

CHAPTER 9

ACTIONS DURING THE VOYAGE

Most perishable products are still alive and respire to maintain its physiological functions during the voyage. Deep frozen and most processed foods, although dead, also require special conditions to maintain quality. The Master and his personnel can only ensure that all equipment is functioning within the specified parameters. Some of the important aspects that require continuous attention during the voyage are highlighted in this chapter.

1. CARRYING INSTRUCTIONS

The exporter selects the carrying conditions, required. These conditions were developed over a long period and are based on extensive research taking into account product condition and market requirements. Optimum temperatures or temperature regimes and fresh air ventilation were defined and codified (reefer code) to comply with standardized shipping documents and administrative procedures. The process to ensure that the correct carrying conditions are applied is initiated at time of booking as described in Chapter 6 par 1.2. It is important to ensure that:

- The ship's crew fully understands the carrying conditions as defined in the reefer code.
- The temperature control thermostat must be set correctly to deliver air at the specified carrying temperature.
- The fresh air intake must be set to supply a prescribed volume of fresh air per container or to maintain the carbon dioxide below 0,5% in conventional shipping spaces.
- Controlled atmosphere conditions, if required must be set according to product requirement and the specification of the shipping line.

Note: It is important to ensure that the temperature control for chilled produce is on the delivery air and for deep frozen produce on the return air.

2. TEMPERATURE MANAGEMENT

Historically chilled produce were stored and shipped at a single temperature. The temperature is defined as the optimum storage temperature and refers to the actual pulp temperature of the product. Storage and transport at the optimum temperature may however still contribute to quality problems. Internal breakdown in plums stored at the optimum temperature of minus 0,5°C can be drastically reduced by changing the storage or carrying temperature. Shipping the product at a defined maturity stage and manipulating the ripening process during storage and transport is a management tool to obtain optimum shelf life and to meet ready-to-eat marketing requirements. Competition and marketing demands require a very high level of reliability in supply. Losses, especially due to incorrect shipping and handling procedures cannot be tolerated. Procedures were therefore developed to also monitor carrying conditions and to ensure optimum equipment performance. The temperature management system developed by the PPECB, in co-operation with shipping lines and the fresh produce industries, consider and combine all the relevant product and shipping factors. The system is based on the evaluation of air temperatures and the change in these air temperatures. Temperature management based on actual product pulp temperatures are more accurate, but pulp temperatures are only available for special and in-transit cold treatment shipments. The temperature management system is not restricted to the voyage only but actually starts in the orchard and continues into the market place. Some of the important steps are discussed in the following paragraphs. Actions other than just the voyage requirements are also highlighted to emphasise the importance of all the links in the cold chain.

2.1 Preharvest actions

Optimum results with temperature management are only possible when the product is at the most optimum physiological stage of development and correctly prepared to minimize quality losses during the voyage and subsequent distribution. Important steps are:

- The storage and transport potential of the specific cultivars or variety is determined.
- Product behavior, in terms of physiological changes such as ripening and ripening rates is determined.
- The effect of climate, growing, maturity and handling conditions and procedures are quantified.

2.2 Preshipment actions

The product and the shipping equipment must be prepared to respond and to operate optimally during the two to three week storage and voyage period:

- Packaging and palletizing must provide adequate product protection, and maximum air circulation in both horizontal and vertical planes to ensure efficient removal of product heat.
- The load must be efficiently precooled to the optimum loading temperature.
- The transport and shipping equipment must operate correctly at the specified temperature and fresh air circulation set points.
- The product must be handled, transported and stored within the prescribed temperature tolerances.

2.3 Actions required prior to and during the voyage

2.3.1 **Prior to sailing**

Voyage temperature management starts when the container or deck is loaded. Both product and shipping space must now be within specification. The following important steps now become operational:

- A final check must be made to ensure that all relevant controllers are set according to the required carrying condition as defined in the reefer code.
- The delivery (DAT) and return (RAT) air temperatures must be recorded as soon as refrigeration is applied.
- The DAT and RAT of containers still to be shipped must be recorded at least once every four (4) hours. These readings must be verified by PPECB at least once every twelve (12) hours.
- All DAT and RAT readings (as well as other shipping information required) must be reported to the PPECB prior to sailing.

2.3.2 **During the voyage**

It is required that the Master ensures that the following actions are carried out:

- The temperature set point must be according to the temperature regime requirement as specified in the reefer code.
- The DAT and RAT of each and every deck or container must be recorded every morning and relayed to the PPECB office as indicated on the PPECB letter of confirmation of carrying conditions.
- The difference between the RAT and DAT should be as small as possible but not more than 1,5°C.
- A cold blast must be applied as soon as the RAT/DAT difference approaches 1,5°C.
- During the cold blast, the DAT is reduced by 0,5°C and maintained for three (3) hours where after the DAT is reset to the reefer code specification and maintained for at least three (3) hours.
- The cold blast procedure must be repeated until such time that the RAT/DAT difference is reduced to less than 1,5°C but not more than four (4) three (3) hour cycles.
- The PPECB must be informed of the cold blast procedure applied.

It is the responsibility of the PPECB to communicate the temperature deviations, as received from the Master, to the owner of the product. A corrective action procedure must be formulated and relayed back to the Master by the PPECB. The corrective action procedure must be regarded as an amended PPECB carrying instruction and immediately implemented.

2.4 **Maintenance of product and air temperature**

In the case of fresh produce the product is almost always warmer than the temperature of the air in the immediate surrounding. This product/air temperature differential is affected by many factors but should preferably not more than 0,5°C at temperature equilibrium. In practice this means that the DAT should actually be 0,5°C colder than the required optimum product (pulp) temperature.

2.5 **Raising and lowering of carrying temperatures**

Some carrying temperature regimes require that the carrying temperature must be raised (e.g. plums or lowered (e.g. avocados) at certain stages during the voyage. These DAT changes must be affected on the dates specified in the PPECB letter of confirmation of carrying instructions (reefer code). It is also important that the temperature change takes place as fast as possible. This is especially important in the case of plums to minimize the actual time of exposure to the temperature range 2°C to 6°C.

3. **LOGGING OF CARRYING CONDITIONS**

It is a legal requirement that all temperature logs and all other relevant information on the carriage of perishable produce be immediately made available to the PPECB. The minimum requirements are as follows:

3.1 **Temperature logs of conventional vessels**

Temperatures in all shipping spaces must be logged at least once every hour until stabilization and thereafter at least once every eight hours. The temperature logs must be safely stored by the shipping line for at least one year and be made available immediately on request to the PPECB. (Other legislation may however require that the logs are stored for longer periods than required by the PPECB).

3.2 **Temperature logs of container shipments**

3.2.1 **Integral containers** are fitted with either a chart (Partlow) recorder or an electronic data logger. Partlow charts must be stored for at least one year and the original chart made available on request to PPECB. Electronically logged data of containerized shipments must be stored for at least three months and immediately made available to the PPECB on request.

3.2.2 **Ventilated containers** are usually not fitted with temperature or other recorders. It is however important to keep accurate records of voyage conditions such as:

- Ambient day and night air temperatures i.e. minimum and maximum
- Relative humidity of the ambient air
- Weather conditions e.g. rain, sun, and fog
- Ocean conditions e.g. seawater temperature, and swell heights
- Air inlet and exhaust temperatures to and from ventilated spaces
- Operation of air extraction fans

3.2.3 **Controlled atmosphere containers** are also fitted with carbon dioxide and oxygen data loggers. This data must be made available to the shipping line that will be responsible for the safe keeping of such data for a minimum of one year. The data must be made available to the PPECB on request.

3.3 Logging of other voyage conditions

All information pertaining to the shipment of perishable products must be kept and stored by the shipping line. This information must be made available to the PPECB on request. Important information to be logged include -

- Voyage conditions such as air and seawater temperatures rain and fog.
- Maintenance carried out on the refrigeration equipment and data sensors, controllers and loggers.
- Commencement and termination of refrigeration in all decks and containers.
- Breaks in the cold chain e.g. power and, refrigeration shut downs and defrost cycles.

4. TRANSHIPMENT AND RESTOWS

Transshipments and restows always result in a break in the cold chain and most of the time in delays. Every effort should be made to minimize additional handling of cargo. Some of the important factors requiring attention during transshipments and restows are summarised in the following paragraphs.

4.1 Transshipments

4.1.1 General conditions

It is the responsibility of the export agent to ensure that a copy of the carrying instructions is handed to the Master of the ongoing vessel as well as to the shipping agents responsible for the handling of the produce in the transfer port. The master of the ongoing vessel will be responsible for applying the carrying conditions and keep the prescribed logs pertaining to the carrying conditions.

The PPECB has certain responsibilities if the transshipment takes place in a South African port. These responsibilities include:

- The re-inspection of the produce according to the Agricultural Product Standards Act should the product exceeds the maximum stipulated time between the initial inspection and the actual shipping date from a South African port.
- The re-inspection of the container or the cargo according to the PPECB Act and regulations to ensure that the cargo is still in a sound condition and within the prescribed temperature tolerance.
- To ensure that the prescribed temperatures are maintained and that breaks in the cold chain are within the Time Temperature Tolerances specified in Chapter 8 par 3.

4.1.2 Ventilated cargo

Ventilated cargo is very often transshipped in South African ports. It can also happen that changes in shipping schedules may result in ventilated cargo be exposed to uncontrolled ambient conditions for extended periods. Transshipment of ventilated cargo is therefore not recommended. The following are some important criteria that must apply should ventilated cargo be transshipped in a South African port:

- Containers with ventilated cargo must be stored in well-ventilated stores and well protected from the elements.
- The total shipping period from first to last port of 10 days may not be exceeded.
- The cargo must be suitably stabilised to allow opening of the doors during the transshipment period.

4.2 Restows

Products may sometimes be restowed for various reasons. It is important to ensure the following conditions are followed:

4.2.1 **Restow of an integral refrigerated container** is necessary when the original container malfunctions or when drastic temperature deviations occur. Under these conditions it is important to ensure that the:

- PPECB cleanliness and pretrip inspection (PTI) certificates are still valid (see Chapter 4 par 3)
- Cargo still meets the quality criteria stipulated under the Agricultural Product Standards Act.
- Cargo temperatures and condition are within specification
- Necessary records are kept to support food traceability requirements.
- Correct carrying temperature reefer code is registered and that the Master is informed accordingly
- All relevant documentation is passed on to the PPECB

4.3 Reporting on deviations

The sooner detailed information on deviations, delays and other conditions that may affect the age and quality of the product, are known, the better the changes to rectify the problem. All deviations must therefore be reported to the PPECB who will, in co-operation with the exporter and owner of the product formulate corrective actions.

4.4 Availability of logs

It is the responsibility of the shipping line or lines who accepted and carried the cargo to make all logs and notes pertaining to all shipments available to PPECB. If such logs are not made available within two (2) months on a written request from the PPECB to so, it will be assumed that the logs were deliberately destroyed.