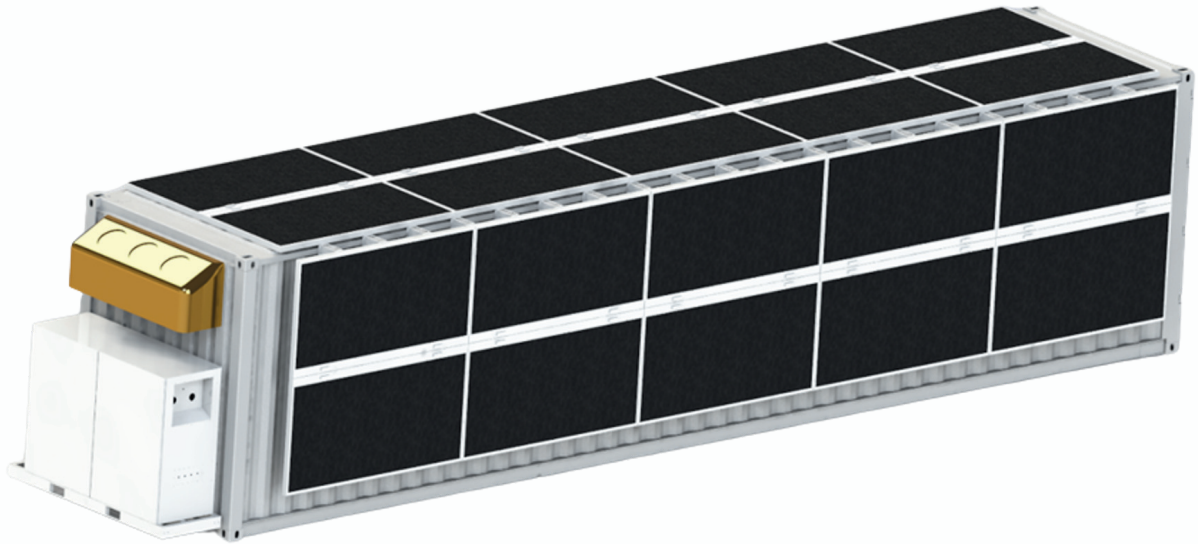


PCM BASED MOBILE COLD STORAGE

RVG HVAC SOLUTIONS CO. LTD.

INTRODUCTION

With more than two decades of experience in the HVAC sector, RVG is based in Anji City, Zhejiang Province, which is one of the most prominent HVAC production centers in the world.

Zhejiang Province has been an important contributor to the development of the HVAC sector in China, providing complete systems as well as essential components to the global market.

At RVG, we have the in-house production of essential HVAC components as well as a robust partnership network to combine complementary products to provide complete HVAC solutions. Our extensive experience in the HVAC sector has developed robust expertise in engineering, quality, and supply chain management. At present, RVG provides customers across the world with a complete range of HVAC components and energy-saving, environment-protecting solutions.

Air Coil Factory

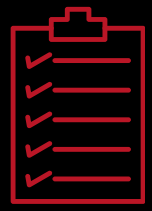
RVG HVAC SOLUTIONS CO. LTD.

INTRODUCTION

Engineering Capabilities

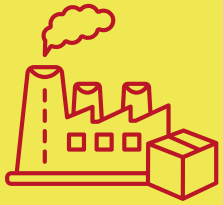
- Design Validation
- Manufacturing Alignment with OEM
- Engineering Audits
- Cross Market Engineering Customisation
- Global Complaince Readiness

Quality Processes



- In-house QC team.
- Pre-Shipment Inspection.
- Factory Auduts
- Performance Testing
- Third Party Certifications

Manufacturing Strength



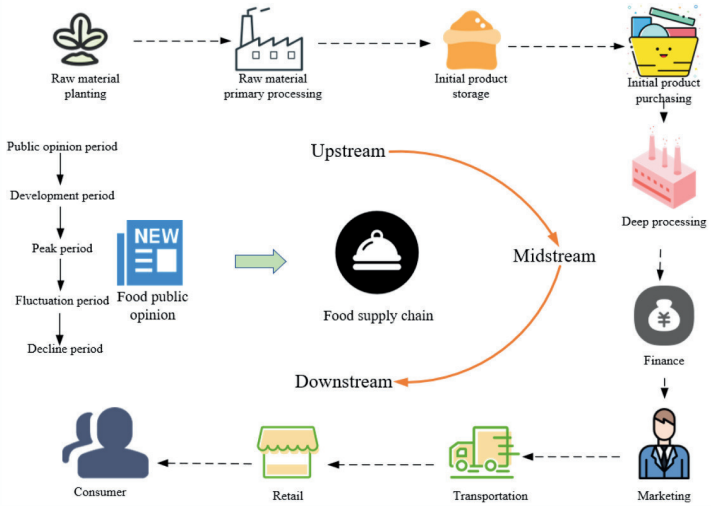
- High Tech Production Facilities
- Ability to Produce as per Customer Specification.
- Scalable production for Large OEM requirements.
- Stock holding for Fast Moving products.

Product Portfolio

- Heat Pumps
- Refrigeration Solutions
- Heat Exchnagers
- Air Coils
- Refrigerant System Components
  - Expension valves
  - Reversing valves
- Core Components
  - Compressor
  - Drives
  - Controllers

UNDERSTANDING COLD STORAGE INDUSTRY

Cold Chain Logistics – Overview



A COLD CHAIN LOGISTICS – OVERVIEW

- Ensures quality and safety of temperature-sensitive products.
- Involves temperature-controlled transport from production to consumption.
- Utilizes special facilities and systems for refrigeration and insulation.

B TYPES OF COLD CHAIN LOGISTICS (BY SERVICE OBJECTS/PRODUCTS):

- Fresh agricultural products
- Frozen foods
- Medical and pharmaceutical products
- Biological products
- Flowers and plants
- Chemical reagents requiring temperature control

C THREE SEGMENTS: UPSTREAM, MIDSTREAM, AND DOWNSTREAM.

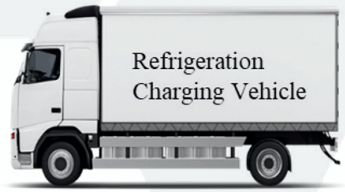
- Upstream : Mainly Producers & Manufacturers
- Midstream : Logistics Companies & Warehuses
- Downstream : End Consumer like Supermarket & Catering Business, Hospitals etc

INTRODUCTION

Mobile Application: Flexible deployment to meet seasonal cold chain storage needs in agricultural production areas.

Mobile Recharging: Energy-saving and consumption-reducing, avoiding the limitation of electric power supply in the first mile of agriculture.

Internet of Things Information Platform



Refrigeration Charging Vehicle

01. Series of thermal energy storage insulated boxes

In addition to standard 40-foot and 20-foot containers, custom cold chain vehicles and small refrigerated insulation boxes can also be tailored to suit a variety of application scenarios.

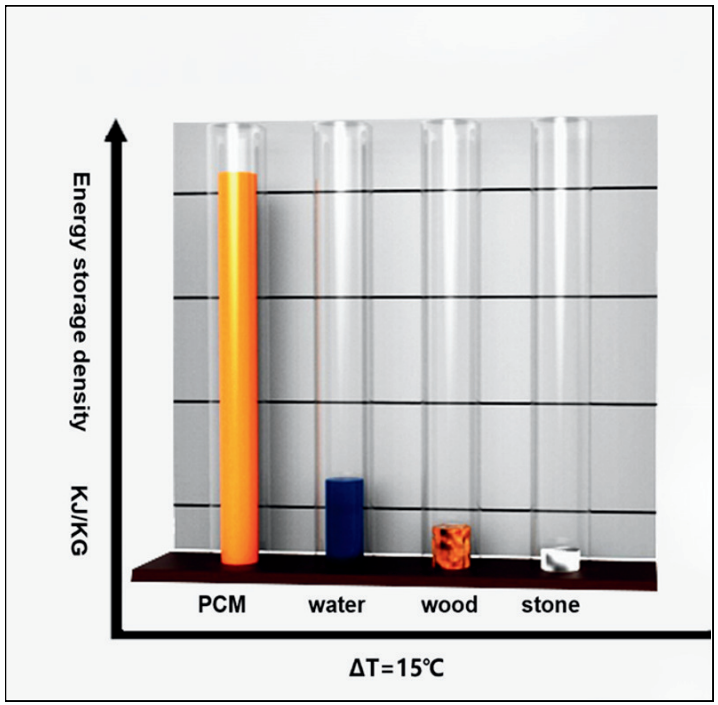
02. Freon charging equipment

Depending on the business scenario requirements, fixed charging stations or mobile charging vehicles can be used to recharge sporadic mobile cold storage units in the field, and may utilize sustainable energy i.e. solar or microgrid.

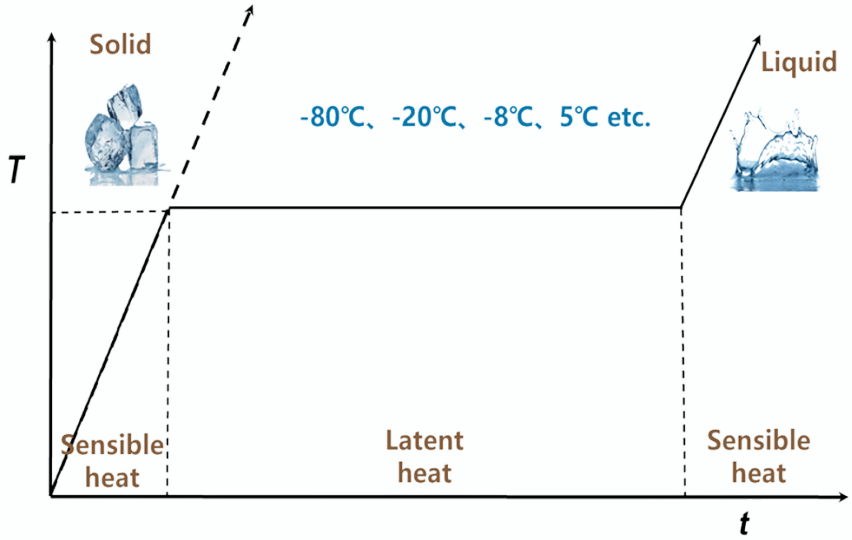
03. Information system monitoring via IoT Internet of Things

Temperature and humidity in the cold storage can be monitored at any time through IoT sensors, and the remote control system can intelligently regulate temperature and humidity ensuring that the products are always kept in the optimal environment.

PHASE CHANGE (PCM) ENERGY STORAGE & TEMPERATURE CONTROL TECHNOLOGY



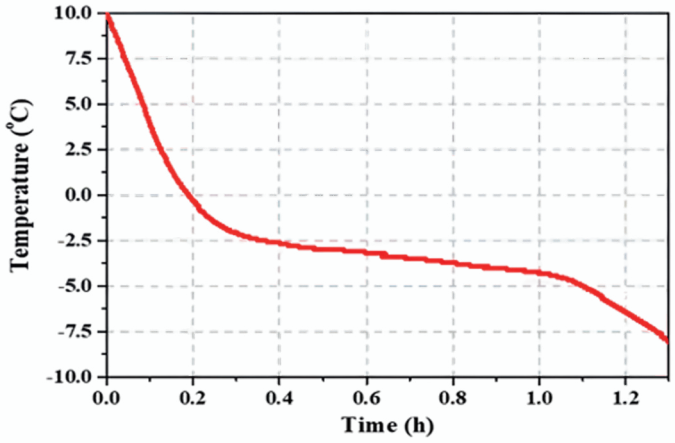
The Temperature remains Almost Constant until the phase change is complete. While a Large Amount of Latent heat is Absorbed or Released



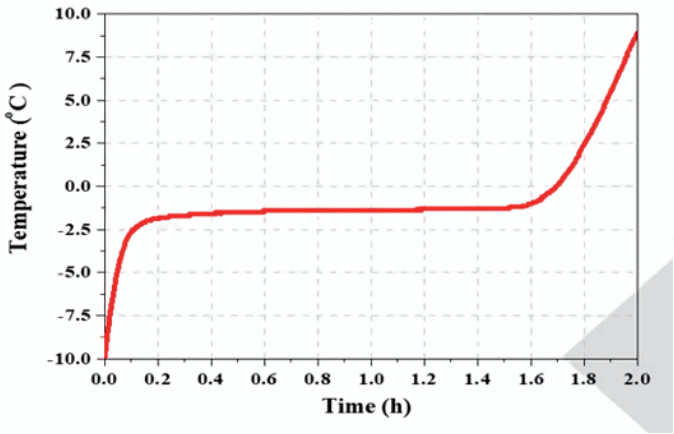
HIGH EFFICENCY PCM

- **High Cyclic Stability**
- **Ultra High Energy Storage Density**
- **Environment Friendly**

Testing Items	Parameter	Unit
Phase Change Material	-2	^{O}C
Latent Heat	316.2	kJ/kg
Density	0.93/1.03	kg/L
Specific Heat	1.95/3.85	kJ/kg.K
Thermal Conductivity	0.55/0.45	W/m.K



PCM Freeze At -2.5^{O}C



PCM melts at -2^{O}C, and keep box temperature at -0.8^{O}C for fruits & vegetables cold storage

OTHER IMPORTANT COMPONENTS

A INSULATION MATERIAL

- High-efficiency thermal insulation
- Insulation thickness up to 150 mm,
- Excellent thermal performance
- Flame-retardant and waterproof construction.
- Environmentally compliant and reliable materials

B REFRIGERATION EQUIPMENT & COLD STORAGE DEVICES

- High-efficiency refrigeration system
- Ultra-fast cooling capability
- Integrated Phase Change Material (PCM)
- Night-time cold energy storage and daytime cold release.
- Peak electricity load reduction.

C PHOTOVOLTAIC PANEL COMPONENTS

- High-efficiency photovoltaic system
- Strong daily power output
- Adjustable panel installation angle
- Maximized solar capture.
- Supports energy independence.

PCM - ADVANTAGE

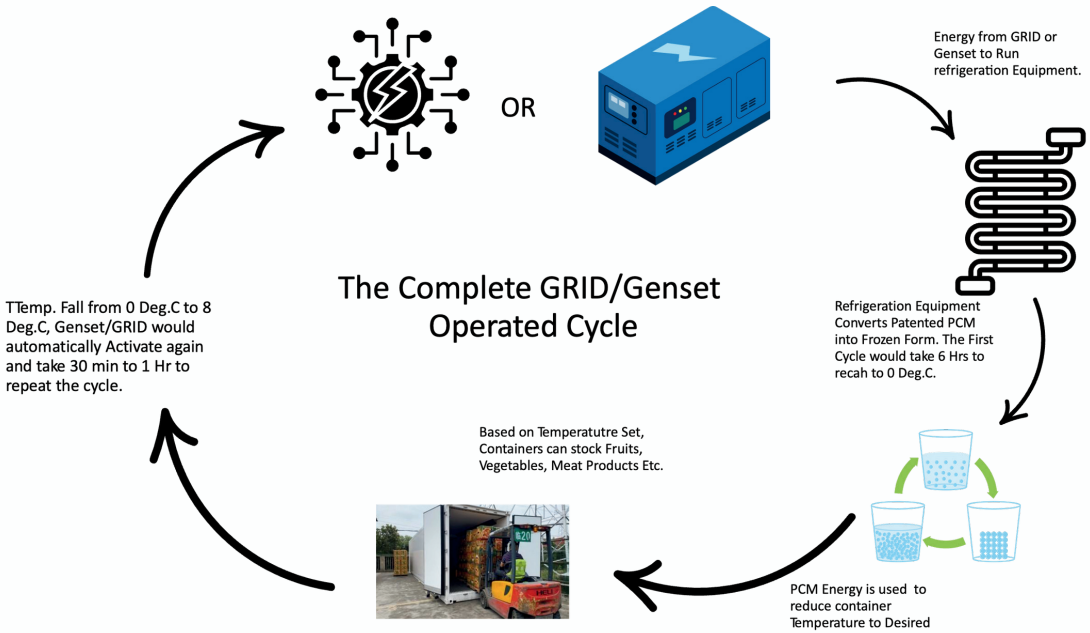
Smart PCM thermal storage under the roof for consistent temperature control

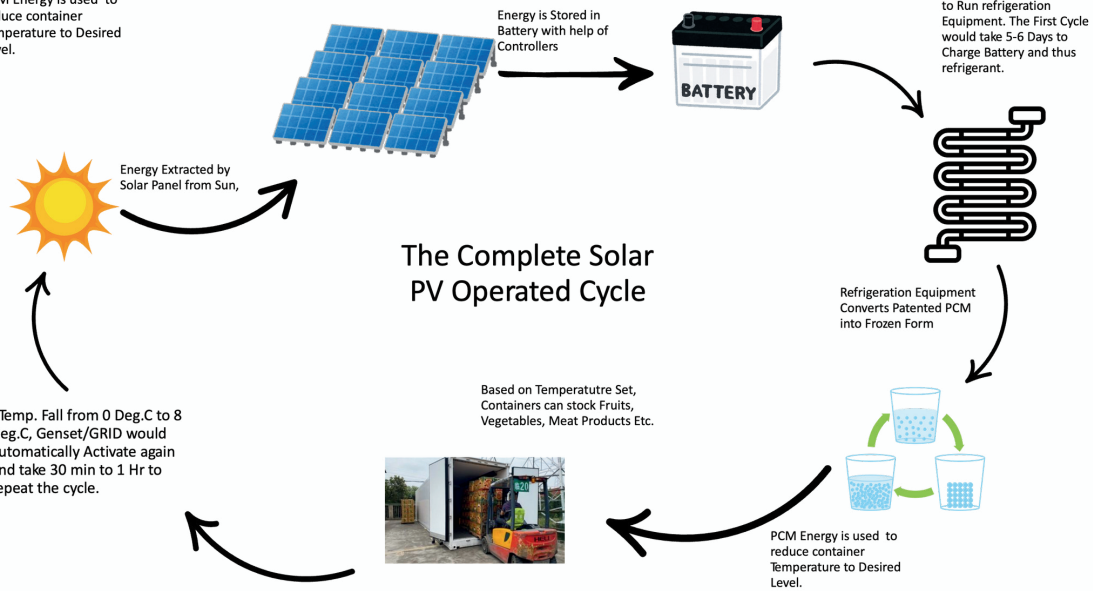
Eco-friendly, non-toxic & non-corrosive materials for safe and sustainable use

Saves 50-70% of Electricity as compared to Traditional Refrigeration

Average product loss rate reduced by 65%
Extended shelf life by 25 days (fruits) by maintaining Air Humidity

THE PROCESS


OR
Energy from GRID or Genset to Run refrigeration Equipment.
The Complete GRID/Genset Operated Cycle
TTemp. Fall from 0 Deg.C to 8 Deg.C, Genset/GRID would automatically Activate again and take 30 min to 1 Hr to repeat the cycle.
Refrigeration Equipment Converts Patented PCM into Frozen Form. The First Cycle would take 6 Hrs to recah to 0 Deg.C.
Based on Temperatutre Set, Containers can stock Fruits, Vegetables, Meat Products Etc.
PCM Energy is used to reduce container Temperature to Desired Level.

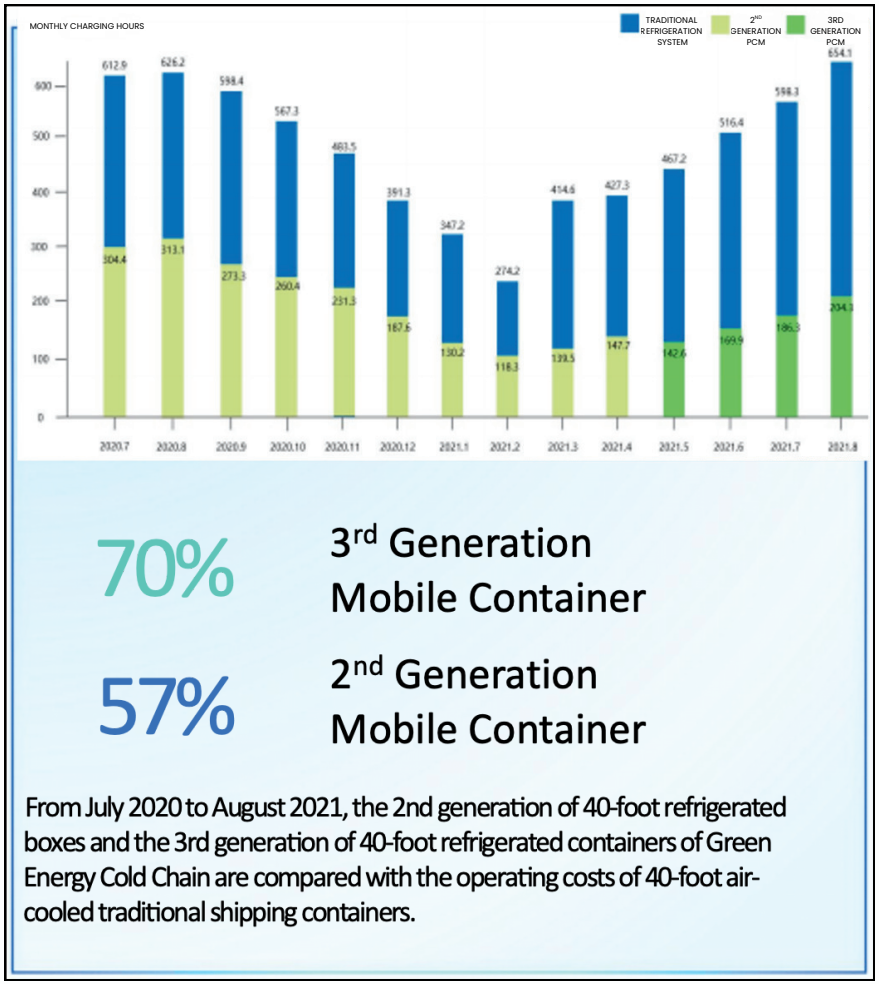

Energy is Stored in Battery with help of Controllers
BATTERY
Energy in Battery is used to Run refrigeration Equipment. The First Cycle would take 5-6 Days to Charge Battery and thus refrigerant.
Energy Extracted by Solar Panel from Sun,
The Complete Solar PV Operated Cycle
Refrigeration Equipment Converts Patented PCM into Frozen Form
Based on Temperatutre Set, Containers can stock Fruits, Vegetables, Meat Products Etc.
TTemp. Fall from 0 Deg.C to 8 Deg.C, Genset/GRID would automatically Activate again and take 30 min to 1 Hr to repeat the cycle.
PCM Energy is used to reduce container Temperature to Desired Level.

PRODUCT LINE-UP

- **REMOVABLE ELECTRIC REFRIGERATION MODULE** DESIGNED FOR FLEXIBLE DEPLOYMENT
- **TOP-MOUNTED COLD ENERGY SYSTEM** RELEASES COOLING CAPACITY EFFICIENTLY FOR COLD-CHAIN CARGO TRANSPORT
- **INTELLIGENT REMOTE MONITORING SYSTEM** WITH REAL-TIME TEMPERATURE AND HUMIDITY TRACKING
- **FAST, CONVENIENT OPERATION** ENABLING QUICK DEPLOYMENT AND EASY CONTROL
- **SUITABLE FOR MULTIPLE APPLICATIONS**, INCLUDING:
  - ROAD–RAIL INTERMODAL TRANSPORTATION
  - TEMPORARY COLD STORAGE AND TURNOVER
  - EMERGENCY COLD-CHAIN SUPPLY AND BACKUP

	Best Case Scenario		Worst Case Scenario	
Mobile Cold Storage	40ft Container	20ft Container	40ft Container	20ft Container
volume(m°)	67	27	67	27
Size:	40 feet container	20 feet container	40 feet container	20 feet container
Maximum capacity	20 tons	10 tons	20 tons	10 tons
Dead weight (tons)	5.5	2.3	5.5	2.3
Charging time (PCM)	0-8°C, 3 Hours Daily	0-8°C, 2 Hours Daily	0-8°C, 12 Hours Daily	0-8°C, 8 Hours Daily
Charging time (Traditional)	0-8°C, 14.4 Hours Daily	0-8°C, 9.6 Hours Daily	0-8°C, 14.4 Hours Daily	0-8°C, 9.6 Hours Daily
Charging Unit (PCM)	8P	8P	8P	8P
Charging Unit (Traditional)	11P	11P	11P	11P
KW/h Consumption (PCM)	9	9	9	9
KW/h Consumption (Traditional)	12.4	12.4	12.4	12.4
Daily Operation Cost (PCM)	27	18	108	72
Daily Operation Cost (Traditional)	178.6	119	178.6	119
Savings	85%	85%	40%	40%
Product Diagram				

SAVES 50-70% ENERGY



70% 3rd Generation Mobile Container

57% 2nd Generation Mobile Container

From July 2020 to August 2021, the 2nd generation of 40-foot refrigerated boxes and the 3rd generation of 40-foot refrigerated containers of Green Energy Cold Chain are compared with the operating costs of 40-foot air-cooled traditional shipping containers.

OFF-PEAK POWER COLD STORAGE · COOLING WITHOUT POWER INTERRUPTION

SAVES 50-70% OF ELECTRICITY

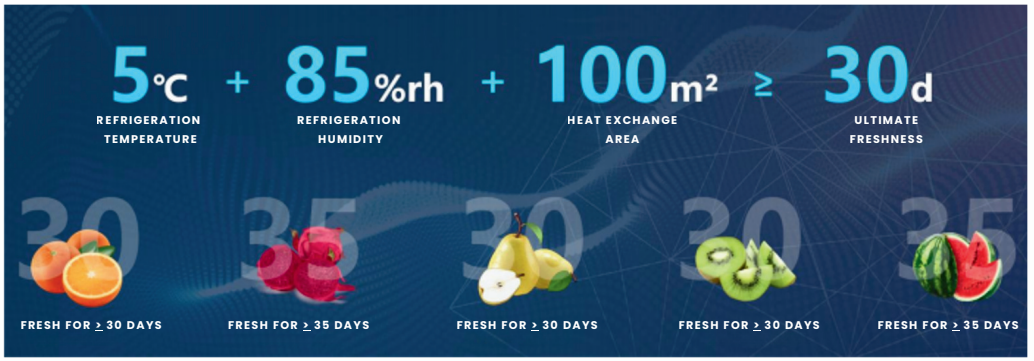
MAINTAIN HUMIDITY WHILE COOLING

COMPARABLE TO A REFRIGERATOR TO KEEP FRESH

AVERAGE PRODUCT LOSS RATE REDUCED BY 65% EXTENDED SHELF LIFE BY 25 DAYS (FRUITS)

THE PHASE CHANGE SOLUTION SOLIDIFIES AND CRYSTALLIZES TO COMPLETE COLD STORAGE

COLD STORAGE	AIR COOLED
	
	
	



REMOTE MONITORING & CONTROL

- **NEW ENERGY + INTELLIGENT CONTROL ARCHITECTURE**, ADAPTABLE TO MULTIPLE OPERATING SCENARIOS WITH TAILOR-MADE SOLUTIONS
- **OPERATES RELIABLY WITHOUT EXTERNAL POWER** DURING EXTREME WEATHER OR GRID OUTAGES
- **ADVANCED REMOTE MONITORING SYSTEM** WITH REAL-TIME VISIBILITY OF TEMPERATURE, HUMIDITY, AND SYSTEM STATUS
- **STABLE AND PRECISE TEMPERATURE CONTROL**, ENSURED THROUGH INTELLIGENT ALGORITHMS AND AUTOMATED REGULATION
- **CLOUD-BASED DATA ACCESS AND ALERTS**, ENABLING PROACTIVE MANAGEMENT AND FAST DECISION-MAKING
- **DESIGNED FOR BOTH ROUTINE OPERATIONS AND EMERGENCY DEPLOYMENT**, ENSURING UNINTERRUPTED COLD-CHAIN PERFORMANCE

REMOTE LOCATION SOLUTION

PRODUCTION-AREA WAREHOUSES REQUIRE NO APPROVAL, AND OTHER LAND-USE PROJECTS ARE VERY EASY TO GET APPROVED.

ALL WEATHER - PV ENERGY STORAGE CONTAINER

1.0 MOBILE CHARGED COLD STORAGE CONTAINER

2.0 ALL-WEATHER PHOTOVOLTAIC ENERGY STORAGE REFRIGERATED CONTAINER

2019
THE INTRODUCTION OF PHASE CHANGE COLD STORAGE RAILWAY MOBILE COLD STORAGE HAS BEEN EXTENDED TO THE FIELD OF PEOPLE'S LIVELIHOOD

2020
THE COLD CHAIN BUSINESS SEGMENT FORMULATED A FUTURE STRATEGIC PLAN THE R&D TEAM WENT TO JAPAN AND THE UNITED STATES FOR INSPECTION

2021
GREEN ENERGY COLD CHAIN IN SEPTEMBER 2021, A NEW INCUBATION PLAN WAS BORN
THE CORE TEAM AND PATENTED TECHNOLOGY HAVE OVERCOME THE IMPLEMENTATION OF THE UNIQUE CUSTOMIZED SOLUTION OF PHASE CHANGE MATERIALS

2022
40-FOOT COLD STORAGE REFRIGERATOR ROLLED OFF THE PRODUCTION LINE IN BATCHES
THE 20-FOOT COLD STORAGE FREEZER WAS SUCCESSFULLY DEVELOPED
NEARLY 30 PATENTS HAVE BEEN OBTAINED

2023
THE FIRST BENCHMARK PROJECT IN NANJING HAS BEEN IMPLEMENTED, AND DEMONSTRATIONS IN JIANGXI, SHANDONG, CHONGQING, SHANGHAI, AND HANGZHOU HAVE BEEN IMPLEMENTED ONE AFTER ANOTHER COMPLETED THE CERTIFICATION OF HIGH-TECH ENTERPRISES

2025

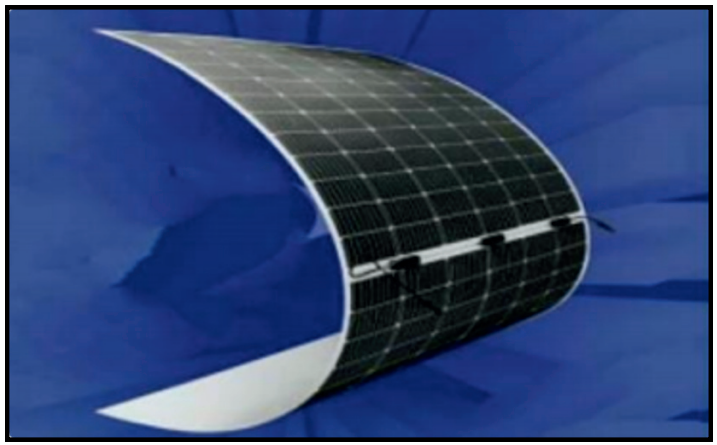
CONSTANT TEMPERATURE WITH PV ENERGY

- MOBILE COLD STORAGE CONTAINER POWERED BY PHOTOVOLTAIC (SOLAR) ENERGY.
- FULLY SOLAR-POWERED OPERATION IN THE ABSENCE OF A FIXED POWER SUPPL.
- INTEGRATED MINIATURE ENERGY STORAGE SYSTEM.
- EXTENDED AUTONOMOUS RUNTIME OF UP TO ~200 HOURS.
- INNOVATIVE ENERGY ARCHITECTURE COMBINING POWER GENERATION, ENERGY STORAGE, AND REFRIGERATION.

PRINCIPLE OF PV POWER GENERATION

SOLAR ENERGY IS CONVERTED INTO ELECTRICITY

- **Solar Energy Capture:** Photovoltaic (PV) panels convert solar radiation into electrical energy through the photoelectric effect.
- **Direct Current (DC) Generation:** The PV modules generate stable DC power under adequate solar irradiance conditions.
- **Power Stability for Cold Storage Operation:** On sunny days, the PV system provides sufficient and continuous electrical output to support cold storage refrigeration loads.
- **DC–AC Power Conversion:** A high-efficiency inverter converts DC power into AC power, meeting the electrical requirements of cold storage equipment.
- **Clean & Sustainable Energy Utilization:** The integrated PV-inverter system enables clean, renewable, and low-carbon energy utilization, reducing dependence on grid or diesel power sources.

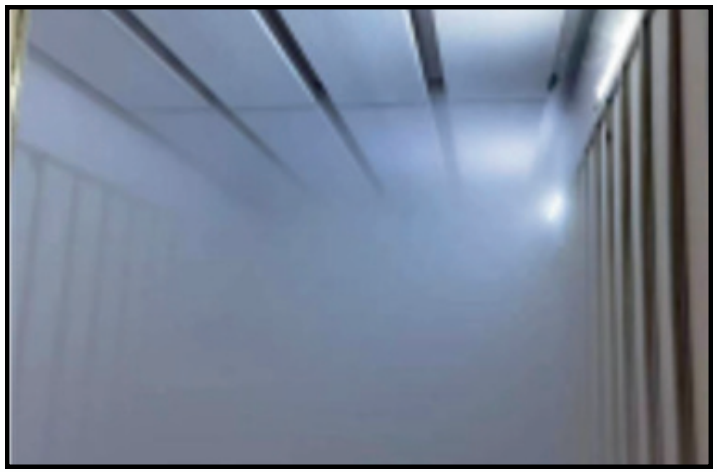


DISTRIBUTION AND USE OF ELECTRICAL ENERGY

- **Priority Power Allocation:** Electrical energy generated by the photovoltaic (PV) system is first supplied to the cold storage refrigeration equipment to ensure uninterrupted operation.
- **Excess Energy Storage:** Any surplus electrical energy is stored in the battery energy storage system (BESS) for later use.
- **Daytime Operation Mode:** During periods of sufficient sunlight, the PV panels simultaneously power the cold storage system and charge the batteries.
- **Night & Low-Irradiance Operation:** During nighttime or low-solar conditions (e.g., cloudy or rainy days), the battery system supplies power to maintain refrigeration operation.
- **24×7 Continuous Operation:** The integrated PV + battery system ensures round-the-clock cold storage operation without reliance on grid or diesel power.

COLD STORAGE & THERMAL ENERGY MANAGEMENT PROCESS

- **Photovoltaic panels generate peak power:** at optimal sunlight (1000 W/m²), supplying cold storage refrigeration first and storing surplus energy for efficient utilization.
- **Refrigeration Operation:** The refrigeration system operates to maintain the required cold storage temperature and charge the cold storage medium with cooling capacity.
- **Cold Energy Storage (Off-Peak / Night Operation):** During nighttime operation, when the storage temperature reaches the set value, the cold storage medium absorbs and stores thermal energy (cold capacity).
- **Peak Load Energy Optimization (Daytime Operation):** During daytime peak electricity demand periods, the stored cold energy is released to maintain low storage temperatures.
- **Temperature Stability & Product Protection:** This process ensures stable cold storage conditions, preserves product quality, and reduces reliance on active refrigeration during peak hours.
- **Energy Efficiency & Cost Reduction:** Shifting cooling load from peak to off-peak periods improves energy efficiency, grid independence, and operational cost optimization.



PRODUCT DESIGN OVERVIEW

- **Flexible Dimensions & Customization:** Mobile cold storage units are available in multiple sizes and can be custom-designed to meet specific application requirements.
- **Standard Reference Size:** Example configuration: 6.0 m (L) × 2.5 m (W) × 2.8 m (H), suitable for field deployment and mobile applications.
- **High-Strength Exterior Materials:**The outer structure is constructed from high-strength aluminium alloy, offering excellent corrosion resistance and weather durability.
- **Outdoor Adaptability & Long Service Life:** Designed to withstand harsh outdoor environments, ensuring reliable performance and extended operational lifespan.
- **Modern & Functional Industrial Design:** Features a clean, minimalist design with smooth lines, combining practicality with a modern technological aesthetic.
- **User-Friendly Operation Interface:** Intuitive control interface designed for easy operation and maintenance.
- **Automated Access System:** Equipped with an automatic sensor-based door, enabling convenient and efficient loading and unloading of goods.
- **Intelligent Monitoring & Remote Management:** Integrated smart monitoring system allows real-time and remote viewing of cold storage operating status, improving management efficiency.

GET RID OF GRID DEPENDENCE

- **High-Efficiency Solar Power Generation:** Equipped with high-efficiency monocrystalline photovoltaic modules, utilizing solar energy for independent power generation.
- **Off-Grid Operation Capability:** Designed for remote and outdoor applications (e.g., upstream agricultural production areas), enabling stable operation without reliance on external power grids.
- **Energy Independence:** Eliminates dependence on traditional energy sources, ensuring reliable and uninterrupted cold storage operation.
- **Expanded Cold Chain Coverage:** Breaks geographical limitations of conventional cold chain infrastructure, extending cold chain services to previously inaccessible regions.

ENERGY COST & POLICY ALIGNMENT ADVANTAGES

- **Reduced Operating Energy Costs:** Photovoltaic power supply replaces traditional energy sources, significantly reducing long-term operating and energy consumption costs.
- **Clean Energy Compliance:** Fully aligned with the policy direction of “Clean Energy Application” as outlined in the Opinions on Accelerating Scenario Cultivation and Open Implementation.
- **Low-Carbon & Sustainable Development:** Supports the low-carbon transition of the cold chain and logistics industry, reducing carbon emissions and environmental impact.
- **Policy-Friendly Application Scenarios:**Well suited for government-supported, subsidy-eligible, and demonstration projects, enhancing project feasibility and funding opportunities.

UNLOCK MULTIPLE DEMAND SCENARIOS

- **Rural Agricultural Cold Chain Development:** Strengthens cold chain infrastructure for upstream rural and agricultural produce, reducing post-harvest losses.
- **Fresh Food Distribution in Remote Areas:** Enables reliable cold storage and delivery of fresh food in off-grid and hard-to-reach locations.
- **Emergency Medical Cold Chain Support:** Ensures safe storage and transportation of vaccines, medicines, and emergency medical supplies.
- **Temporary Cold Chain for Outdoor & Special Events:** Provides short-term cold chain assurance for outdoor activities, exhibitions, disaster relief, and mobile operations.

WAREHOUSING BENEFITS

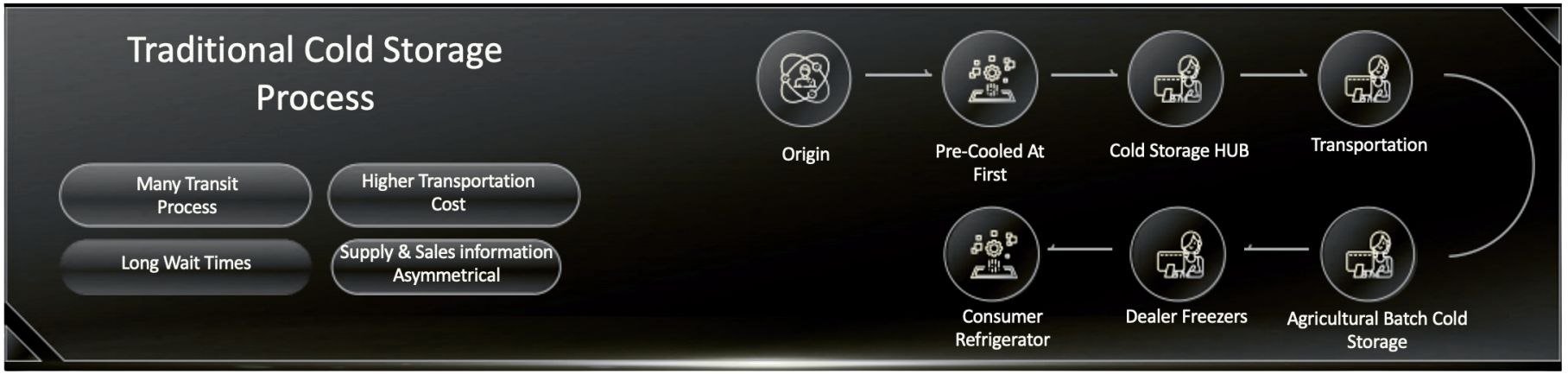
Limitation of Traditional Cold Storage

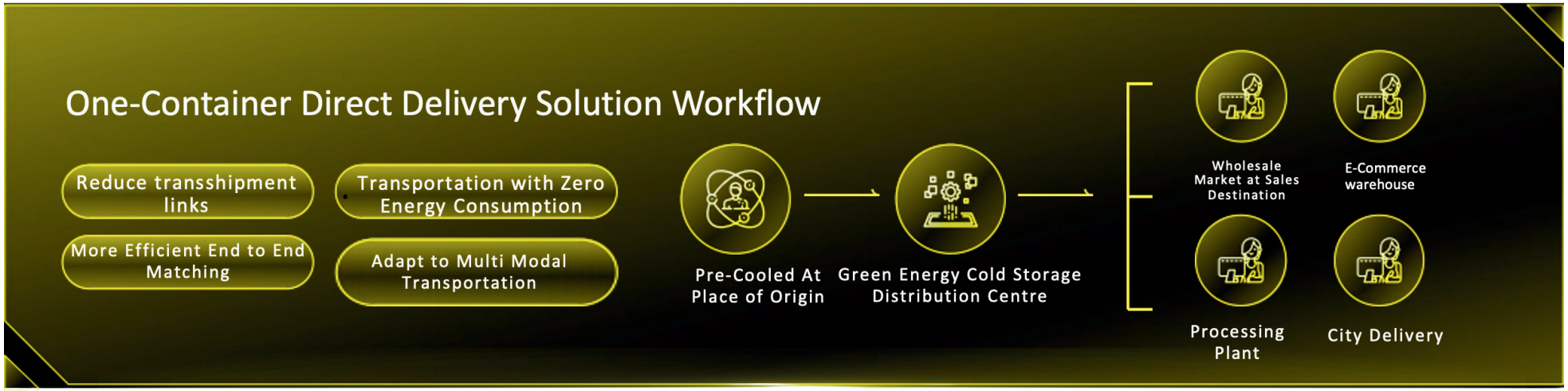
- **High energy consumption and operating costs** due to continuous power demand.
- **Manual monitoring and maintenance,** increasing labour dependency and risk.
- **Limited freshness retention**, with higher moisture loss and shorter storage life.
- **Low flexibility**, as location and capacity are difficult to adjust.
- **High capital investment and lifecycle costs**, making premium storage conditions hard to maintain.

PCM Solution Key Advantages

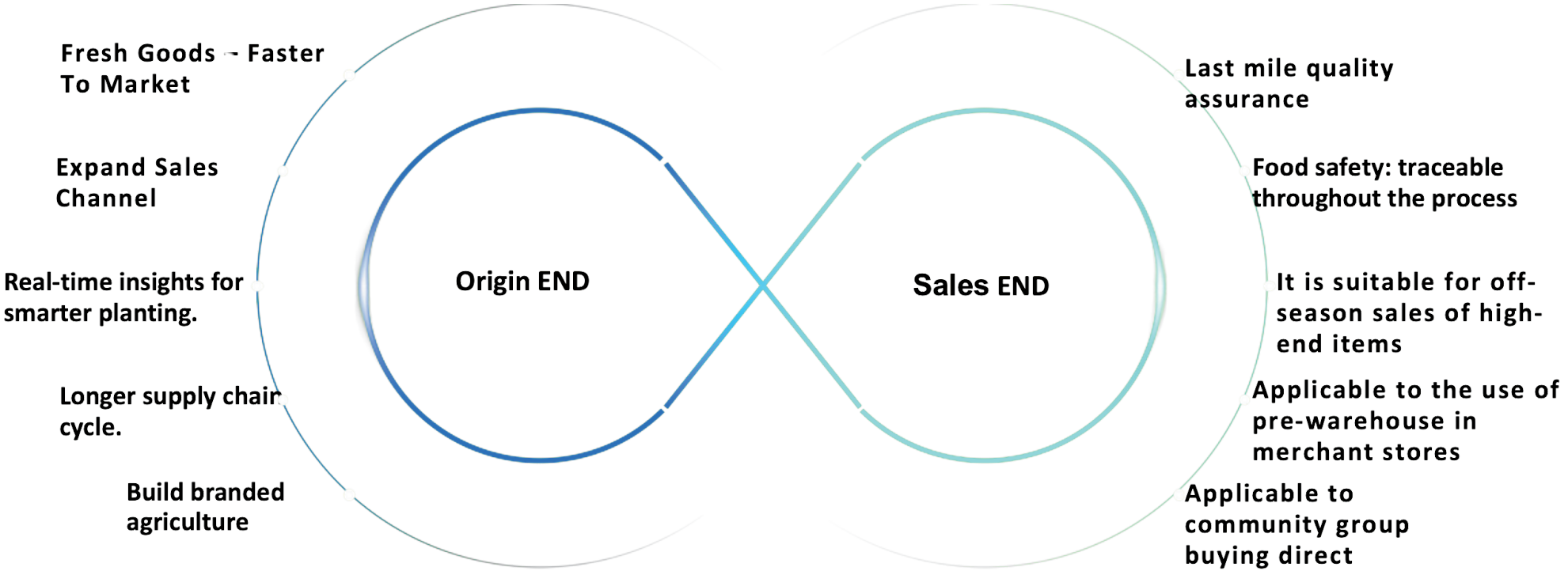
- **Up to 70% energy savings** compared to conventional refrigeration systems.
- **Remote monitoring and automated operation,** extending shelf life of agricultural products.
- **Mobile and flexible deployment,** with capacity adjustable based on demand.
- **No construction approvals required,** enabling rapid deployment and customized storage for high-value products.

TRANSPORTATION BENEFITS





SALES BENEFITS



MOBILITY AND FLEXIBILITY

CONVENIENT TRANSPORTATION

- **Lightweight and transport-ready,** easily loaded onto trucks or trailers
- **Compact design,** small units weigh only ~5 tons for convenient road transport
- **Stable and reliable in transit,** protects internal goods during movement
- **Cold chain continuity,** ensures uninterrupted temperature control

DEPLOY QUICKLY

- **Rapid installation and commissioning,** completed within 1 hour after arrival on site.
- **Quick deployment at agricultural procurement points,** enabling immediate cold storage of fresh produce.
- **Highly flexible and relocatable design**, with location adjustable to meet operational needs.
- **Adaptable to complex terrains**, including mountainous regions, islands, and remote locations.

FOOD PROCESSING – COLD STORAGE

味全
伊利 滋养生命活力
紫燕食品
红梅乳业 HONGMEI DAIRY
元初食品 SUNGIVEN FOODS 一健康三餐提供者一
思念
深粮集团
佳得乐
中洋集团 ZHONGYANG GROUP
Aice HAVE AN AICE DAY
妙可蓝多 MILKGROUND

RESTAURANT CHAIN - COLD STORAGE

COLD CHAIN LOGISTICS – COLD STORAGE

永辉物流 YONGHUI LOGISTICS

统一

華潤物流 CR Logistics

百果园 PAGODA

顶新国际集团 TING HSIN INTERNATIONAL GROUP

清湖冷链 QING HU COLD CHAIN

EXPRESS 天天快递

HIGREEN 海吉星

LABORATORY TEST CHAMBERS - COLD STORAGE

THANK YOU

Thank you for taking the time to explore our PCM-based mobile cold chain solutions. We appreciate your interest and look forward to supporting your cooling and storage needs with innovative, efficient solutions.

RVG HVAC Solutions Co. Ltd.