

QUEST II

**Quicker cool-down
– less CO₂ emissions**



Speed up your container cool-down

Quest II is an innovative Maersk Line reefer initiative for chilled products, designed to reach the cargo set point temperature faster than ever before.

The benefits of the system are twofold.

- 1) On one hand, faster cool-down helps when handling warm loaded cargo and keeps the average cargo temperature closer to the requested set point temperature, which all in all means better cargo care and maintained quality for our customers.
- 2) On the other hand, Quest II reefer units also use considerably less energy in the process, resulting in a remarkable decrease in the overall environmental footprint.

In fact, compared to traditional non-Quest reefer containers, Quest II reduces the CO₂ emission with as much as 65%.



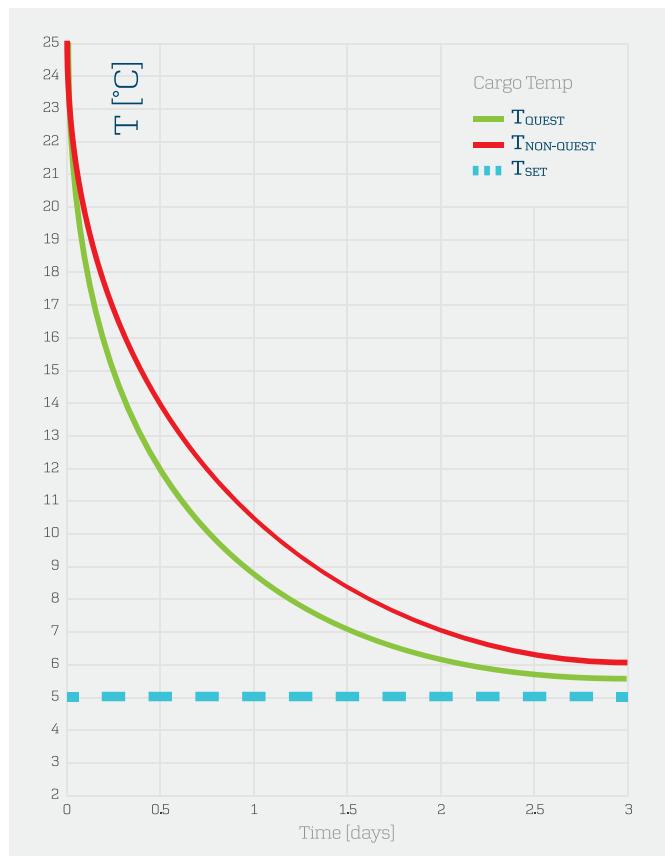


How does Quest II work?

The principle behind Quest II is simple. Instead of having the energy-consuming reefer compressor running non-stop to keep the supply air temperature steady, Quest II exploits acceptable temperature fluctuations to switch the compressor state between off and its most efficient operation mode.

Turning the cooling on and off in cycles obviously allows for minor supply air temperature fluctuations. However, since this only affects the supply air temperature – and not the average cargo temperature – there is no negative impact on cargo quality at all. On the contrary, running the compressor periodically maintains cargo quality as well as saving power, thus increasing the overall cooling capacity.

The result is that cargo will reach set point temperature much faster than in non-Quest reefers, while also maintaining the right set point averaged temperature throughout the entire shipment.



However, this is only half the story of the Quest II system. In traditional chilled reefers the evaporator fans are always set at maximum speed, but Quest II is programmed to adjust the internal air circulation according to the actual cargo heat load.

This continuous adjustment of air circulation saves a huge amount of energy, thus helping to decrease the total CO₂ emissions from Quest II reefer units even more.

Nothing is left to chance

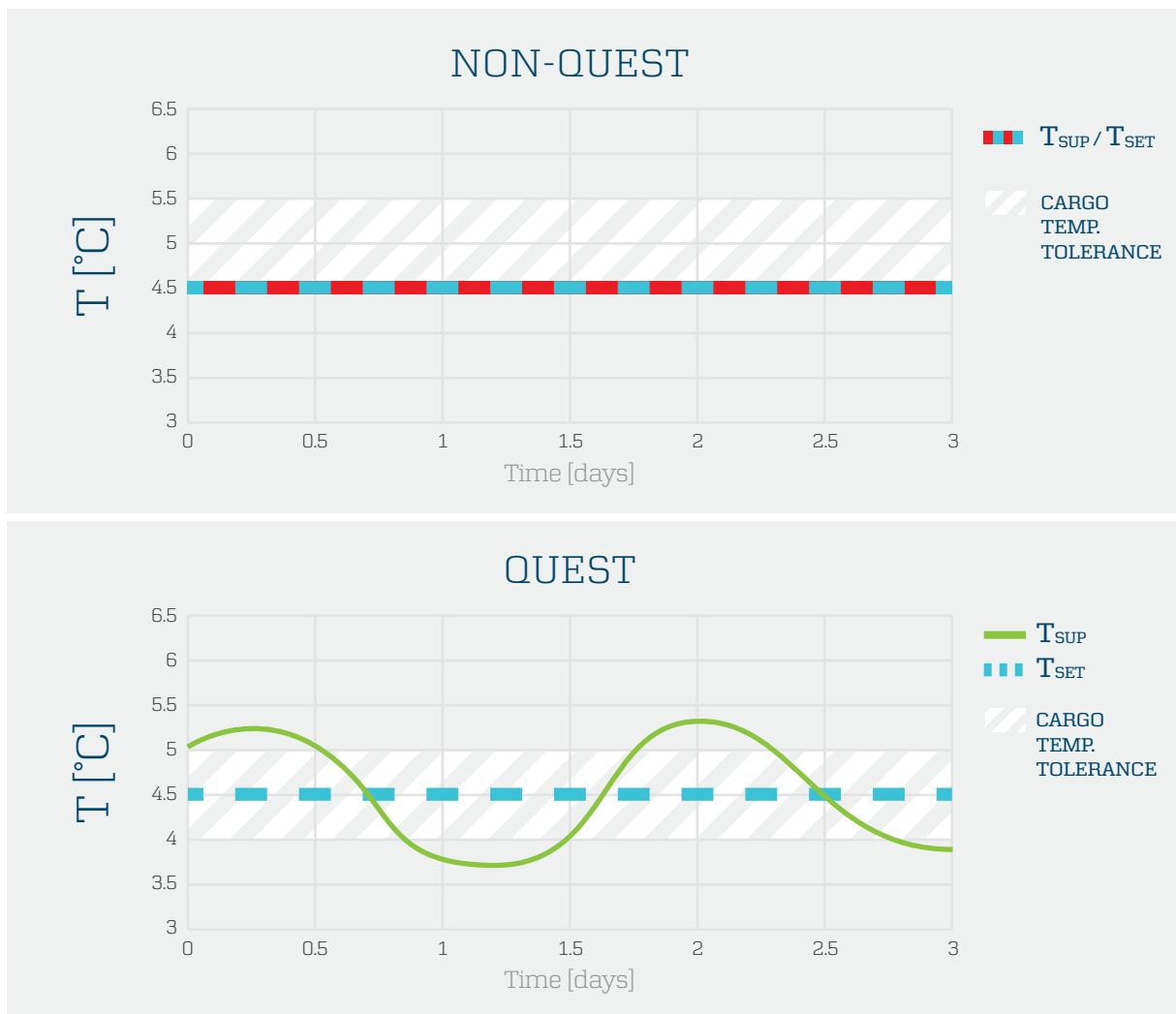
When introducing cyclical temperature fluctuations three things count:

- The amplitude
- The cycle duration
- The cycle averaged temperature.

Quest II deals with amplitudes by only permitting swings up to 6° C below and 2° C above set point temperature.

Also, the system ensures that duration of non-cooling periods always correlate to cargo heat load. Usually this means that four minutes of cooling alternates with everything from 5 to 50 minutes of non-cooling.

Finally, Quest II is programmed to continuously start new cycles. This happens automatically and ensures that Quest II always maintains exact control over the cycle-averaged temperature.





How the research was done



Two examples of our lab set up when testing Quest II in the preliminary phase.

We have performed numerous lab tests on commodities to ensure that produce quality isn't affected by the temperature fluctuations in Quest II.

After completing the lab tests, we moved on to live trials and performed more than 300 field trials before actually releasing Quest II. In each trial two containers were stuffed with the same load and shipped from the same origin to the same destination at the same time – one running with Quest II software and one without. Upon arrival energy consumption and produce quality were then compared.

Tested commodities

Commodity	Countries of origin	°C
Apples	South Africa, Chile, New Zealand	-1° to 0°
Asparagus	Peru	3,3°
Avocado	Spain, Chile	3,3°, 4° to 5°
Bananas	Ecuador, USA, Phillipines, Costa Rica	13,3° to 14,4°
Controlled Atmosphere Blueberry	Chile	-0,5°
Chilled Lamb	New Zealand	-1,5°
Chilled Meat	South Africa, New Zealand, Australia	-1,8° to -1°, 0,5°
Chocolate	South Africa	16°
Citrus	Chile, Uruguay, South Africa	-3,5°, 5°, 8°, 10°
Cold Treatment Citrus	South Africa	-1,5° to -0,5°
Cold Treatment Pears	South Africa	-1,3°
Flowers	Ecuador	1°
Garlic	China	-3°, -1°
Grapes	Chile, South Africa	-1,5° to -0,5°
Kiwi Fruit	New Zealand	0° to 1°
Live Plants	Costa Rica	16°
Melon	Brazil, Costa Rica	2,8°, 10°
Onion	Chile	1°
Oranges	South Africa	3,5°
Pears	Uruguay	-1°
Pineapples	Costa Rica	6,5°
Plums	Chile, South Africa	-0,5°
Printer Cartridges	China	21° to 22°

No downsides – only benefits

All these precautions are taken so Maersk Line can keep offering our customers the best cargo quality, while also lowering the reefer unit's energy consumption. And the system works.

Quest II has been tested thoroughly on most common commodities in both laboratories and field trials. And over and over again the results came back the same:

- The cargo set point temperature was reached faster.
- The produce quality was not harmed.
- The reductions in CO₂ emissions were great.

In addition, Quest II is hassle-free for our customers. This is a software update and nothing changes in the actual operation of the reefer units. Everything is just as it used to be and customers can enjoy the benefits without any extra effort.

Not to mention that Quest II is completely free of charge.

Quest II is a part of Maersk Lines effort to stay ahead of rules and regulations and this is only done by continuously optimising our environmental standards in daily operations.

Benefiting our customers and Maersk Line the environment in general.

CONTACT

Henrik Lindhardt

Head of Reefer Innovation

henrik.lindhardt@maersk.com

