

# Vacuum Cooling of fresh flowers

Flowers should be rapidly cooled after harvesting, and kept at low temperatures, to preserve vase life. A very significant part of vase life is wasted by premature damages such as botrytis, dormancy, bent neck etc. Once the flowers are cut, they begin a continuously race to their senescence and death. Temperature is the single most important factor affecting flower life. Quick pre cooling reduces these physiological activities. It also reduces other metabolic activity and slows down the rate of opening of the flowers. Therefore, quickly reducing temperature by means of precooling, starting directly after harvesting, is vital for the quality of the flowers.



There are many flower precooling preserving methods, of which the most effective way is **vacuum pre-cooling**. Vacuum precooling can ensure very quick precooling (generally only 20 to 30 minutes), high efficiency, uniform cooling, without influence of packing. Over the last years the vacuum precooling systems used by ColdMax Europe have been modified especially for flowers, making their cost effective systems the most suitable for the quick precooling of flowers. Vacuum cooling is the only realistic means to cool down flowers at the airport (both at departure and arrival) but only the most effective system to precool at growers, directly after harvesting.

## Need for precooling of fresh flowers

The most important aspect in preserving the quality of fresh cut flowers is to have them cooled down as soon as possible after harvest and also kept within the right temperature range (2-5°C/ 36-41°F) up to their distribution. The purpose of cooling is to remove the field heat by lowering the temperature at harvest time to the ideal for transportation. The above benefits the flowers by reducing their respiration and transpiration rates and therefore precluding damages due to dehydration.



Respiration rate affects quality of flowers much more than transpiration, roses and carnations respire 25 times faster, when temperature increased from 0° to 20°C (68°F). Not only do environmental factors affect flower longevity. Among plant hormones, ethylene is the main factor exerting influence over their senescence. Also at low temperature, ethylene release is reduced, delaying maturity during transportation and distribution and increasing vase life.

**You Tube**

Watch  
the broadcasted  
video about  
vacuum cooled  
flowers here.





Precooling is a process that quickly reduces the temperature, thus extending the beauty and useful life and, obviously, increasing the quality of the product. This is especially important for those flowers who have high respiration rates (generating much heat) such as roses and carnations.

Many experiences have proven that such process is beneficial to most species, and will give a longer vase life, especially if precooling is done at the grower (directly after harvesting, and at both departing and arriving airports, as flowers will otherwise heat up to much in the meantime (see graph).

To summarize, precooling:

- Reduces respiration rates.
- Reduces growth of decaying micro-organisms.
- Reduces transpiration and moisture loss.
- Reduces ethylene release and increases tolerance to it.
- Reduces physical damage.
- Reduces waste of vase life during transportation and storage.

## Precooling Methods for flowers

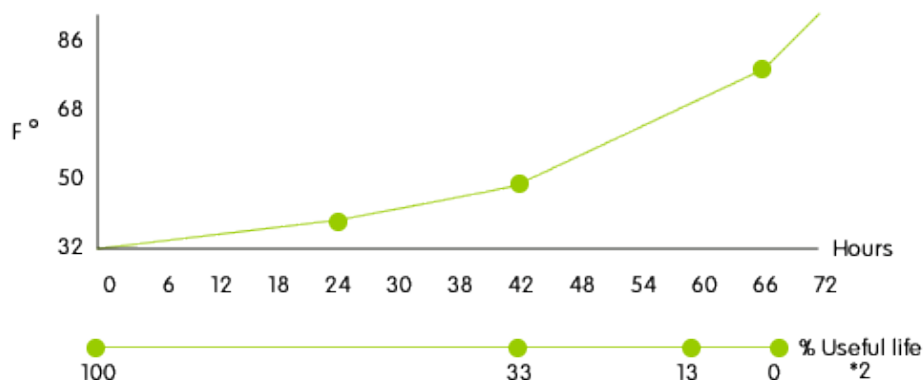
Passive air precooling is not effective to rapidly remove the heat absorbed at the greenhouse, cooling down often requires 2 hours or more! Passive air precooling of packed flowers is even much less efficient. If the plant material is kept for a long time (more than one day) in a cold room, it will show symptoms of dehydration earlier.

Forced air precooling requires that the bunches are placed very carefully in the boxes to make sure that the flow of cold air will not be blocked by the flowers. The average processing time varies between 20 and 60 minutes, depending on the product. Packing and stacking can strongly influence this processing time. Flowers are often packed in a manner that makes pre-cooling impossible. The large amount of paper used results in slow pre-cooling, and copious condensation from water that comes from the flowers, occurs on the flowers, sleeves, and packaging. Additionally, pre-cooling on airports & auction houses requires unthinkable space & time.

Vacuum Cooling is the fastest method, capable of handling large volumes in short periods of time, with reduced spaces, and independent of packing method. Flowers are induced rapidly into a cool-chain, making it easy to maintain all the way to their final destinations. The process reduces undesired free moisture. Boxes keep their mechanical strength. Quality standards increase.



Heating of Flowers \*1



## The principle of vacuum precooling

Vacuum precooling is based on the principle that water evaporates spontaneously under low vacuum conditions. The vacuum causes a small amount of humidity from the surface of the product to evaporate. The latent heat is released with the water vapor, and lowers the temperature of the produce. Vacuum cooling is adequate for products with a high surface area to mass ratio (to easily release humidity), such as flowers. Packing (as long as not airtight) does not influence the speed of the process, so packed and palletized products can be cooled, quickly and evenly and thoroughly. The usual cycle allows up to 350 boxes to cool down from 55F(13°C) to 35F(1.7°C) in just 30 minutes.

The vacuum precooling process will cause some water loss, around 1% for each 8 - 10 °C temperature decrease. Care has to be taken to limit the water loss, as to severe loss due to

open surface porosity can lead to affect the quality of flowers. This can be by absorbing the flower in cold water before the vacuum cooling, if required by adding (about 1%) silver nitrate as a preserving agent. Hydrovac is a different method, based on spraying some moisture inside the vacuum room, just before the cooling process starts. The resulting uniform water dispersion helps reducing the water loss.



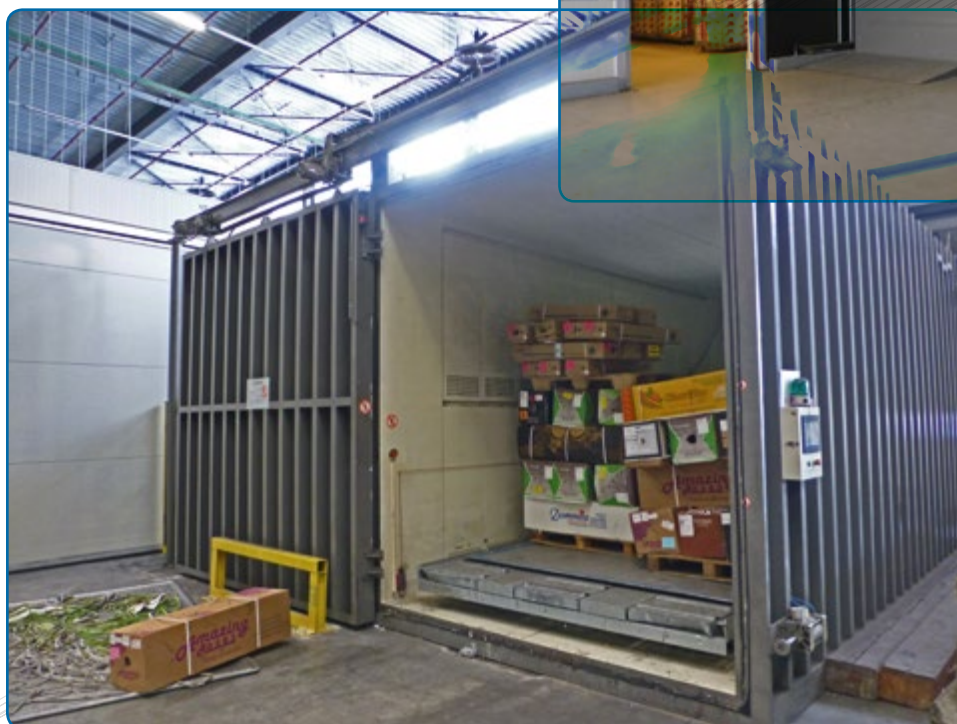


## The advantages of vacuum cooling

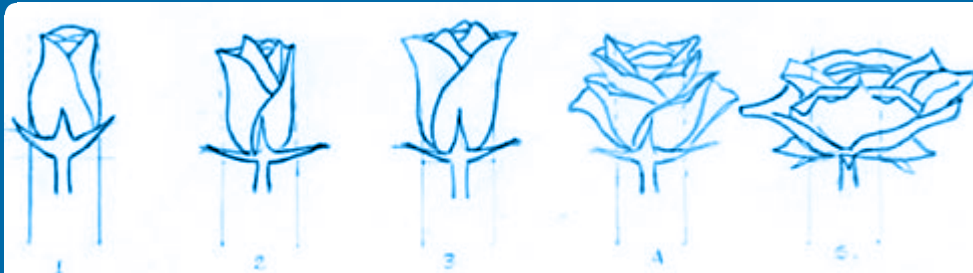
Vacuum cooling is the most rapid and energy efficient form of precooling, applicable to flowers. Vacuum cooling is not only a faster and more uniform cooling method, but due to the reduced pressure, the flower tissue oxygen concentration is decreased, and the ethylene release concentration reduced, resulting in an longer flower freshness and prolong the storage period. Studies have shown that the use of vacuum pre-cooling can be used for flowers like freesias, tulips, daffodils, carnations, roses and chrysanthemums. Tests also show that treated flowers had longer vase life and are shipped better than non-treated ones, and that Vacuum precooling can extend the vase life significantly.

Bottom line, vacuum pre-cooling of fresh flowers can offer:

- A shorter time to market (same day delivery), reducing your storage & logistic needs
- A longer storage life if needed, increasing your sales flexibility
- More constant cold room temperature conditions, as flowers enter the storage at lower temperatures.
- No problem in cooling completely packed products! Packing does not influence the speed of cooling.
- Overall a better product quality and longer vase life.



Floral opening grades considered upon the evaluation of vase life of 'Classy' roses.



## ColdMax Vacuum Pre-Cooling systems

ColdMax Europe has grown and developed to become the new standard in vacuum cooling in just a few years and can supply high speed, low cost vacuum coolers which can reduce the temperature of flowers from 15°C (59°F) to 3°C (34°F) in about 20 - 25 minutes. ColdMax Europe uses top quality components (Bitzer compressors, Busch & Leybold vacuum pumps, Danfoss control systems etc.). Due to low labor costs, large production volume and standardisation, we are in the position to offer a unique price-/performance ratio within the marketplace.

Our standard range consists of:

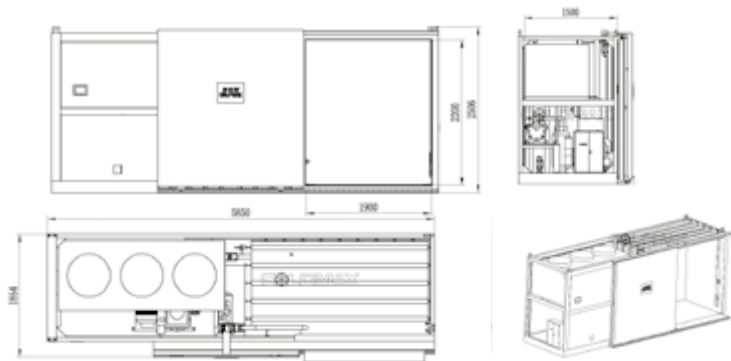
- A complete integrated two/three pallet system with sliding door. Extremely compact and very fast to load and unload. Also suitable for flower pallets.
- A 3 to 12 pallet system where the pallets are placed one behind the other in one row.
- Suitable for pallet dimensions of 80 x 120 cm, 100 x 120 cm and 120 x 120 cm.
- A 4 to 12 pallet system where two rows of Euro pallets can be placed side by side. These systems give you the highest value for money.

For flowers the integrated system with sliding door are the perfect solution at the growers.

For the airport we've developed 1 and 2 aircraft pallet systems with an unparalleled price/performance ratio!

### Two/three pallet system with sliding door, compact

Interior space	1.900 x 1.500 x 2.200 mm, 6,3 m <sup>3</sup>
Net produce weight	600 – 800 kg ... 900 – 1.200 kg
Cooling capacity	50 – 70 – 90 kW
Number of pumps	1 or 2
Capacity	25 kW – 45 kW (60 – 100 A)



### Large 2 Aircraft Pallet system

Interior space standard version	3,000 x 6,500 x 3,400 mm (66.3 m <sup>3</sup> )
Net produce weight	4,000 – 8,000 kg
Cooling capacity	200 – 350 kW
Number of pumps	6 – 8
Capacity	120 – 200 kW (300 – 500 A)

