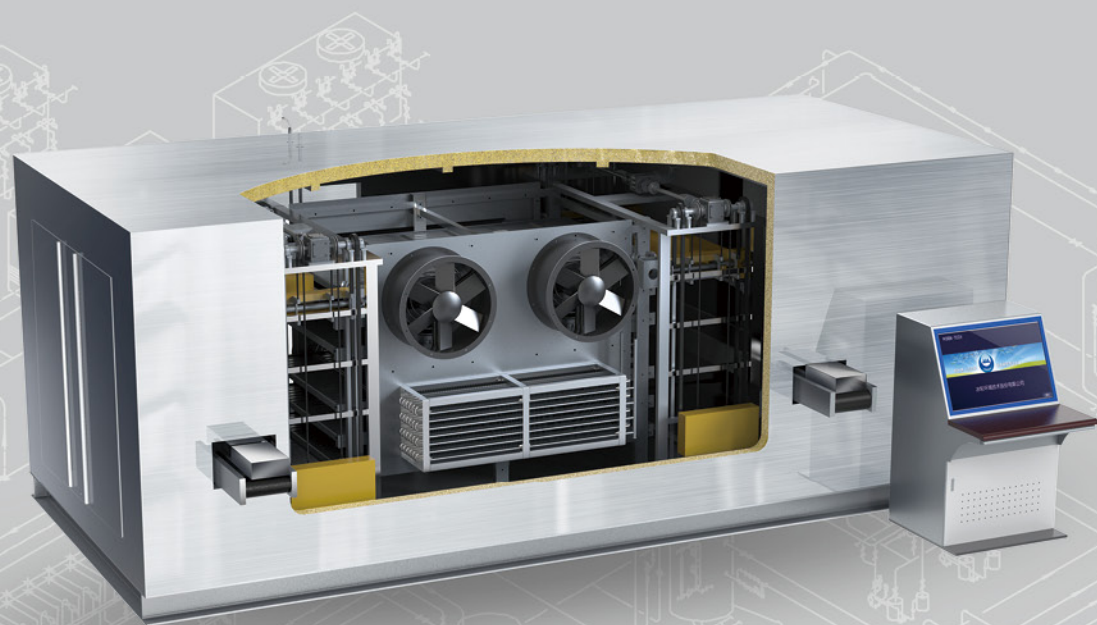


CARTON FREEZER



With continuous technological and manage has promoted the continuous optimization of resource allocation and reconstruction of core competencies, Moon-TECH accelerated international expansion transformation. We have transformed from a traditional manufacturing enterprise to a modern service-oriented enterprise with strong competitiveness, large scale, wide coverage, complete business chain, and strong comprehensive research and development capabilities



Industrial Park in the US



Malaysian Industrial Park



Industrial Park in the UK



Vietnam Industrial Park



Baoding Industrial Park



Guxian Industrial Park



Laishan Industrial Park



Jinan Center

MOON-TECH

(Stock Code of 000811)



Low-temperature refrigeration



Central air conditioning



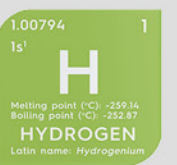
Environmentally friendly heating



Energy and chemical equipment



Precision Casting



Hydrogen Energy Development



Smart Services



Intelligent Packing Machinery and Warehouse Storage System

With devoting to improving the quality of human life as the enterprise mission, MOON-TECH continuously build and enhance competitive advantages in the field of comprehensive energy utilization and accelerate the process of globalization, taking the revitalization of national industry and achievement of customer value as its responsibility, continuously creates and improves its competitive advantage, striving to become an evergreen enterprise with core competitiveness, loved by employees and respected by industrial partners.

Founded in 1956, Moon Environment Technology Co., Ltd (Stock Code: 000811) is a diversified and international comprehensive equipment industrial enterprise. The main business covers low-temperature refrigeration, central air conditioning, environmental protection heating, energy and chemical equipment, precision castings, smart services, hydrogen energy development, etc. In recent years, MOON-TECH has successively won the titles of Top 30 Enterprises with Core Competitiveness in China's Machinery Industry, Top 100 Enterprises of National Machinery Industry, Meritorious Enterprise of Equipment in China, and Demonstration Enterprise for Ozone Layer Protection.

For a longtime, with continuous technological and manage has promoted the continuous optimization of resource allocation and reconstruction of core competencies, accelerated international expansion transformation. We have transformed from a traditional manufacturing enterprise to a modern service-oriented enterprise with strong competitiveness, large scale, wide coverage, complete business chain, and strong comprehensive research and development capabilities

With the synchronous development of refrigeration and heat treatment, and actively expanding energy-saving and environmental protection industry as developing strategy, MOON-TECH is engaged in the technical research and development of low-temperature environment, waste heat recovery, gas compression, industrial heat exchange, urban clean emission and other fields, as well as the production and sales of related complete sets of equipment, and specializes in food refrigeration, chemical process cooling, comfortable environment air conditioning, research temperature control, process gas compression, building aggregated cooling, comprehensive application of heat energy, permafrost drilling, waste treatment, tec. MOON-TECH has production bases, scientific research centers and marketing& service organizations in more than 40 countries around the world. With safe, environmentally friendly, energy-saving, intelligent and Butler-style system integration capabilities, MOON-TECH is providing products with entire product life cycle to users in more than 120 countries and regions around the world.

MOON-TECH has 6 national scientific and technological innovation platforms including the National-Recognized Enterprise Technology Center and 16 provincial scientific and technological innovation platforms including the Shandong Provincial Key Laboratory of Energy Saving and Environmental Protection of Refrigeration Equipment. MOON-TECH has been recognized as a key high-tech enterprise of the China Torch Program, with 326 national patented technologies, and has hosted and participated in the formulation of 25 national standards and 37 industry standards. MOON-TECH has won two national awards, the National Science & Technology Progress Award and the National Technology Invention Award, and has successively won 213 provincial and ministerial scientific and technological achievements awards such as the Special Prize for Scientific and Technological Progress of the Chinese Association of Refrigeration and the First Prize for Scientific and Technological Progress of Shandong Province.

Following the requirements of the environmental policy of harmonious coexistence between human and nature, MOON-TECH is committed to the innovation of artificial environment control technology and comprehensive energy utilization technology to promote a simple, moderate, green and low-carbon mode of social production and operating system, actively building an interconnected and complementary system, including refrigeration, heating, water, gas, electricity, sewage, waste within the -271 °C -200 °C temperature and 0-90Mpa pressure range, aiming to achieve an energy ecological link between industrial parks and living spaces, and become an intelligent green energy system solution service provider. MOON-TECH also dedicates to develop the utilizations of NH₃、CO₂、HC、He、H₂O and other environmentally friendly substances application technologies, striving to provide professional, high value-added intelligent energy comprehensive utilization solutions.

In recent years, MOON-TECH actively actualized the green and low-carbon developing concept, accelerating the transformation of traditional industries around the dual-carbon goal and energy revolution, promoting the upgrading of the industrial structure to a low-carbon and high-quality level, and set six goals of "low-carbon industry, low-carbon technology, low-carbon manufacturing, low-carbon chain, low-carbon services, low-carbon culture", so as to ultimately realize the industrial structure of high-end, low-carbon consumption of energy, utilization of resources recycling, cleanliness of the production process, and to contribute to the realization of dual-carbon target.



R&D Background

● Huge development space of the freezing and refrigeration market



Freezing and refrigeration **plays an important strategic role** in the national economy;

The freezing and refrigeration market **remains high annual growth rates**;

The freezing and refrigeration industry occupies a large share of the national economy and **has huge development space!**

● Related constraints on the development of the traditional quick freezing industry

High labor costs		Adverse working environment
Traditional quick freezing is highly dependent on labors. With ever-increasing remuneration costs, the labor cost has become an expensive resource.		It is low-temperature and high-moisture in traditional ABF, and low temperature has been listed in the Classification Directory of Occupational Disease Hazard Factors issued by the Government.

The traditional quick freezing industry is highly dependent on labors, severe in working conditions and

at low AI level!

Food security and personal safety

Workers deal with materials in traditional ABF, so contacts between humans and animals are inevitable, the bacterial and viral cross infections occur at a high probability, and the hygiene conditions are worrisome.



The existing assembly lines of the slaughtering industry deal with slaughtering, division and partition, but the procedures of quick freezing and rear-end packing remain highly dependent on labors.

High cold loss

To satisfy requirements of small batches, multiple varieties and flexible production, traditional ABF is small in capacity, highly frequent in turnover, and severe in cold loss.

Poor wind field uniformity

Horizontal blow from air cooler is commonly applied, cold-blast air sinks naturally, the blowing and return fields are mixed, and the freezing time of different articles is different, resulting in the problems of over-freezing and long freezing time.

Low space utilization

Racks or trolleys are used, stacking height is low, and manual inspection channels need to be reserved, resulting in low space utilization.



High cold loss, poor wind field uniformity and low space utilization remain to be further solved for the refrigeration industry!

● Trends of intelligent transformation

"Intelligent transformation" is the requirement for traditional manufacturing of "Smart Manufacturing Plan for 2025" and "China's 14th Five-year Development Plan on Smart Manufacturing";

It is imperative to apply **intelligent freezing technologies** into the traditional quick freezing industry!



Advantages of MOON-TECH

Powerful technological strength



National-level innovation platforms: 5

National-Recognized Enterprise Technology Center
National-local Joint Engineering Laboratory
Post-doctoral Research Workstation
Yantai Branch, National Agricultural Products Modern Logistics Engineering Technology Research Center
Refrigeration and Air Conditioning Engineering Technology Research Center of China Machinery Industry

Provincial innovation platforms: 14

Shandong Provincial Key Laboratory of Energy Saving and Environmental Protection of Refrigeration Equipment
Shandong Refrigeration System Engineering Laboratory
Shandong Refrigeration Engineering Technology Research Center
Technology Center of Refrigeration Equipment Industry of Shandong
Shandong Provincial Industrial Design Center...

Scientific research and quality control achievements

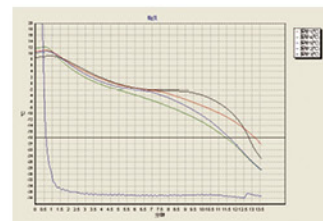


- The project of "Impact-type IQF Industrialization" (with project No. of 2010GH041248) was listed as a China Torch Program 2010.
- The Company undertook the R&D and demonstration of low-energy and intelligent quick freezing equipment for the program of key manufacturing technologies and R&D of prepared food and new quick freezing technology and equipment development, a key R&D program during the "13th Five-year" Plan Period.
- It undertook the topics themed with "New product and ultra-low temperature machinery equipment development and industrialization demonstration for bulk low-value fish processing", and "Fruit and vegetable pre-cooling at source, cold-chain technology integration and industrialization demonstration" for the National Science and Technology Support Program during the 11th Five-year Plan Period.
- In 2020, the project of "Low-energy and Intelligent Tunnel Continual and Quick Freezing Equipment" of MOON-TECH passed the scientific and technological verification of China Association of Refrigeration. 8 articles have been published in domestic renowned journals and 9 patents applied based on the achievements obtained in the terms of theoretical studies and equipment development for the Project.



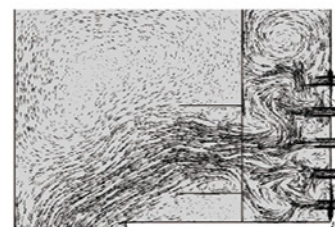
MOON-TECH has established its own freezing laboratory and the only quick freezing experiment platform nationwide verified by Hefei General Machinery Research Institute Co., Ltd.

We are capable of stimulating freezing states of various single freezers, obtain precise freezing curves of frozen articles in different freezing ways, and select reasonable quick freezing equipment solutions.



MOON-TECH has conducted close cooperation with China Academy of Sciences, Xi'an Jiaotong University, Tianjin University, Tianjin University of Commerce, etc., done a lot of theoretical studies and experiments on quick freezing devices, and obtained fruitful research achievements.

At present, the freezing and wind field layout processes of MOON-TECH are at the internationally advanced level.



Rich professional experience

Wide product application scope

The quick freezing devices are widely applied in deep processing of aquatic products, meat, fruit, vegetables, prepared food, etc.

Applicability in multiple working media

The applicable working media include ammonia (R717), CO2 (R744), Freon (R404A, R507, etc.), etc.

Coverage of wide temperature range

The temperature range is from 0°C pre-cooling device, -30°C secondary freezing device, -40°C quick freezing device to -70°C cryogenic quick freezing device. MOON-TECH possesses advanced quick freezing equipment and supporting cold sources.

Introduction to product

The carton freezer is exclusively designed as special equipment for quick freezing large-scale dished (boxed) meat cuts and poultry products, and is an ideal substitute of traditional ABF at present.



● Application scope of product

The carton freezer can be in two operational modes

Mode of IQF

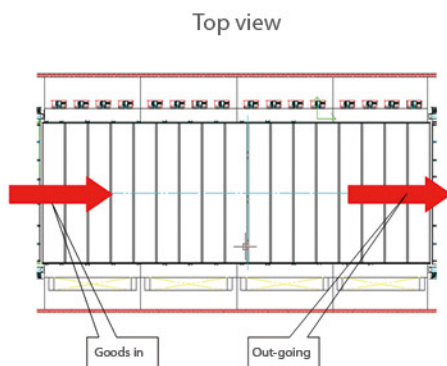
Frozen articles are in continuous warehousing and delivery, namely, the food freezing time is equal to the full warehousing operation time, and continuous production without shutdown is realized. It is applicable to continuous production of few products.

Mode of ABF

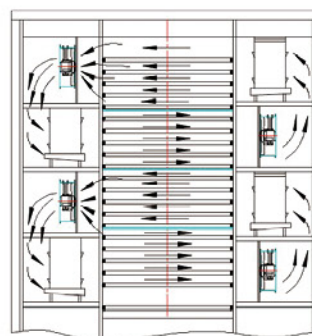
The food warehousing and delivery time is non-related to the freezing time, normally, a shift lasts for 24 hours (or 48 hours), namely, warehousing is done on the first day and delivery on the second (or third) day, and the mode is applicable to the mode of non-continuous production of single or various products.

Two different wind filed layout forms

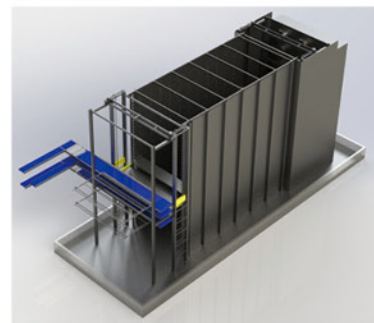
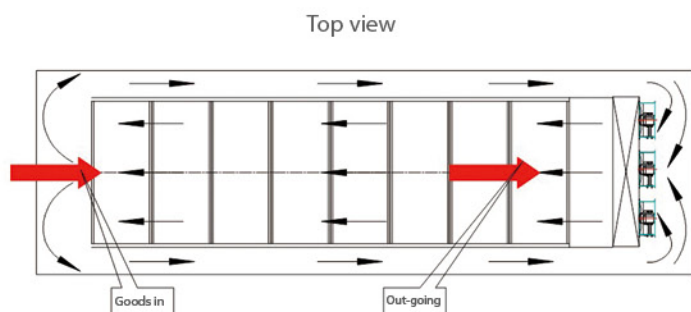
Horizontal blowing-in



Cross-section



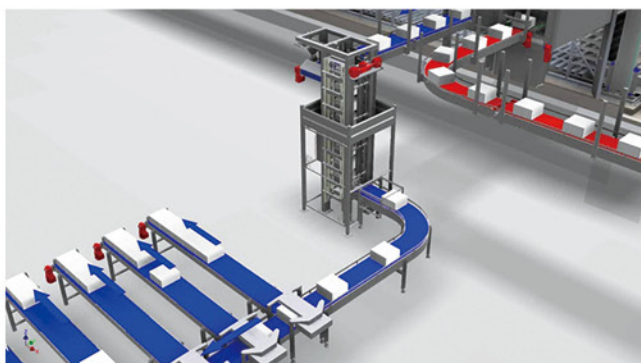
Vertical blowing-in



Determining factors of operation modes and wind field forms of carton freezer



MOON-TECH is capable of customizing production line solutions based on customers' actual use situations



* Notes for users: the "mode of IQF" of the carton freezer is different from the production mode of traditional ABF!

Operational mode of carton freezer

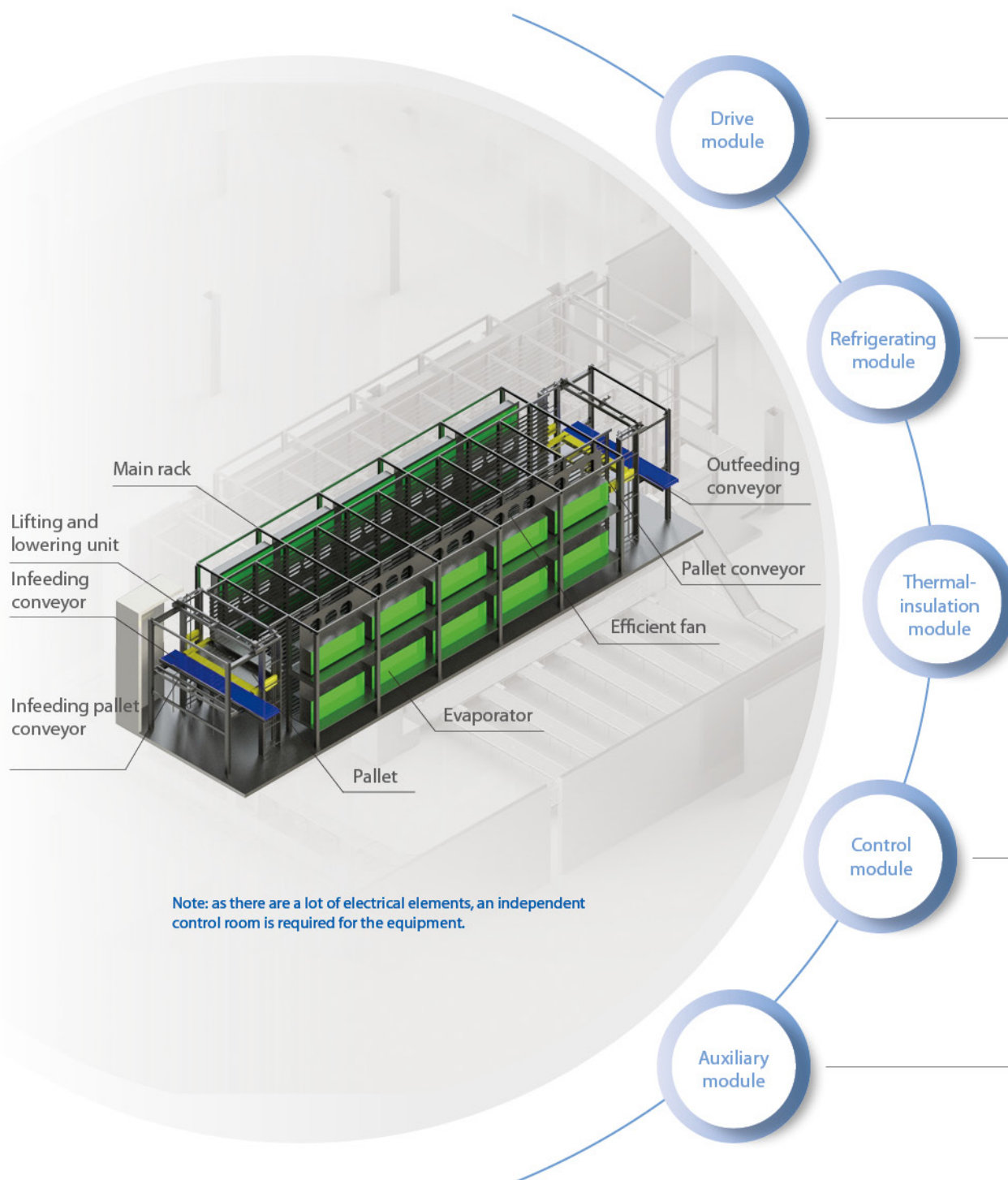
The carton freezer is a concept of assembly line, requires the uniformity between the front-end and rear-end speeds (The requirement is also applicable to the mode of single freezer), so customers might need to adjust production flows in use.

VS

Operational mode of traditional ABF

Generally, the production mode of traditional ABF is: warehousing → warehouse closing after full → freezing by cooling → centralized delivery → packing. The rear-end outfeed packaging is further faster than the front-end warehousing, that is to say, for an ABF, it might take 6 hours to complete warehousing, but only 1~2 hours to complete outfeed packaging, so the front-end and rear-end speeds don't match each other.

● Equipment structure



- The drive module mainly contains: the infeeding and outfeeding conveyors; the infeeding and outfeeding pallet conveyors; the infeeding and outfeeding rack conveyors; the infeeding and outfeeding lifting and lowering units; main rack; and tray rack



- The refrigerating module mainly contains fan, evaporator, air deflector, etc.



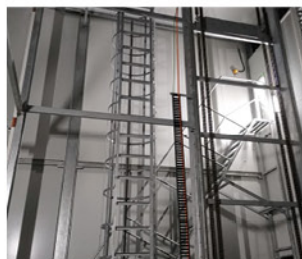
- The thermal insulation module mainly contains main warehouse, buffer panel, warehouse gate, etc.



- The control module mainly contains control cabinet (panel), computer, cable, inductive switch, etc.

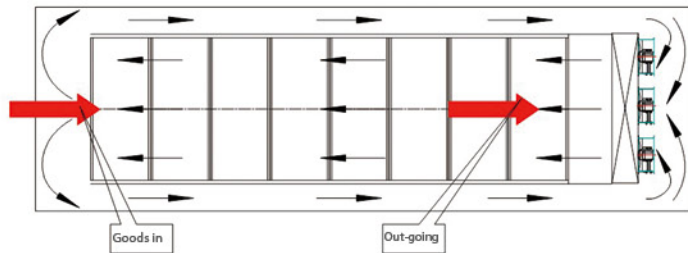


- The auxiliary module mainly contains dehumidifier, camera and storage equipment, maintenance platform, ladder stand, crane span structure, etc.

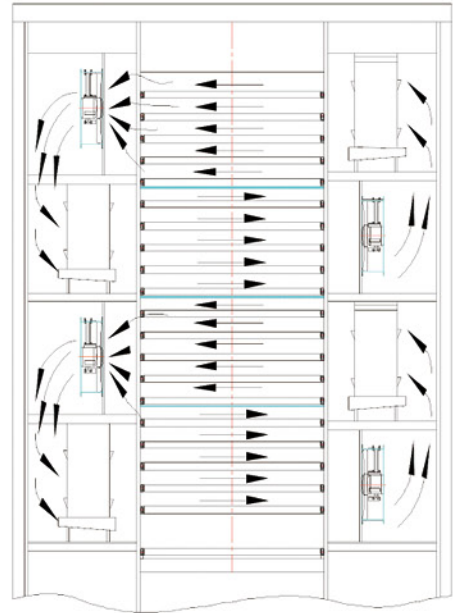


Product features

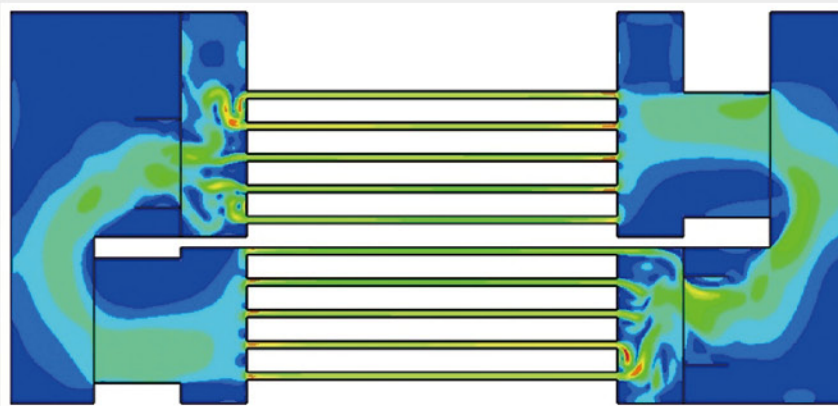
Reasonable wind field layout



- The separated design of fan and evaporator makes it easy to clean and maintain.
- Divisional design can be realized along the warehouse length or height direction, and good energy-saving performance realized through real-time control of warehouse temperature.
- MOON-TECH can select the most suitable wind field layout based on customers' actual use requirements, realizing high food freezing efficiency.
- The fan is an induced-draft fan, ensuring good wind field uniformity and uniform food freezing.



Simulated diagram of flow wind field from the cross section



The max difference value of the average wind speed within various flow channels in the height direction is within 15%

● Long-term and efficient continuous operation

01

Infeeding and outfeeding buffers are equipped to effectively reduce the entry of outside air with water into the warehouse.

02

There are fans and dehumidifiers in the infeding buffer which can effectively avoid the entry of off-tray surface water into the warehouse.

03

The infeding side of evaporator is in the design of variable pitches to avoid low working efficiency caused by poor ventilation of evaporator under the frosting condition.

04

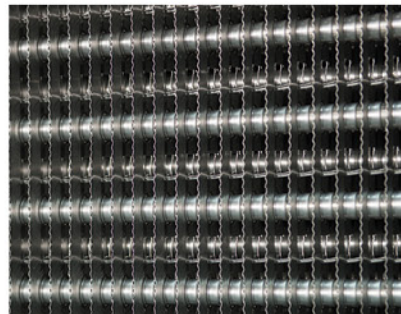
The small-diameter heat exchange tubes are used in the evaporator and straight compound, and smooth and plain fins are selected to minimize the increased wind resistance of evaporator caused by frosting and ensure the efficient continuous operation of the equipment.

05

There are automatic plugboards at infeding and outfeeding throats, they can adjust the switch states based on the warehousing and delivery conditions to avoid extra cold loss.

06

Divisional defrosting can be realized without shutdown to satisfy continuous production.



● Perfect safety protection

- There are maintenance squirrel cage and platform to ensure climbing operators' personal safety. The warehouse gate opening alarm is set under equipment operation; the gate can be opened manually from the inside, and manual alarm can be set inside as well.



- The warehouse gate opening alarm is set under equipment operation; the gate can be opened manually from the inside, and manual alarm can be set inside as well.



- Fan and reducer over-load alarms, and deviation alarms of limiting unit setting.

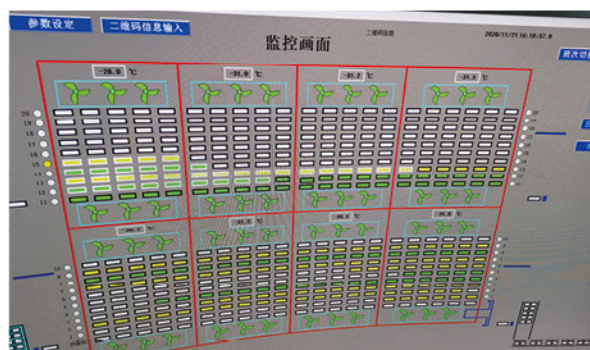
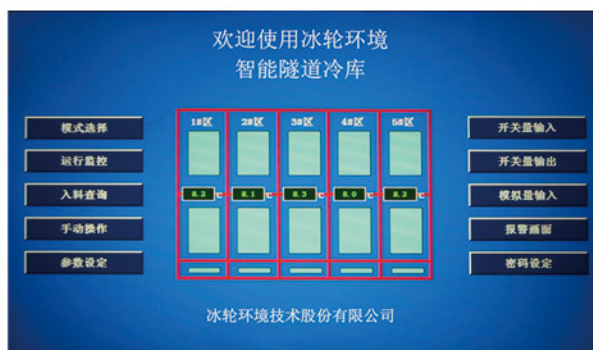


- An inserted low-temperature monitoring system is equipped to synchronize the operation images, and the monitoring system has the memory function to realize process tracing.



Intelligent control

Configuration name	Configuration description	Function features
SIEMENS 1500PLC	Standard	Fast computation speed and strong networking ability
Low-temperature control system	Standard	Conduct real-time control of warehouse states, and support historical control inquiry
Host system	Standard	A domestically advanced SCADA configuration software which ensures stable and reliable operation
Customized control schemes	Standard	We provide comprehensive control flow optimization services based on users' individualized demands of front-end and rear-end production processes
Database	Optional	Open data port and data interaction with user production management system
Barcode scanner system	Optional	Mass collection of goods name, code, weight, time, shift, quantity and other information by identifying product QR code
Cloud platform	Optional	The life-cycle operation control of frozen products and systematic energy-saving solutions available



Notes about operation

The efficiency of front-end and rear-end production lines must match the production capacity of the intelligent tunnel, otherwise, it affects the energy consumption of the latter.

In case there are trays of various specifications, it must be ensured that the trays on a rack is of the same specification and they are regular in shape.

