

Next Quick-freezing Technology

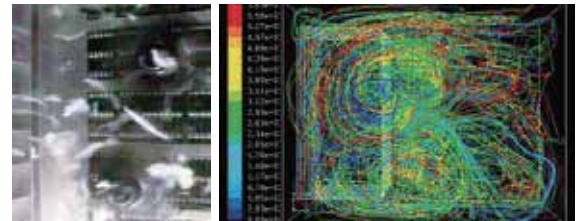
3D Freezer



About 3D freezer

In contrast to the constant circulation of air for the conventional type, the 3D freezer exchanges heat without returning air to the cooler in the refrigerator. Due to the non-circulating structure, the air cools the whole food uniformly from all directions.

This homogeneity makes high quality freezing without distorting the shape of ice crystals while placing the ice crystals in a way which minimizes the growth of ice crystallization, thereby maintaining the content's original freshness, flavor, texture and moisture.



Visualization of cold air and the flow pattern inside of freezer



The 3D freezer uses the built-in fan circulating the high humidity turbulence in the freezer to have a 360 degree cooling where every surface of foods is hit all at once while forming the ice crystallization.

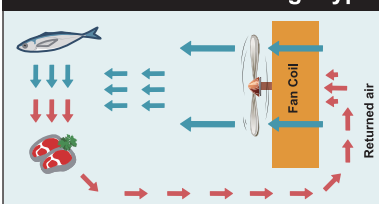
It is capable of rapid freezing without using super cooling technology to prevent the crystallization from growing while still being able to freeze foods faster than any other conventional freezers in the market.

Mechanism

In the conventional freezing method, the cold air cooled by the cooler is applied to freeze the food. In the refrigerator, the heat taken from the food is chilled again with a cooler and applied to the food.

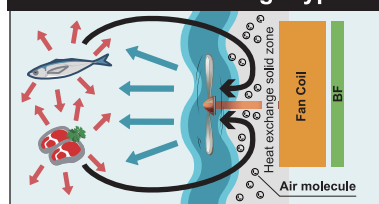
The 3D method freezes the ingredients without directly applying cold air to the food. This is a non-flow-through heat exchange method that freezes the food by keeping the air around the food in contact with cold air while cooling it.

Conventional flow through type



The difference occurs in freezing speed between the places where the cold air hits and where the cold air does not hit the food.

3D non-flow-through type



3D cold air hits the whole food as if it wraps the whole food, so there is no uneven. Therefore, the stable quality of food can be provided.

Characteristics

Quick freezing

3D cold air with 5~8% higher humidity has a strong ability to transfer and to remove heat in a short time freezing without depriving the water content.



Frozen distribution

Freezing products mostly in the chilled distribution extend the shelf life resulting in the reduction of food loss and expansion of sales channels



Non drip

3D freezing minimizes drip by avoiding the destruction of cell membrane. Since the influence on ingredients is minimal, the original freshness and flavor can be reproduced.



No pre-cooling

Immediately after heating, food even with high temp. can be cooled and frozen at once without pre-cooling resulted in achieving an amazing yield.



Cost reduction

Continuous operation without defrosting for a long time can reduce the running cost of more than 30% by the lower labor & electricity charge in the short-term production.



Hygienic management

Since cold air circulation duct is not equipped, there is no blind spot for cleaning. As the result, the hygienic management is improved by removing the hotbed for bacteria.





Reproducibility

Succeeded in freezing yellowtail, sea urchin and paste products which have been considered unsuitable for freezing, it was demonstrated that 3D freezer has excellent reproducibility of frozen foods proving almost no difference between before freezing and after thawing.

In addition to fresh fish such as tuna, puffer fish and firefly squid, 3D freezer is also effective for highly processed ingredients such as meat and prepared foods.

3D Freezer



Drip spilling is not much seen and the original condition of ingredients such as color, flavor and texture can be restored.

Conventional



Defrosting usually produces a large amount of drip. In addition, foodstuffs are oxidized causing discoloration and odor.

Drip loss is one of the most important parameters of food-quality evaluation. It leads to the loss of nutrients flowing out with drips, affecting the texture and juiciness as well as the appearance.

No inferior to before and after



Vacuum-packed yellowtail was tested in a temp. range around -60°C. After storing for 3 weeks, it was confirmed that the blood and white parts of the cut surface were almost the same as before freezing.

Frozen fruit



The problem of freezing mangoes occurred from high water volume, changing important nutrient, color and texture. 3D Freezer was found to be a great freezing method maintaining the quality similar to fresh mango.

Freezing Capacity

Comparison between 3D and other methods

Freezing method	3D Freezer	Air based	Liquid based	Spray based	Contact based
Food	⊙ Any food	○ Partially limited	× Limited	△ Limited	× Limited
Yield	⊙ Hardly dry	△ Dry	○ A little dry	○ A little dry	△ Dry
Quality	⊙ Very good	△ Average	△ Average	⊙ Very good	○ Good
Freezing time	○ Average	○ Average	○ Average	⊙ Fast	○ Average
Inside the freezer	○ No scattering	× With duct	○ Without duct	△ Scattering	△ Scattering
Cleaning (bacteria)	⊙ Easy	× Hard	△ A little hard	○ Average	× Hard
Initial cost	○ Average	○ Average	○ Average	△ A little high	× High
Running cost	⊙ Cut 30%	○ Average	△ A little high	× High	○ Average

Freezing Capacity (+10°C ⇒ -18°C)

Food example	Rice ball with beans (100g/pc.)		Meat (300g/pc.)		Fish (250g/pc.)		Fish paste (200g/pc.)		Bread (300g/pc.)	
	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)
Model										
KQF-8A-300B	140	60	35	50	32	42	90	100	45	70
KQF-16A-300	240	120	60	70	56	80	160	140	80	130
KQF-16A-500	300	80	100	60	80	60	200	120	110	80
KQF-20A(L)-1000	1200	160	240	80	180	80	400	160	200	110
KSS-20A(L)-2000	1200	80	240	40	180	35	400	80	200	50

Cooling Capacity

Comparison between 3D and other methods

Cooling method	3D Freezer	Vacuum cooling	Blast chiller cooling	Natural cooling or refrigerator
Yield	⊙ Maintained	△ Dried & Lighter	△ Dried & Lighter	△ Dried & Lighter
Energy	⊙ Low	× Big	○ Average	⊙ -
Quality	⊙ High	○ May deform	○ Partially dry	× May maillard reaction
Cooling time	○ Short	○ Short	○ Short	× Long
Inside the freezer	○ No ducts	△ Dirt in the ducts	× Dirt in the ducts	× Constant maintenance
Cleaning (bacteria)	⊙ Easy	× Hard	× Hard	× Bacteria exist
Initial cost	○ Average	× High	× Average	⊙ Low
Required space	○ Small	△ Space for Pump	○ Small	× Large

Cooling capacity (+80°C ⇒ 10°C)

Food example	Omelets (500g/pc.)		Daily dish (500g/pc.)		Caselle (7g/pc.)		Fish paste (200g/pc.)		Steamed rice (200g/pc.)	
	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)	QTY (pcs.)	Time (min)
Model										
KQF-8A-300B	90	100	32	75	5	100	90	75	80	70
KQF-16A-300	160	150	56	120	8	180	160	125	140	120
KQF-16A-500	200	90	75	80	8	135	200	75	185	65
KQF-20A(L)-1000	400	60	180	30	10	60	400	30	360	25
KSS-20A(L)-2000	400	40	180	35	10	30	400	20	360	15

Lineup

