inside the container;
- changes of temperature outside the container.

Changes and fluctuations of temperature may occur due to:

- exposure of the container to direct sunlight;
- exposure of the container to a clear night sky;
- dew or frost on the outside of the container;
- stowing the container near a source of heat;
- stowing the container near a refrigerated space;
- different temperatures between cartons and ambient air at the time of unloading (opening of the doors);
- moving a container from a shaded area to sunlight exposure, or from an open area to a shaded area, where extreme changes in ambient temperature can occur.

Pathways for the migration of water vapour can be present in a cargo stow:

- between cartons or other adjacent bodies of cargo;
- between cargo and the container walls;
- in the container structure itself.

To reduce both "cargo" and "container" condensation inside a container, the following operational procedures are recommended:

- containers must be dried completely after cleaning;
- pallets, wooden dunnage etc. to be used must be stored in a dry, covered area. Only dry pallets and dunnage should be used;
- fibreboard cartons should be stored in a dry area;
- when gluing cartons, minimal glue should be used if the glue is water based;
- loaded pallets should be stored in a dry, covered area;
- if cargo is being loaded into general purpose containers, this should be done in a covered area;
- loaded containers should be stored under cover;
- land transport under severe cold weather conditions should be avoided;
- whilst being transported on board a ship, an underdeck or protected stow should be used wherever possible for commodities sensitive to moisture;
- containers should be unloaded as soon as possible after opening the container doors and, if the cargo is on pallets, palletised units should be broken down immediately;
- use of proprietary products to absorb free moisture present in the free cargo airspace inside the container such as "non sweat" or the use of forced draught hot air blowers to dry the container before packing with cargo.

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