SOLUTION TO:

LONG-TERM FRESHNESS PRESERVATION AND FRESH PRODUCE DELIVERY WORLDWIDE

Cool Innovation

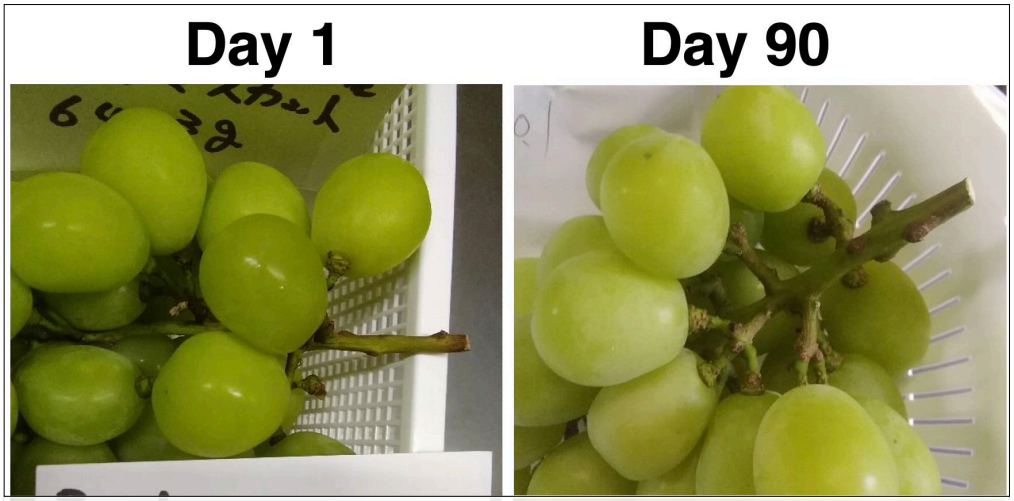
SEEING IS BELIEVING

Since 2018, Cool Innovation has conducted various pilot projects in collaboration with our customers. These experiences have not only significantly contributed to the upgrade of our technology but also provided us with a deeper understanding of fruits, vegetables, and seafood. In this section, we would like to share some of the results of these endeavors.

STRAWBERRY - 45 DAYS

Tochiotome, a specialty of Tochigi Prefecture, Japan, was examined on the 26th day using Cool Innovation technology. The tests showed no changes in appearance, taste, and texture compared to the first day. Even after two months, all three indicators remained almost unchanged.

SHINE MUSCAT GRAPE - 90 DAYS

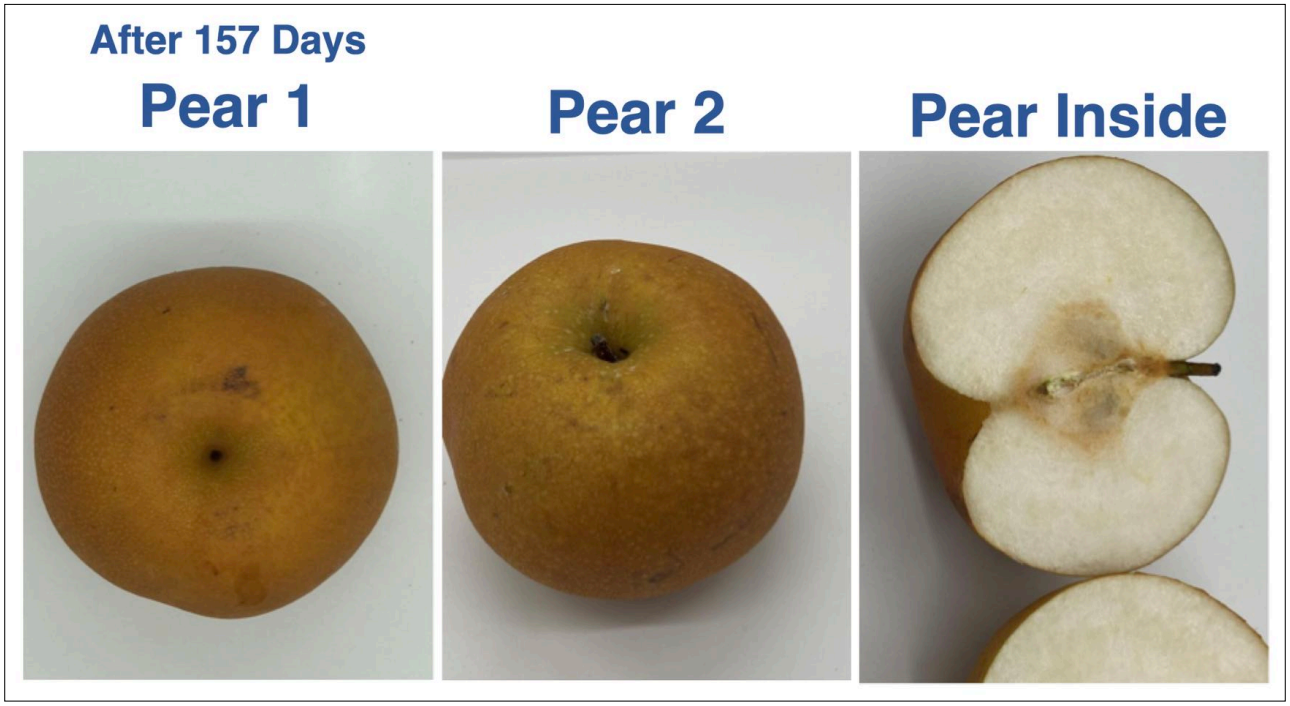


These Japanese premium grapes maintained almost unchanged appearance and texture even after being stored for 90 days using Cool Innovation technology. Freshness should be judged by the stem rather than the fruit itself, and after 90 days, the stem remained moist, plump, and green. These grapes were stored without any packaging, but with suitable packaging, even better freshness preservation is expected.

GREEN LETTUCE - 45 DAYS

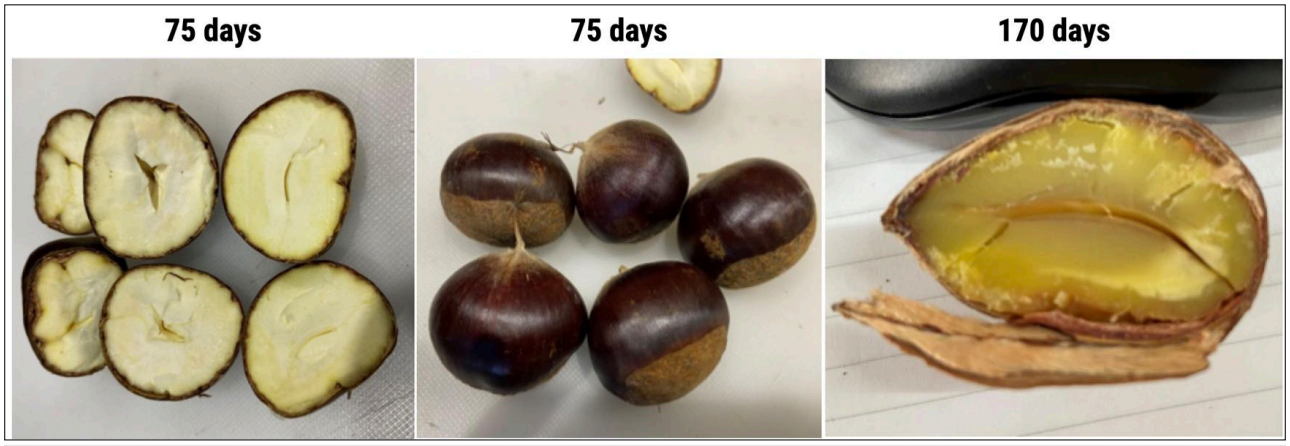
Green lettuce produced at the foot of Mount Fuji was tested for appearance and inspected on the 20th day using Cool Innovation's technology. Even when displayed in supermarkets, it maintained a level of freshness that made it one of the first to be purchased. It was confirmed that freshness can be maintained for up to 45 days.

NIITAKA PEAR - 157 DAYS



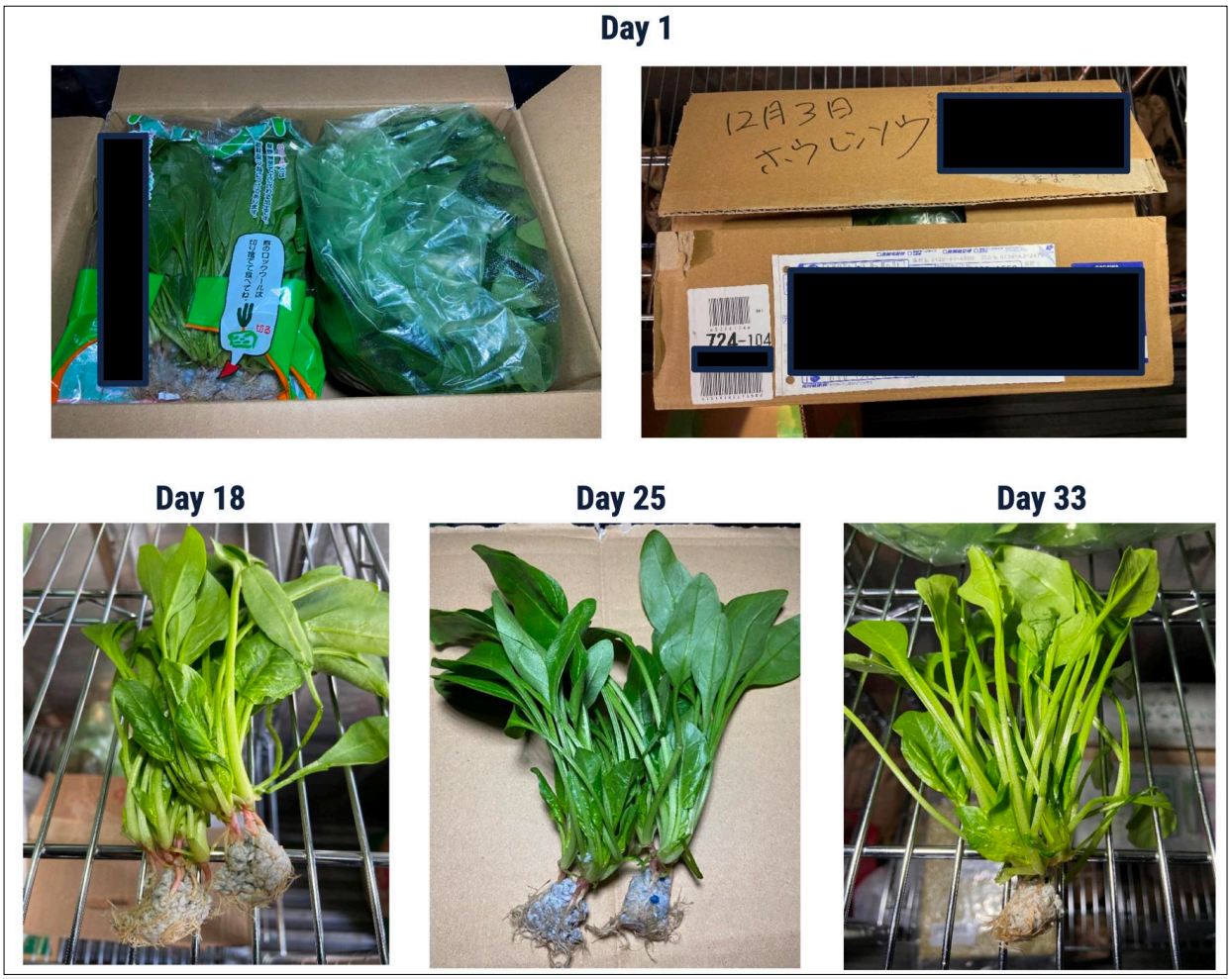
We stored the Japanese variety of Nii Takana pears along with grapes for 5 months. After 157 days of storage, the weight decreased by about 8%, but the appearance was at a sellable level. The texture just below the skin was slightly dry, but over 90% of the taste and texture maintained its freshness. The condition is expected to be significantly improved with PET packaging.

CHESTNUT - 170 DAYS



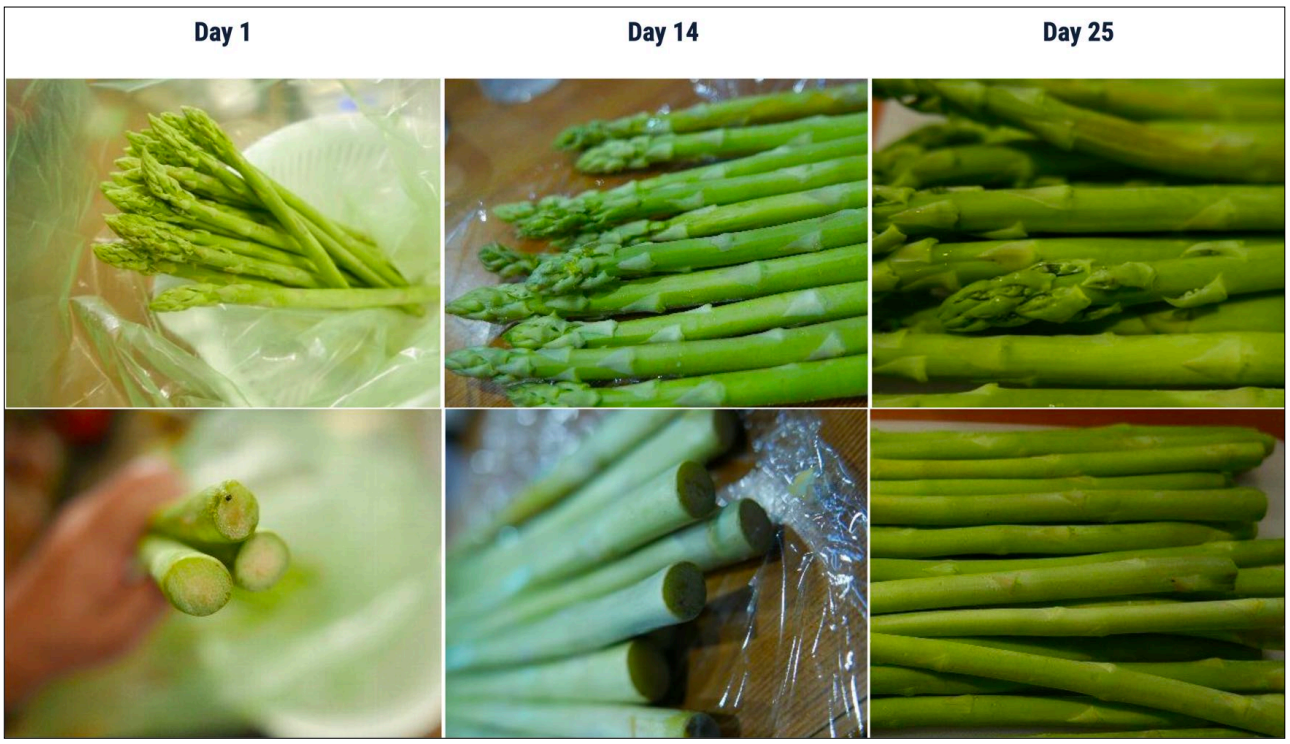
Generally, chestnuts can only maintain their freshness for a few weeks, but in the Cool Innovation environment, they were able to stay fresh for 170 days. Furthermore, the increased sweetness due to low-temperature aging amazed professional producers during tastings, leading them to remark that these were "the best chestnuts they've ever tasted."

SPINACH - 33 DAYS



Here are the results of the 33-day freshness test on spinach from Wakayama. The appearance showed minimal difference, and the weight decreased by only 0.2%, indicating that the moisture was well retained within the plant.

ASPARAGUS - 25 DAYS



We conducted a freshness preservation test on green asparagus from Nagano. The asparagus was stored in FH film bags with ethylene-absorbing properties, with the bags loosely closed without sealing.

After 14 days, the asparagus showed no change in appearance or flavor, except for one spear that had turned yellow. When retested after 25 days, four spears had discolored, but the remaining 20 spears were as fresh as the initial state, with no significant changes in taste or aroma. There was minimal elongation between nodes, bending, wilting, or discoloration at the base, maintaining their fresh condition.

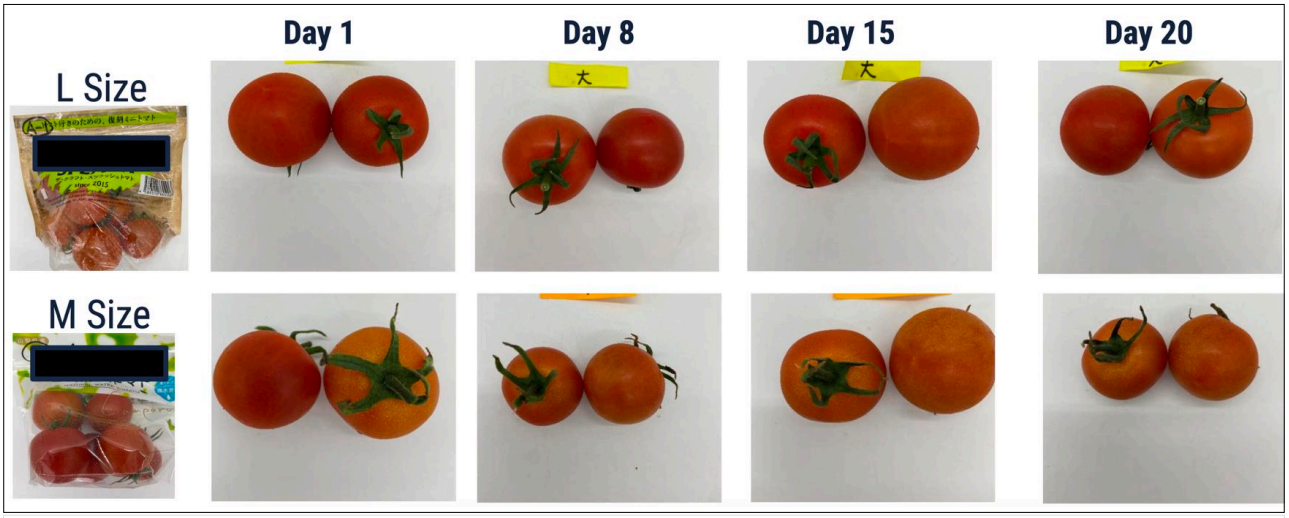
FLOWERS - 30 DAYS

Cool Innovation was able to extend the lifespan of flowers by up to 30 days, maintaining a freshness as if they had just started to bloom.

When taken out of our storage environment, the flowers appeared "groggy," but after 2-3 hours, they looked almost fully bloomed.

Furthermore, the samples were cut flowers purchased from a local florist, not directly from the producers. No preservatives or chemicals were used to extend the life or maintain the freshness of the flowers.

TOMATO - 20 DAYS



Unit: KG	Day 1	Day 8	Day 15	Day 20
L Size	0.865	0.92	0.897	0.898
M Size	>1.0	>1.0	>1.0	0.951

A 20-day freshness test was conducted on tomatoes grown in a Japanese plant factory. The results showed no changes in appearance or taste. Regarding firmness, an important indicator of tomato texture measured in kilograms (KG), the tomatoes maintained a consistent level of firmness throughout the testing period.

RED SEA BREAM - 7 DAYS

Japan is renowned for being the largest consumer of fish in the world and for its tradition of eating fresh fish as sashimi, which demands high standards for seafood freshness. Cool Innovation conducted a one-week freshness preservation test on red sea bream (madai). Here are the results:

Comparing fish stored with a cloth, without a cloth, and with the conventional ice method, the best results were observed with the cloth method. Even after a week, both transparency and

crunchiness were somewhat retained. Although a slight odor was detected, it was at a level indistinguishable when served as sashimi.
Without the cloth, the fish showed increased opaqueness and odor compared to the cloth method. The conventional ice method resulted in a strong odor spreading even before preparation. The flesh clung to the knife, was highly opaque, lacked crunchiness, and had a strong odor, making it unpalatable without cooking.

HOW IT WORKS

RESPIRATION OF FRUITS & VEGETABLES AND MAINTAINING FRESHNESS

Controlling respiration activity plays a crucial role in maintaining the freshness of fruits and vegetables. Respiration is the process by which post-harvest fruits and vegetables take in oxygen to generate energy, releasing carbon dioxide and water in the process.

As respiration progresses, energy and nutrients are consumed, leading to a decline in quality. The respiration rate of fruits and vegetables varies by type. For example, fruits like avocados and bananas have high respiration rates and ripen quickly. In contrast, apples and potatoes have relatively low respiration rates and can be stored for longer periods.

Respiration activity increases with higher temperatures, making low-temperature storage recommended. For instance, apples and broccoli retain their freshness longer when stored at 0°C. However, some fruits and vegetables, such as tomatoes and bananas, are sensitive to low temperatures and may deteriorate in quality if refrigerated.

A high-humidity environment helps prevent moisture loss in fruits and vegetables, aiding in preserving their freshness. Generally, a relative humidity of 90% to 95% or higher is ideal. Specific storage conditions are available on the websites of agricultural departments and related organizations in various countries.

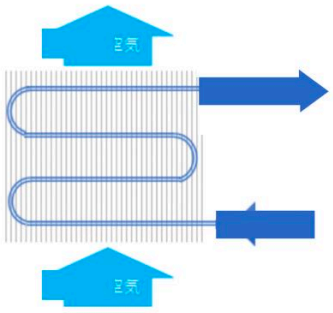
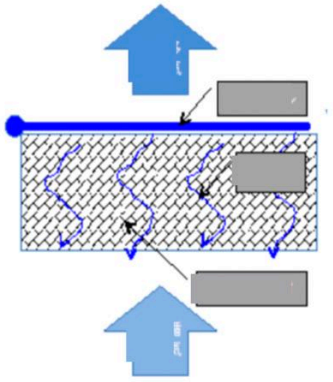
General Storage Conditions

- Apples: 0°C, 90-95% RH
- Lettuce: 0°C, 95-100% RH
- Tomatoes: 13-16°C, 85-90% RH
- Broccoli: 0°C, 95-100% RH
- Strawberries: 0°C, 90-95% RH
- Potatoes: 7-10°C, 90-95% RH

Additionally, some fruits and vegetables emit ethylene gas, which can accelerate the respiration activity of surrounding produce. Fruits and vegetables that are highly sensitive to ethylene gas (such as apples, bananas, and tomatoes) should be stored separately from other produce, or technology that can extract ethylene gas becomes essential.

Maintaining appropriate storage conditions helps control respiration and moisture loss, minimizing spoilage and preserving freshness. Since ethylene gas can accelerate the ripening and spoilage of nearby produce, it is crucial to store ethylene-sensitive fruits and vegetables separately or use technology capable of extracting ethylene gas.

Traditional coolers use finned tubes where refrigerant passes through, resulting in low heat exchange per unit volume, which leads to insufficient air cooling and poor humidity control. The dry air exiting the cooler further affects humidity levels.

	Conventional Air Cooler	Cool Innovation
Concept		
Overview	This is a cooler typically used for air conditioning and refrigeration. Cold refrigerant passes through finned tubes. Typically, the refrigerant liquid is supplied inside the tubes, and when it evaporates, the evaporation heat is used to cool the air passing outside the tubes. Finned tubes are used to increase the heat exchange surface area.	As shown in the diagram above, cold water is sprayed over the packing material. The cold water flows downward in a liquid film. Meanwhile, the internal air is supplied from below, and as it exchanges heat with the cold water, it flows upward.
Efficiency	30～40 kcal/m2h°C	100～150 kcal/m2h°C
Capacity	Due to its price and structure, the surface area per volume is small, and the efficiency mentioned above is 1/3 to 1/4 compared to direct contact types, resulting in low heat exchange per unit volume.	The specific surface area is very large, and the overall heat transfer coefficient is four times that of indirect types, so the capacity per unit volume is extremely high.
Frosting	To obtain air below 5°C, the refrigerant's evaporation temperature becomes below freezing, causing frost to form on the surface of the heat transfer tubes. Using fins accelerates frost formation, leading to severe heat transfer issues. Frequent defrosting is required, which further increases the load. If a humidifier is used for humidity control, all the added water vapor will freeze.	To obtain moist cooling air at 2°C, ice water is used. In our new technology, excess moisture is absorbed by the cold water, and when humidity is low, the cold water evaporates (heat exchange involving mass transfer). To create cooling air below 1°C or below freezing, antifreeze is used.
Temperature and Humidity Control	Due to the relatively small heat exchange surface area, the air exiting the cooler is dry. Humidity control cannot be achieved without a humidifier.	Sufficient heat exchange surface area allows for heat exchange with a small temperature difference. This is the reason for creating moist cooling air.

Moreover, to achieve cold air below 5°C, the refrigerant's evaporation temperature drops below freezing, causing frost to form on the surface of the heat exchange tubes. When using a

humidifier to adjust humidity, the added water vapor freezes, making humidity control difficult.

Cool Innovation's technology effectively controls humidity by absorbing excess moisture and evaporating it as needed. With ample heat exchange surface area, our system ensures efficient heat exchange, circulating moist, cooled air evenly throughout the storage space.

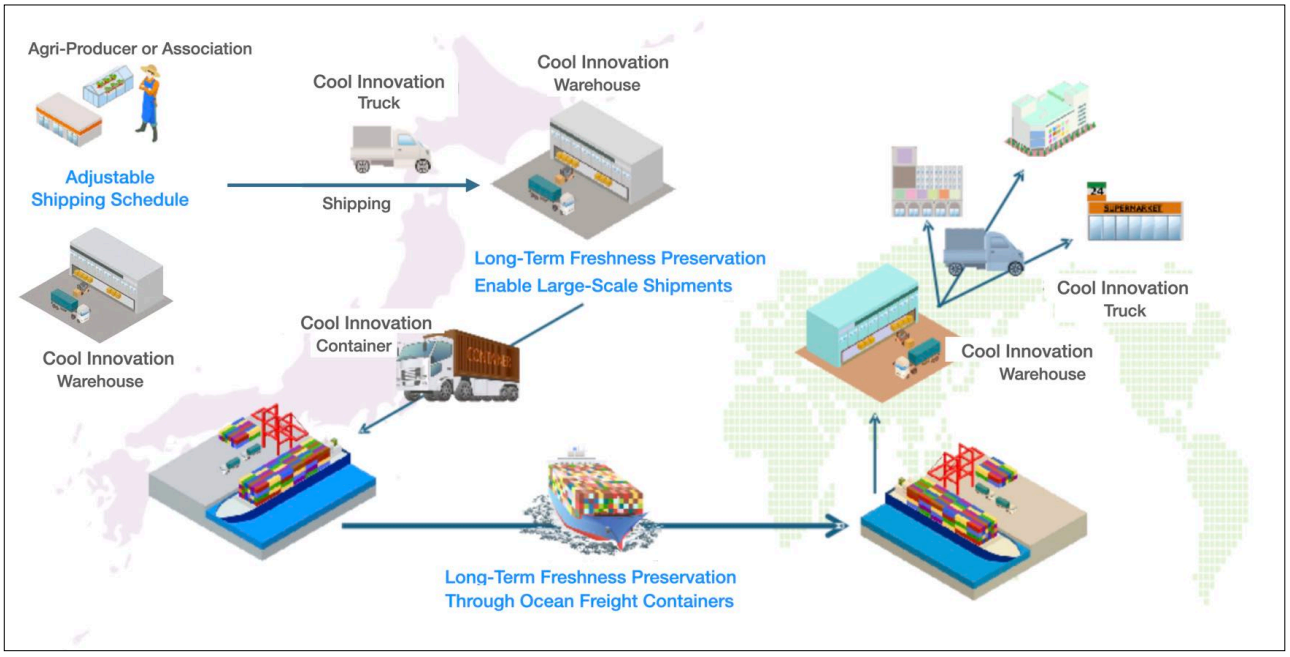
TECHNOLOGIES COMPARISON

Refrigeration Technology	Conventional Refrigeration	Conventional Refrigeration + Humidifier	Conventional Refrigeration + High Voltage & Electromagnetic Waves	Conventional Refrigeration + Nitrogen Gas Generator (CA)	Cool Innovation
Long-term Storage & Quality Retention	**Bad**	**Average**	**Average**	**Average**	**BEST** Achieves optimal environment
High Humidity	**Bad**	**Good** (Up to 90%)	**Bad**	**Bad**	**BEST** Achieves 95% or higher
Independent Temperature & Humidity Control. Temperature & Humidity Fluctuations	**Bad** Temperature fluctuations due to compressor ON/OFF + heating during defrosting. Dependent	**Bad** Frequent heating for defrosting besides compressor ON/OFF. Dependent control.	**Bad** Temperature fluctuations due to compressor ON/ OFF + heating during defrosting. Dependent control	**Bad** Temperature fluctuations due to compressor ON/ OFF + heating during defrosting. Dependent control	**BEST** High precision with temperature ±0.3°C, humidity ±2%, and independent control
Microorganism & Dust Control from Outside	**Average**	**Average**	**Average**	**Average**	**BEST** Internal air: almost sterile
Defrosting Required	**Bad**	**Bad**	**Bad**	**Bad**	**BEST** Not required.
Cooling Unevenness Inside the Storage	**Bad**	**Bad**	**Bad**	**Bad**	**BEST** Circulates large amounts of cold air with ultra-fine airflow
Energy Efficiency	**Good**	**Bad**	**Good**	**Bad**	**BEST** Consumes half the energy
Operation & Maintenance Costs	**Good**	**Bad**	**Bad**	**Bad**	**Good** Remote monitoring with predictive diagnostics

Our subscription service not only allows customers to use our solutions according to their needs but also reduces initial investment costs, thereby shortening the decision-making period and enabling quick responses to market demands.

We offer a range of products, including small experimental refrigerators, land/sea containers, and cooling units for large refrigerated warehouses. There are no size restrictions for warehouses, and by adding our cooling units according to the volume, you can extend the freshness preservation period of fresh produce by more than 10 times*, reduce energy consumption by

50%, and create a storage space that allows for free opening, closing, and mixed storage.



20/40FT CONTAINER SERVICE

Cool Innovation's containers are used for land, rail, and sea transport, enabling the export and import of fresh produce that previously could only be shipped by air, at a quarter of the cost and with a 97% reduction in CO2 emissions.

Unlike other products that only support chilled meat or CA refrigeration that does not allow for mixing or opening and closing, Cool Innovation's containers can maintain long-term freshness for a wide range of fruits and vegetables that were previously thought impossible. They also allow for opening and closing, making it possible to transport fresh produce worldwide at low cost.

REFRIGERATED WAREHOUSES

There are no size restrictions for warehouses, and by adding our cooling units according to the volume, you can extend the freshness preservation period of fresh produce by more than 10 times (depending on the type of produce), reduce energy consumption by 50%, and create a storage space that allows for free opening, closing, and mixed storage.

This enables inventory adjustment and sales planning, eliminating the need to discard fruits and vegetables due to imbalances in supply and demand. The ability to maintain long-term freshness also solves the problem of small-lot logistics.

This service is beneficial for producers, logistics companies, retailers, consumers, and the planet.

FOOD STOCKER

The Food Stocker, measuring 220 cm in height and 90 cm in width, is a compact storage unit that is equipped with Cool Innovation's long-term freshness preservation technology.

This device is loved by customers for storing high-value products in small quantities and for testing the limits and optimal temperature and humidity for long-term freshness preservation of various fresh produce.

BUILDING A SUSTAINABLE FUTURE WITH US

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