Industrial Refrigeration **Solution**

Real **HVAC-R** people who understand your needs

www.hcgroup.co.za

ABOUT HC

HC is a design and manufacturing business that specialises in heating, ventilation, air conditioning, and refrigeration equipment.

Over its 50-year history, HC has grown to become the largest OEM of finned tube heat exchangers, refrigeration systems, and HVAC equipment in Southern Africa. This success is due in large part to the expertise and depth of our team, as well as the investment in innovation through our Reasearch and Development department.

The combination of these resources enables us to provide unparalleled customer service and product quality to both the commercial and industrial market segments.

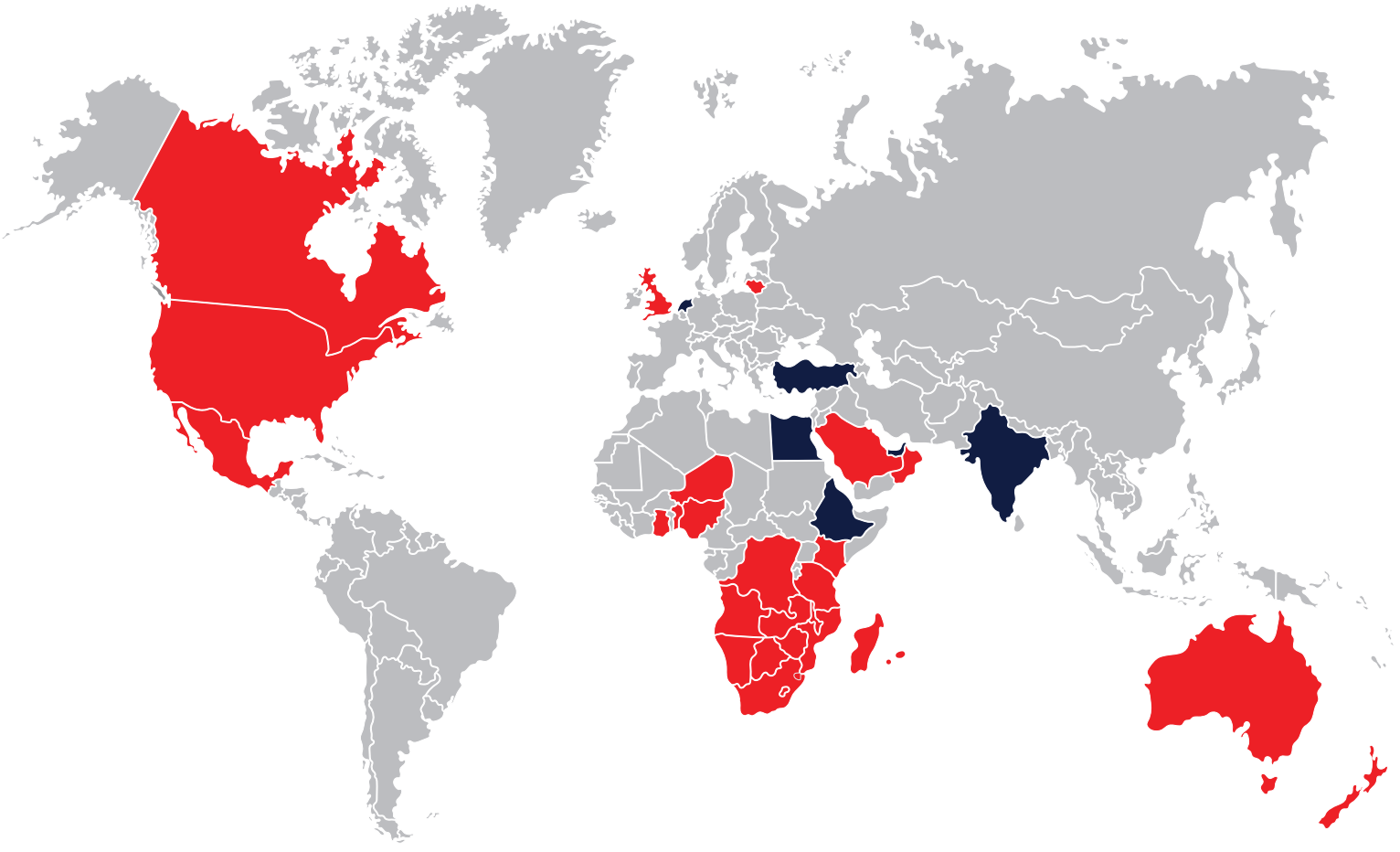
We deliver products tailored to your exact requirements thanks to our extensive industry knowledge and a clear understanding of our customers' applications. This industry-leading adaptability enables us to thrive in both domestic and international markets where our standard and customised products compete.

We continue to build on our illustrious history to ensure that our reputation for superior engineering and manufacturing of HVACR&E systems and components leaves a lasting legacy in our industry.

Copyright by HC ©

GLOBAL PRESENCE

Our global equipment presence and international expansion venture



Global Equipment Presence *Global Expansion Venture*

- Angola
- Australia
- Benin
- DRC
- Botswana
- British Virgin Islands
- Canada
- Ghana
- Eswatini
- Kenya
- Lesotho
- Lithuania
- Malawi
- Madagascar
- Mauritius
- Mexico
- Namibia
- Mozambique
- New Zealand
- Niger
- Nigeria
- Oman
- Qatar
- Reunion Island
- South Africa
- Saudi Arabia
- Tasmania
- United Arab Emirates
- United Kingdom
- USA
- Zambia
- Zimbabwe

Copyright by HC ©

INDUSTRIAL REFRIGERATION

Industrial refrigeration encompasses a comprehensive array of equipment and components essential for extracting and rejecting heat from large-scale processes or materials. By reducing temperatures to predetermined levels, it prolongs the lifespan of various products, thereby enhancing the efficiency, reliability, and overall performance of cooling systems in industrial settings.

The product line-up for industrial refrigeration includes condensers which are specialised HVAC-R units responsible for rejecting heat from the system. These condensers come in several variations, such as air-cooled, water-cooled, and adiabatic condensers. Additionally, industrial refrigeration solutions encompass evaporators, units designed to facilitate extracting heat from industrial facilities. These evaporators are available in various configurations, including cubic, ceiling-mounted, wall-mounted, and free standing options.

Unlike commercial refrigeration systems primarily catering to human-centric and perishable product applications, industrial refrigeration focuses on products and materials. Its diverse range of applications spans district cooling, electricity generation, chemical and petrochemical processes, pharmaceutical production, food and beverage processing, data centre cooling, and distribution centre spiral freezers.

Copyright by HC ©

INDUSTRY APPLICATIONS

Industrial refrigeration assumes a pivotal role in bolstering the economy by ensuring the secure and efficient storage and transportation of a diverse array of perishable goods across numerous industries.

Food Processing

Logistics

Petrochemical

Catering Clean Room

Pharmaceutical

Chemicals

Mining

Ice Rinks

Beverage Production

Data Centres

Warehousing

Electricity Generation

Dairy Processing

Fish Freezing

District Cooling

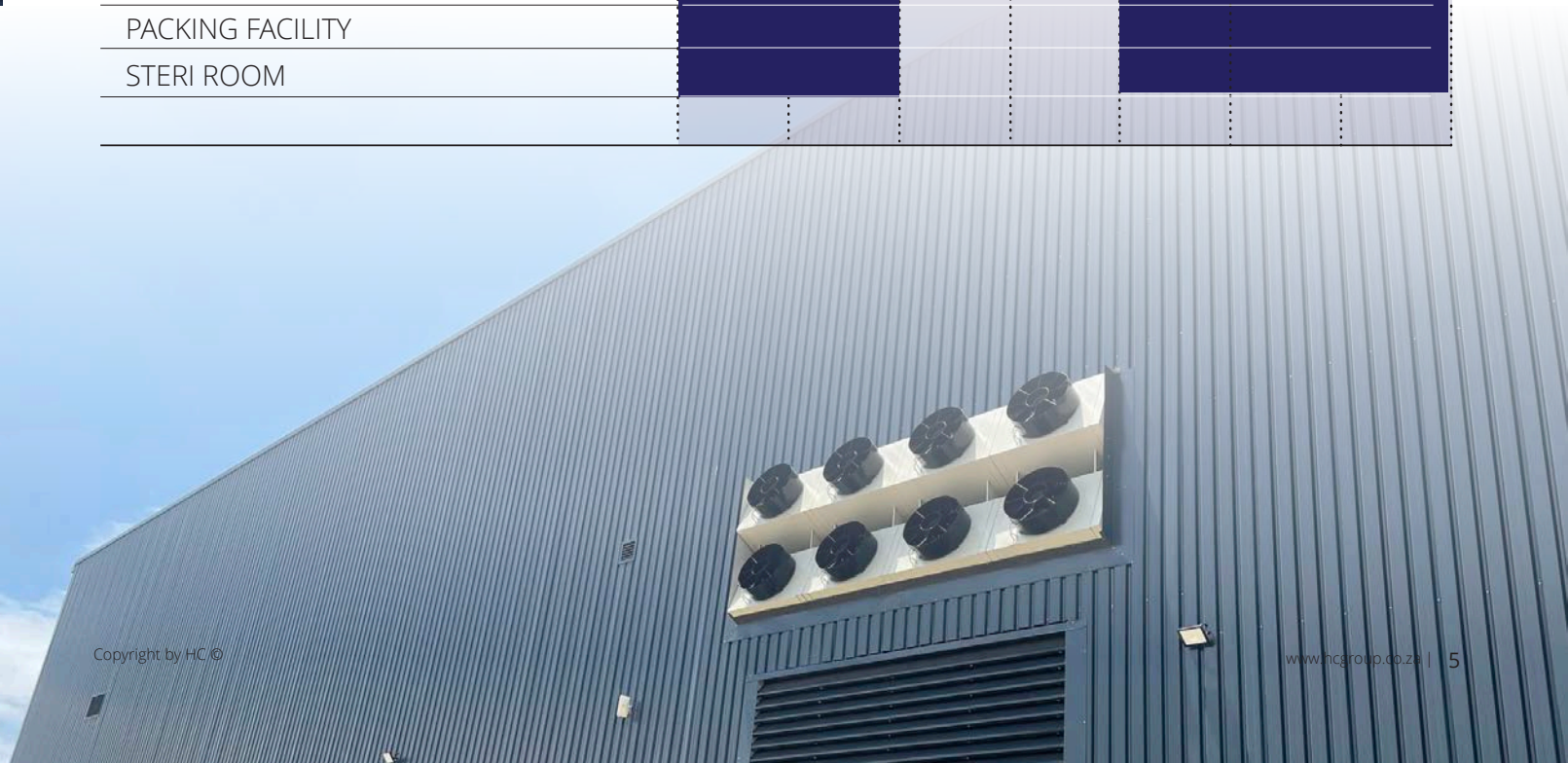
Marine

Copyright by HC ©

HC SOLUTIONS

A breakdown of our industrial refrigeration solutions and their applications.

	AIR COOLER	DUAL DISCHARGE AIR COOLER	SPIRAL FREEZER	BLAST FREEZER	ADIABATIC CONDENSER	AIR COOLED CONDENSER	V-SHAPE AIR COOLED CONDENSER
FOOD PROCESSING	■	■	■	■	■	■	■
BEVERAGE PRODUCTION	■	■			■	■	■
DAIRY PROCESSING	■	■			■	■	■
FISH FREEZING	■	■					
COLD STORAGE WAREHOUSE	■	■	■	■	■	■	■
DISTRIBUTION CENTRE	■	■	■	■	■	■	■
REFRIGERATED TRANSPORT	■						
PHARMACEUTICAL PROCESS	■	■	■	■	■	■	■
PETROCHEMICAL | CHEMICAL	■	■			■	■	■
DATA CENTRES	■	■			■	■	■
DISTRICT COOLING					■	■	■
ELECTRICITY PRODUCTION					■	■	■
ICE RINKS					■	■	■
MARINE REFRIGERATION	■	■					
HOLDING ROOM	■	■			■	■	■
PACKING FACILITY	■	■			■	■	■
STERI ROOM	■	■			■	■	■



Copyright by HC ©

DESIGN OVERVIEW

HC evaporators and air coolers provide heat exchange solutions in industrial refrigeration applications. Our wide range of air cooler models is designed to satisfy all your project requirements with high performance and low maintenance costs.

We offer a wide range of material options to ensure compatibility for all types of applications. Our industrial and bespoke coils characterise their flexibility and ability to suit site-specific needs. We offer solutions for all Natural and Synthetic refrigerants and single-phase fluids like water and Brine.

COIL BLOCK

- Multiple Fin Geometries for varying applications
- Ø 10,12 & 16 mm tubing options, smooth or inner-grooved
- In-line and staggered tube arrangements
- Fin spacing 2,11 to 12mm or Staggered Spacing options for extended running times
- Vertical or horizontal connections- depending on application
- Elements
- HGD capable

Materials

Tubes: Copper | Stainless Steel 304L/316L | Hot-dip galvanised mildsteel | Aluminium

Fins: Aluminium | Al Epoxy Coated | AlMg | SS 304L | Copper

CONNECTION SYSTEM

- Flexible arrangement of the cooling medium connections, horizontal or vertical
- **Optional:** Junctions to mildsteel or stainless steel tube

CASING

- Galvanised mildsteel - Power coated | Stainless Steel 304 | Aluminium
- Hinged or fixed drip trays with drain /elements
- High strength mounting connections

Materials

AlMg or galvanised mildsteel | powder coated | stainless steel 304L/316L

FANS

- ø 350 to 910mm in AC and EC variations
- Industrial fans for applications with high external pressure drops
- Draw-through and blow-through designs available
- **Power supply:** 400V 50/60hZ 3ph | 230V 50hZ 1ph | 220V 60hZ 1ph

Copyright by HC ©

CEILING MOUNTED AIR COOLERS

The ceiling-mounted air coolers

Specifications

Performance Range:
R404 | Capacity up to 320 kW
Glycol | Capacity up to 300 kW
Ammonia | Capacity up to 250 kW
CO_2 | Capacity up to 220 kW
Fans: Ø350 | Ø450 | Ø500 | Ø630| Ø800 | Ø910

Features

Modular Design | 1 to 5 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Fin spacing: 2.11mm to 12mm with staggered options available
Various defrosting systems available incl: Electric, Hot Gas & Hot Glycol available
Casing available in EPC galvanised steel or SS304

Applications

Small to large cold rooms, refrigerated warehouses and distribution centres that preserve fresh produce and freeze products.
Medium and large processing facilities.
Abattoirs
Agricultural cooling, storage and processing facilities.

Copyright by HC ©

CEILING MOUNTED DUAL DISCHARGE COOLERS

The flat design ceiling-mounted evaporator with double coil

Specifications

Performance Range:
R404 | Capacity up to 320 kW
Glycol | Capacity up to 300 kW
Ammonia | Capacity up to 250 kW
CO_2 | Capacity up to 220 kW
Fans: Ø350 | Ø450 | Ø500 | Ø630 | Ø800 | Ø910

Features

Modular Design | 1 to 5 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Fin spacing: 2.11mm - 12mm with staggered options available
Various defrosting systems available incl: Electric, Hot Gas & Hot Glycol available
Casing available in EPC galvanised steel or SS304

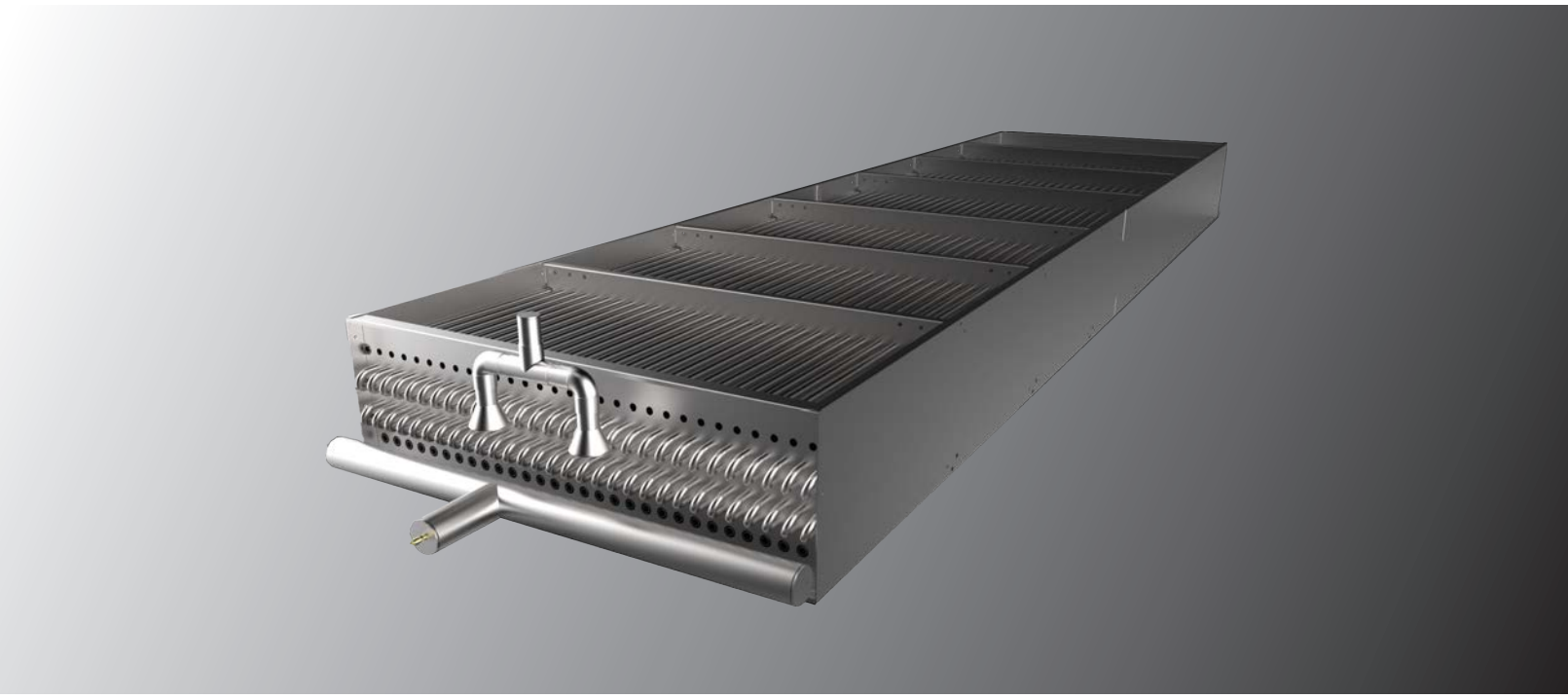
Applications

Ideally suited for working and processing areas as well as fruit ripening rooms. Medium and large cold rooms and freezers.

Copyright by HC ©

HEAT EXCHANGER COILS

The heat exchange coil for multiple applications



Specifications

Performance Range:
R404 | Capacity up to 500 kW
Glycol | Capacity up to 550 kW
Ammonia | Capacity up to 600 kW
CO_2 | Capacity up to 550 kW

Features

Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Fin spacing: 4.2mm - 12mm | with staggered options available
Various defrosting systems incl:
Electric | Hot Gas | Hot Glycol
Casing available in EPC galvanised steel or SS304

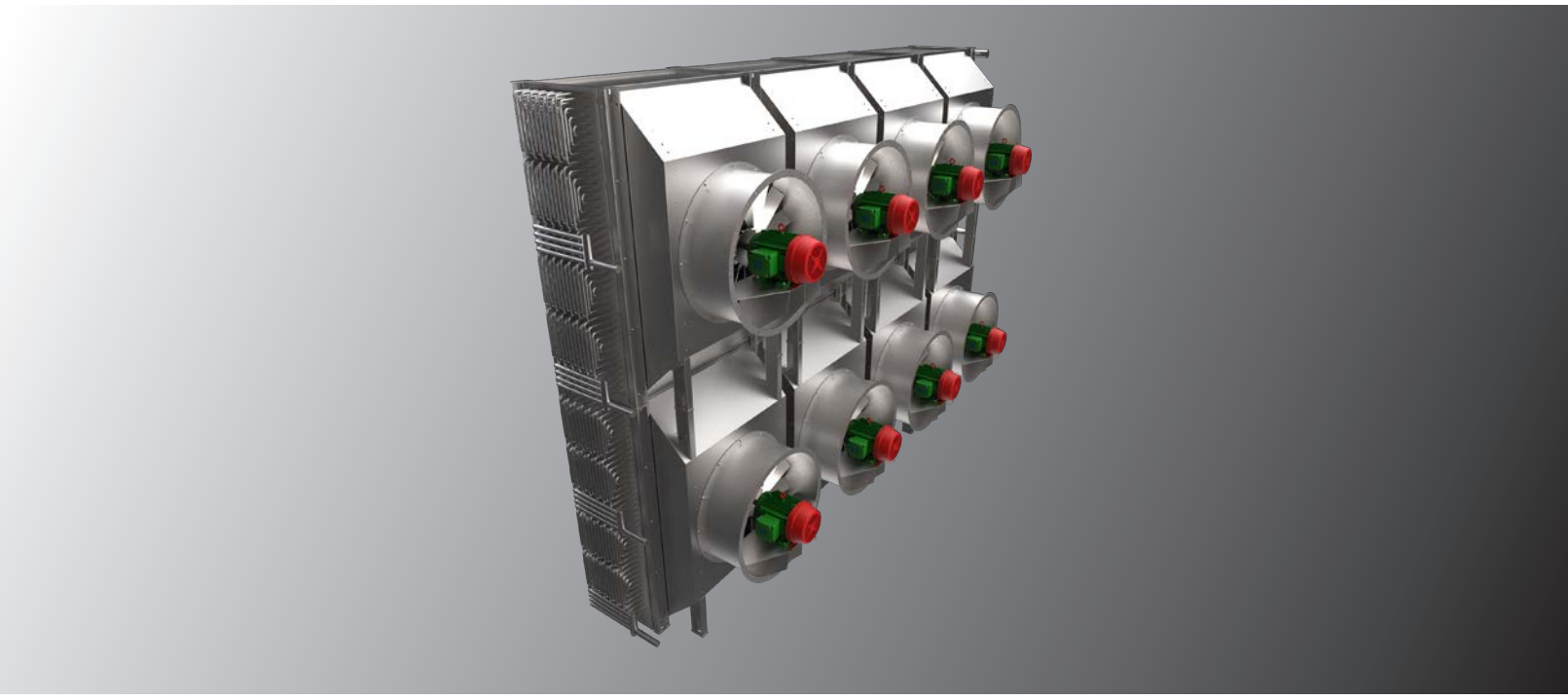
Applications

Medium and large industrial heat exchange applications to serve all your refrigeration requirements from HVAC (Evaporators and Condensers, Cooling and Heating Coils), Freezing, Pharmaceutical and Marine applications to food processing.

Copyright by HC ©

FLOOR STANDING BLAST FREEZERS

High performance blast freezers



Specifications

Performance Range:
R404 | Ammonia | CO_2
Capacity up to 800 kW
Fans: 500Ø | 600Ø| 630Ø | 800Ø | 900Ø | 1000Ø | 1200Ø | 1250Ø

Features

Modular Design | 1 to 16 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Various defrosting systems available
Casing available in EPC Galv or Stainless Steel

Applications

Blast Cooling and Freezing applications such as Spiral Freezers, Carton freezers, Abattoirs, Marine Vessels, and food production facilities.

Copyright by HC ©

DESIGN OVERVIEW

HC Condensers and Gas Coolers are designed to optimally recover heat generated and absorbed in the refrigeration process. Used in both commercial and industrial refrigeration applications, our products are manufactured in a wide range of sizes ranging from 8 to 1300kW to suit all applications.

For every type of application, suitable material combinations can be selected from a wide range of possible materials. Units of the Industrial Range are characterised by high flexibility in connections as well as comprehensive design and accessory options. Depending on the application, NH_3, CO_2, or HFC/HFO can be used as refrigerants for evaporators. Water and every type of brine can be used as operating fluid for condensers.

HEAT EXCHANGE COIL

- Tube Ø 9.52, 12 or 16.5mm, smooth or innergrooved
- Efficient staggered tube arrangement
- Fin pitch 1.81, 2.1 or 2.54 mm fin spacing
- Operating pressures up to 130 bar

Materials

Tubes: Copper | Stainless Steel 304L (1.4307)
Fins: Aluminium | Aluminium epoxy coated | AlMg | Stainless Steel 304L | Copper

RELIABILITY

- Fluid containing tubes are isolated from contact with the casing as a floating coil construction
- Allowance is made for the expansion and contraction of the coil block during operation

CASING

- Galvanised Steel - Powder Coated and SS304
- Corrosion protection options available

FANS

- ø 400-910mm
- AC or optional energy-saving EC fans, directly controllable via 0-10 V, 4-20 mA or Modbus signal
- Industrial fans for applications with high air flow requirements
- **Power supply:** 400V 50/60hZ 3ph | 230V 50hZ 1ph | 220V 60hZ 1ph

ADIABATIC SYSTEM FOR PEAK LOADS

- Spraying with variable selection of nozzles
- Tubing in stainless steel 304L (1.4307)
- Pre- or Post fitted systems
- Wet pads

CONNECTION SYSTEM

- Connection diameter is optimized to the respective case of application

Copyright by HC ©

FLOOR STANDING CONDENSER

The vertical Gas Cooler | Condenser

Specifications

Performance Range:
R404 | Ammonia | CO2
Capacity from 8 to 1300 kW
Fans: Ø500 | Ø630 | Ø800 | Ø910

Features

Modular Design | 1 to 12 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Casing available in EPC Galvanised Steel or Stainless Steel

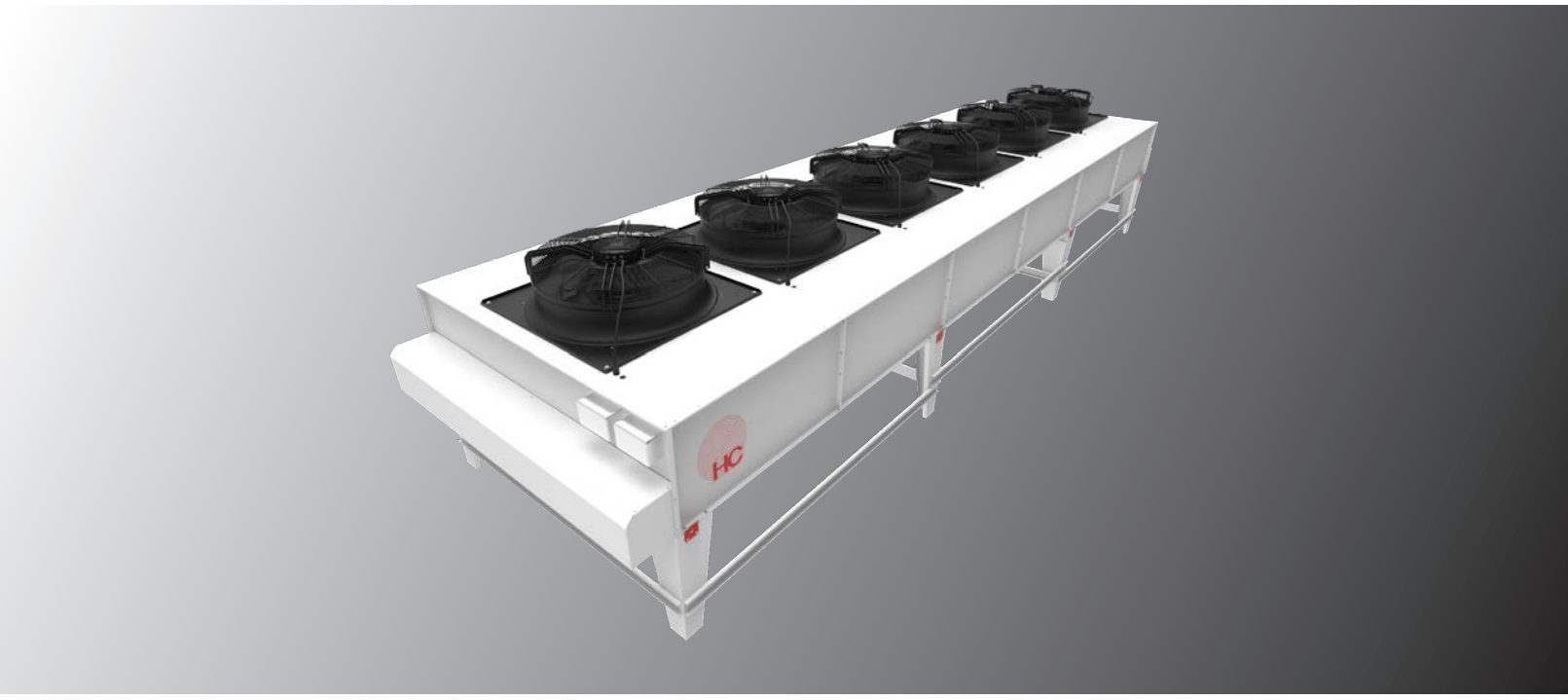
Applications

Any Refrigeration facility where heat rejection with horizontal airflow is required.

Copyright by HC ©

AIR COOLED CONDENSER

The horizontal Gas Cooler | Condenser



Specifications

Performance Range:
R404 | Glycol | Ammonia | CO2
Capacity from 8 to 1300 kW
Fans: Ø500 | Ø630 | Ø800 | Ø910

Features

Modular Design | 1 to 12 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Casing available in EPC Galvanised Steel or Stainless Steel

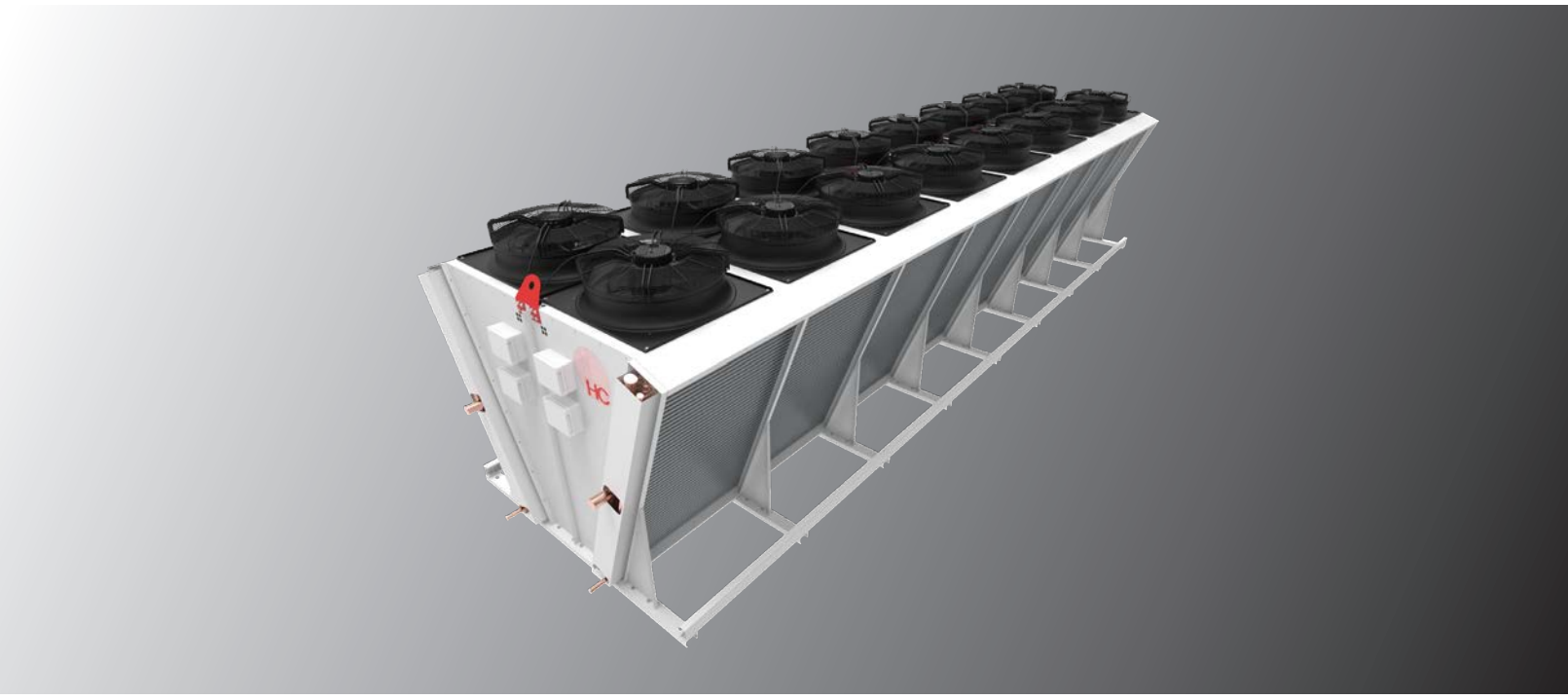
Applications

Any Refrigeration facility where heat rejection with Vertical airflow is required.

Copyright by HC ©

V-SHAPE AIR COOLED CONDENSER

V-Shaped Gas Cooler | Condenser



Specifications

Performance Range:
R404 | Ammonia | CO2 |
Capacity from 50 to 2220 kW
Fans: 500Ø | 630Ø |800Ø | 910Ø

Features

Modular Design | 1 to 18 Fans
Piping in Copper or Stainless Steel
Finned pack available in a range of materials | Alu | AlMg | Copper | SS304
Casing available in EPC Galvanised Steel or Stainless Steel

Applications

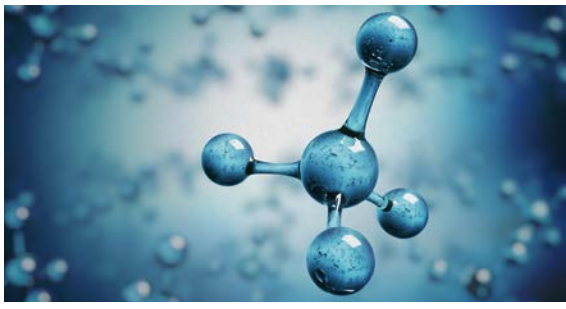
Medium and large cold rooms, refrigerated warehouses that preserve fresh and frozen products and prioritises footprint.
Medium and large processing facilities.

Copyright by HC ©

Ammonia | NH_3 | R717

What is Ammonia?

Ammonia is a highly efficient refrigerant used in medium to large cooling applications due to its outstanding thermodynamic properties. Its GWP (Global Warming Potential) and ODP (Ozone Depletion Potential) are both equal to zero. Ammonia systems are common in large commercial and industrial refrigeration installations. The system designs often also include CO2 or Glycol components.



What are the benefits of Ammonia Refrigeration?

Lower Running Costs

- Ammonia systems are often 15-20% more efficient than standard HFC or other Direct Expansion systems, offering lifetime energy savings.
- Overfed coils typically used in NH3 systems have better heat transfer properties than direct expansion coils and thereby decrease the required coil sizes for a given application and increases the energy savings.
- Ammonia is generally less expensive than F-Gas equivalents and, therefore, offers savings on refrigerant costs in DX NH3 systems.
- Traces of Ammonia can be detected in minimal quantities, providing an early warning system for leaks, unlike F-gasses and CO2.

Efficient

- Ammonia refrigeration is the choice for medium to large-scale refrigeration systems where energy costs are considered. The high latent heat evaporation of ammonia and enthalpy difference allows systems to be designed with efficiencies up to 20% better than traditional HFC installations.

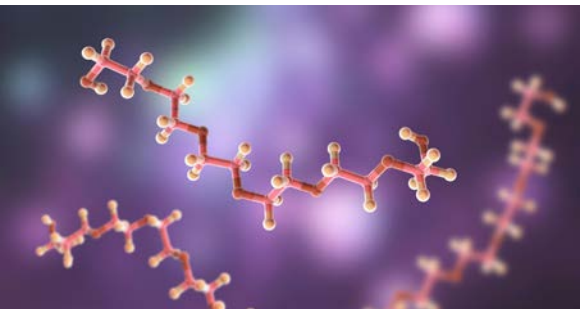
Ozone Safe

- Ammonia refrigeration does not harm the ozone layer which means that it does not contribute to global warming; unlike CFCs, HFCs, HCFCs, and HFOs, Ammonia is an environmentally sustainable refrigerant.

How does it work?

Ammonia Systems operate like typical vapor compression systems, with critical components being a compressor, condenser, expansion device, and evaporator. Ammonia systems are usually utilised in an overfeed or flooded manner where the addition of an accumulation vessel or surge drum is required.

Copyright by HC ©



What is Glycol?

Glycol refrigerants, namely ethylene glycol and propylene glycol, are widely used in cooling systems to provide freeze protection and prevent corrosion. Their addition to water allows a single-phase fluid to be used in refrigeration systems at below freezing temperatures. Ethylene glycol is typically lower in cost but is moderately toxic, so it is used in applications where contact with the fluid does not occur. Propylene glycol is considered a food-grade antifreeze and is widely used in the food industry, where contact with the liquid is possible.

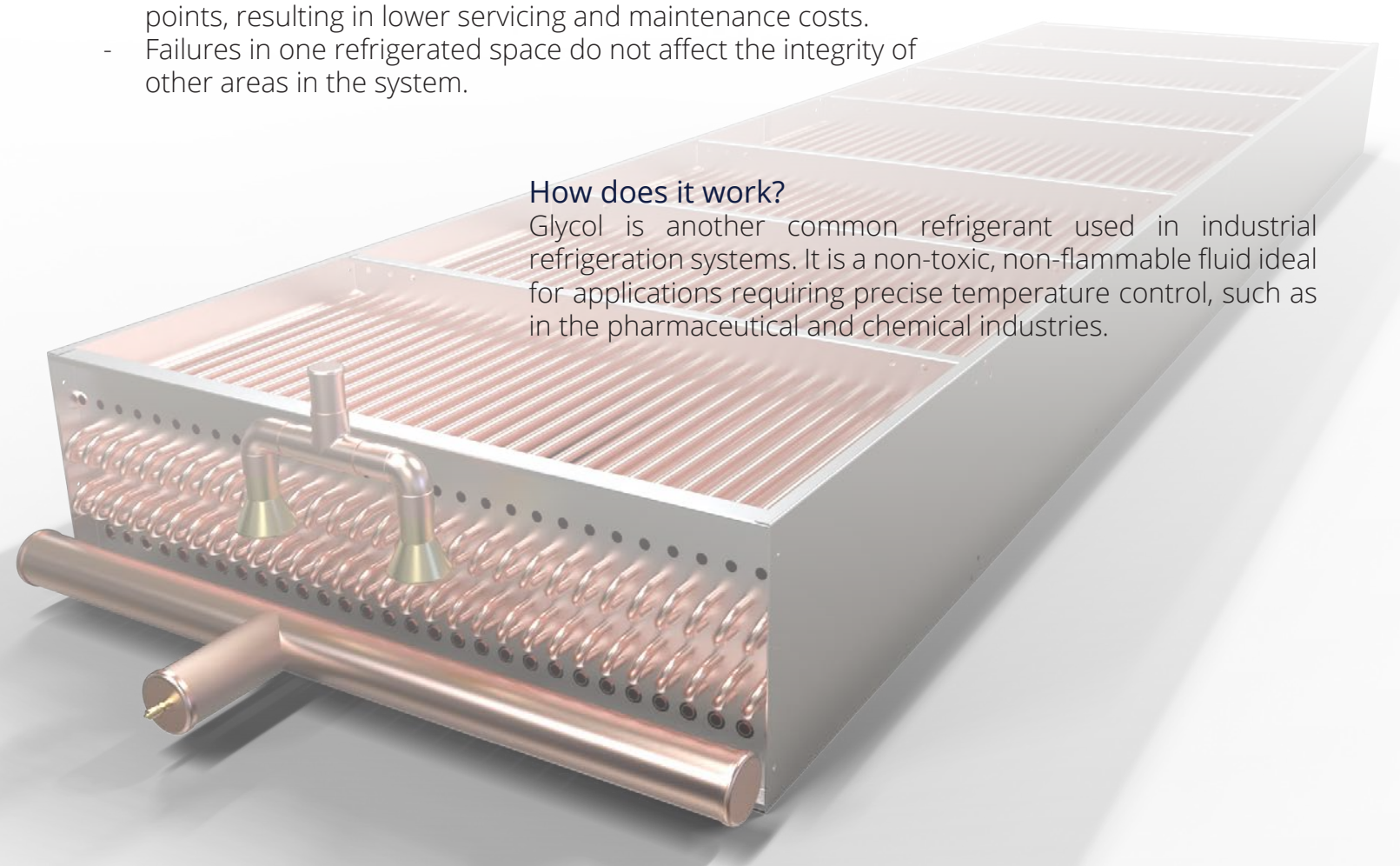
What are the benefits to Glycol Refrigeration?

Sustainable

- Glycol is a natural refrigerant, making it environmentally friendly.
- Glycol systems allow for precise temperature control and tight room temperature differences.
- Matching glycol with an ammonia system allows you to limit the overall charge of ammonia in the comprehensive system while still retaining its energy efficiencies.
- Glycol systems have reduced complexity and number of failure points, resulting in lower servicing and maintenance costs.
- Failures in one refrigerated space do not affect the integrity of other areas in the system.

How does it work?

Glycol is another common refrigerant used in industrial refrigeration systems. It is a non-toxic, non-flammable fluid ideal for applications requiring precise temperature control, such as in the pharmaceutical and chemical industries.

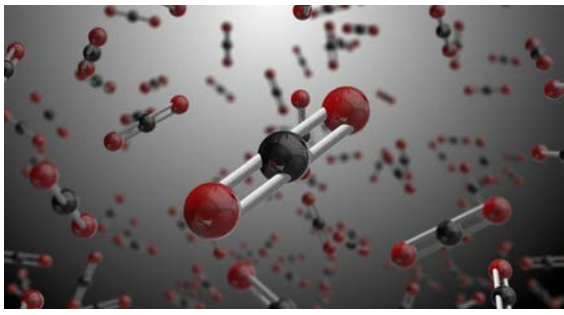


Copyright by HC ©

Carbon Dioxide | CO_2 | R744

What is CO2?

R744, or CO2, is an environmentally friendly refrigerant that has gained popularity recently due to its low global warming potential and non-flammability. It is commonly used in refrigeration systems requiring low-temperature cooling, such as food freezing and cold storage applications.



What advantages does CO2 offer?

Environmentally Sustainable

- It is a natural and non-flammable cooling agent.
- Compared to HFCs, it has a very low global warming potential (GWP) with zero PFAS emissions.

Efficient

- CO2 exhibits exceptional efficiency in low-temperature applications. It efficiently extracts heat even at lower temperatures, making it ideal for cooling systems.
- CO2 requires less energy than other refrigerants, resulting in significant energy savings.
- CO2-based solutions offer the opportunity to maximise efficiency, reduce environmental impact, and optimise energy consumption.

Heat Reclaim

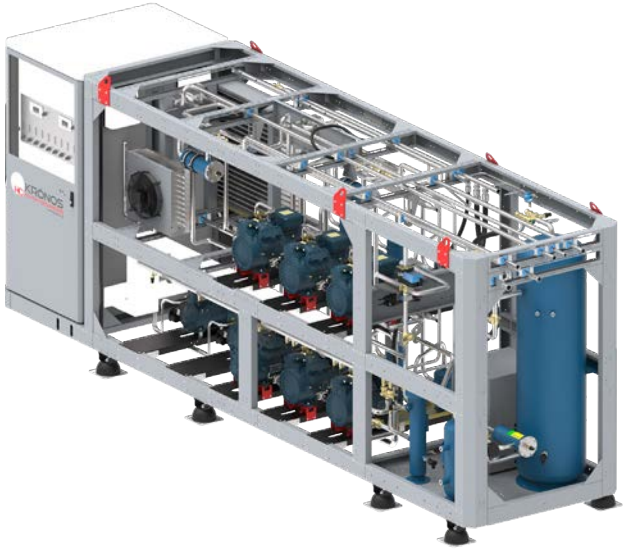
- CO2 has a higher discharge temperature than traditional HFC refrigerants due to its greater compression index.
- Even in winter conditions, CO2 systems provide usable quantities of recoverable heat.
- The reclaimed heat can be utilised to improve efficiency in other areas of operation, such as HVAC or domestic hot water.

How does it work?

The process begins by expanding CO2 into an evaporator. Here, it is evaporated into superheated vapour. The vapour is then compressed, raising its heat and pressure.

Once the pressure exceeds the critical point of CO2 (1055 PSIG/74 BAR), the CO2 transforms into an "undefined gas." The undefined gas offers excellent heat transfer capabilities like a gas and has a higher density that resembles that of a liquid.

This unique combination of properties allows for efficient heat transfer between the CO2 and the surrounding medium, making transcritical CO2 systems ideal for applications such as refrigeration, air conditioning, and heating systems.



Copyright by HC ©

WHAT IS THE COLD CHAIN?

The term "cold chain" refers to a comprehensive process of maintaining controlled temperatures throughout the entire supply chain. It encompasses various stages, including preparation, packaging, storage, distribution, retail holding, display, purchase, and home storage until the point of consumption.

The cold chain is particularly relevant for perishable items, such as chilled or frozen foods, as it ensures their quality and safety from the initial raw material stage to the final consumption.

To ensure the integrity of the cold chain, it is crucial to eliminate any weak links in the process. Each stage of the supply chain must prioritise the maintenance of proper temperature conditions. The guiding principle should be "Don't re-cool; keep cool." By adhering to this motto, the entire cold chain can guarantee that the products remain consistently cooled throughout their journey, preserving their freshness and preventing any compromise in quality.

The Purpose of the Cold Chain

The purpose of the cold chain is to ensure the preservation, safety, and effectiveness of perishable items, particularly food and vaccines, by maintaining a controlled temperature environment throughout their storage and transportation.

For food, chilling or freezing is done primarily to extend the shelf life and maintain the freshness of the products. Additionally, it serves as a crucial safety measure since higher temperatures facilitate the rapid growth of food-poison-causing bacteria if contaminated food is consumed.

In the case of vaccines, the cold chain plays a vital role in ensuring their efficacy. Vaccines must be stored within a specific temperature range from manufacturing until administration. Deviating from this temperature range, the potency of vaccines can be lost if temperatures fluctuate too much, rendering them ineffective in providing immunity against diseases.

To successfully deliver vaccines to various locations worldwide, a well-coordinated cold chain system is necessary. This involves maintaining temperature-controlled environments at every stage, including storage, management, and transportation. Precise temperature monitoring and control are crucial to prevent any damage or loss of potency in vaccines, ensuring that the vaccines remain viable and effective when administered to individuals.




Copyright by HC ©

FOOD PROCESSING

The importance of refrigerating food at an optimal temperature to ensure food safety has been extensively demonstrated. Controlling and maintaining storage temperatures is often necessary, with specific temperature requirements varying for different types of products.

Primary Food Processing Facilities

Primary food processing is essential in the farm-to-table journey. It transforms raw agricultural products into minimally processed foods, preserving their quality. This stage involves cutting, cleaning, packaging, storing, and chilling, freezing or refrigerating to protect nutritional value and maintain original properties. Its goal is to prevent spoilage and provide safe, wholesome products to consumers.

Secondary Food Processing Facilities

Secondary food processing refines raw ingredients, enhancing their value and palatability. It involves extracting, transforming, and purifying to create convenient and appetizing products. Using techniques like heat treatment, fermentation, and packaging for secondary processing extends the shelf life of primary ingredients.

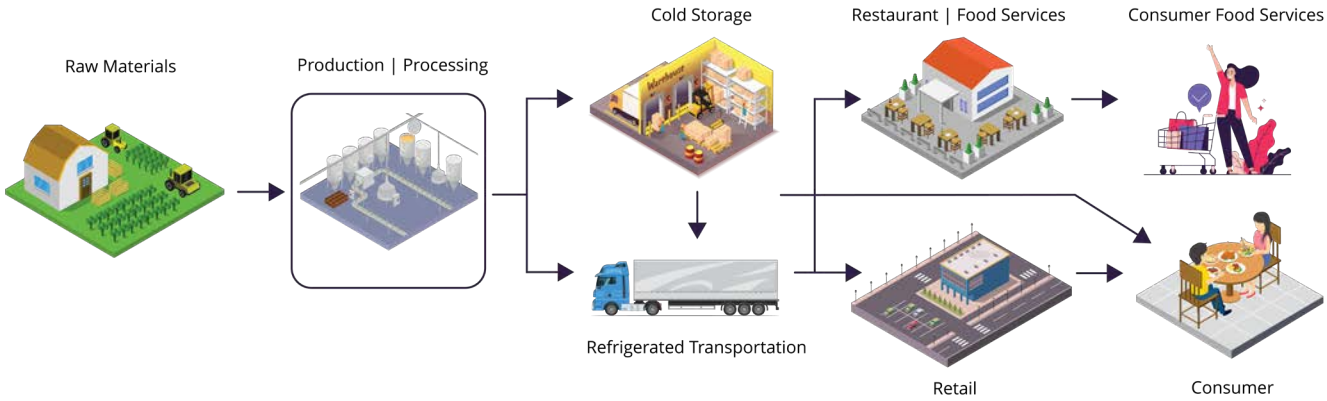
Tertiary Food Processing Facilities

Tertiary food processing involves refining and preparing processed food products for distribution and consumption. It enhances convenience and extends shelf life, providing diverse food options. Industrial refrigeration plays a critical role in this stage by ensuring product safety and preservation. It maintains low temperatures to slow microbial growth, preserve freshness, and prevent spoilage. Additionally, industrial refrigeration enables transportation and distribution, expanding market reach. Through temperature and humidity control, it ensures the quality and longevity of tertiary processed food products.

Copyright by HC ©

BEVERAGE PRODUCTION

The beverage industry is a diverse landscape comprising two primary sectors: alcoholic and non-alcoholic beverages.



The non-alcoholic beverages are made up of Liquid Refreshment Beverages (LRB) such as fruit juice, carbonated soft drinks, energy drinks, bottled water, milk, coffee, and tea. While the alcoholic beverages consist of spirits, wine, and beer. In order to maintain the desired quality, hygiene, and safety of these beverages, precise temperature control is crucial throughout the processing, transportation and storage phases.

Pre-cooling

Rapid cooling techniques are employed based on the type of beverage product.

Chilling

After pre-cooling, beverages need to be chilled and maintained at specific temperatures to reduce the risk of bacterial growth. Rapid chilling methods, such as pulldown, holding, or flash freezing, are mentioned to further mitigate this risk. The chilling process typically involves chilling tunnels or chilling rooms. The required temperature range depends on the sensitivity of the beverage product.

Copyright by HC ©

DAIRY PROCESSING

Milk and dairy products are rich in nutrients and microorganisms. This necessitates that the strictest temperature control processes are adhered to in producing and distributing these products.

The dairy sector produces numerous products with individualised processes and requirements. Common to all of these is the need for cooling to ensure product quality and extend its shelf life. As the product is fundamentally intended for consumption, strict temperature control is necessary from farm to table. A break in the cold chain at any point leads to decreased product quality and shelf life.

From the initial cooling after collection to the re-cooling after pasteurisation to the transportation and storage requirements, the various processes and temperature regimes impact the product life span, quality, and desirability to consumers.

Copyright by HC ©

FISH FREEZING

HC observes that industrial refrigeration is vital in preserving fish's nutritional properties, establishing it as a fundamental component of a balanced and healthy diet.

Both marine and freshwater species are highly perishable and vulnerable to environmental conditions from the moment the fish is caught. To prevent decomposition caused by microorganisms, immediate refrigeration after capture is essential.

Maintaining the cold chain goes beyond the vessels. Inland processing plants continue refrigeration during preparation until the fish reaches the consumer. Specific conditions are required in different industrial refrigeration environments:

- **Fresh room:** Kept at -1°C to 0°C with high humidity.
- **Ice factory and silo:** Maintained close to 0°C.
- **Workrooms:** Kept at approximately 12°C with low airspeed (0.2 m/s) from evaporators.
- **Frozen product storage:** Temperature must not exceed -18°C for short-term preservation dropping to -30°C for longer periods.
- **Waste deposit:** The recommended temperature is -5°C, generating superficial freezing to reduce waste odor before evacuation.
- **Fish and fresh seafood storage chambers:** Product covered with ice, temperature generally between -1°C and 1°C.
- **Freezing tunnels:** Three types; continuous, semi-continuous, and static - with process temperature between -35°C and -30°C. Continuous tunnels provide freezing times of 120 to 240 minutes.

By ensuring these ideal conditions through industrial refrigeration, the fishing industry preserves fish and seafood quality, extends shelf life, and meets market demand for fresh and frozen products.

Copyright by HC©

COLD STORAGE WAREHOUSE

Cold storage is vital for efficient inventory management, encompassing the storage of various product groups. These include fruit and vegetables, processed foods (such as meat and fish), and final goods (including beverages and pharmaceuticals). Cold storage plays a crucial role in preserving the freshness and quality of perishable goods within these warehouses.

Climacteric Fruits and Vegetables

Certain fruits and vegetables (e.g. tomatoes, pears, quinces, and melons) are climacteric. They are harvested before full ripening and undergo ripening during cold storage. Ripening rooms are temperature and humidity-controlled to ensure the ripening process is successfully completed.

Non-Climacteric Fruits and Vegetables

Non-climacteric fruits and vegetables, such as oranges, lemons, tangerines, cucumbers, and peppers, require refrigeration to prevent deterioration. It is crucial to allow them to mature adequately on plants before harvesting. De-greening of citrus fruits must be done in temperature- and humidity-controlled rooms or tunnels.

Frozen Cold Storage: Safeguarding Perishable Goods

Meat, fish, chicken, and baked goods are susceptible to spoilage due to micro organisms. Proper refrigeration slows down pathogen reproduction. Maintaining an uninterrupted cold chain during distribution is vital for preserving quality and safety.

Primary and Secondary Cooling

After meat has been butchered it must be immediately refrigerated at an abattoir to reach an internal temperature of 3 °C to 4 °C (primary cooling). This step prevents microbe proliferation and extends the shelf life. Secondary cooling to 0°C halts pathogen reproduction. Secondary cooling is required during meat processing.

Cold Storage for Finished Goods: Beer, Tobacco, Pharmaceuticals

Cold storage is crucial for preserving finished goods like beer, tobacco, and pharmaceuticals. Refrigeration maintains their quality, efficacy, and stability, safeguarding their composition and potency.

Copyright by HC ©

DISTRIBUTION CENTRE

Distribution centres are like the heart in your body, connecting every part of the value chain from a central location to ensure every aspect gets what it needs when it needs it. These facilities are strategically positioned to serve as hubs for storing finished products before they journey to the end customer.

Distribution centres are akin to retail outlets, embracing a holistic approach to logistics. They store goods and handle order picking, packing, and shipping, ensuring that customer orders are met with speed and accuracy. Unlike warehouses, distribution centres prioritise the smooth flow of goods over long-term storage. This emphasis on efficiency calls for streamlined processes, making distribution centres the linchpin of modern supply chain networks.

One of the most critical aspects of distribution centre operations is temperature control, particularly for cold and frozen foods. Maintaining precise temperature conditions is paramount to preventing bacterial growth and health risks. For products such as fresh meat, poultry, fruits, vegetables, dairy, and eggs, storage temperatures must remain constant at 4°C or lower. On the other hand, freezers need to maintain temperatures of -18°C or lower to stave off food spoilage and the proliferation of harmful bacteria. Regular temperature monitoring is essential to this meticulous process.

While temperature control is critical for cold and frozen items, dry food products, including canned goods, dehydrated items, grains, pasta, rice, and similar items, have their own storage considerations. Although they don't require the same stringent temperature control, maintaining proper storage conditions is essential for maximising their shelf life.

Moisture control takes centre stage for dry food products. Lower moisture levels not only extend the longevity of these items but also minimise the risk of bacteria formation, which thrives in damp environments.

Copyright by HC ©

https://www.wbhocs.za/portfolio/bulk-liquid-distribution-centre/

REFRIGERATED TRANSPORT

HC ensures the integrity of the cold chain in handling, transporting, and storing food and various products. It recognizes the vital role of the cold chain in preserving the quality and efficacy of items like food, pharmaceuticals, medical supplies, and chemicals from production to consumption.

Linking producers and consumers is a crucial stage in any product's success. The importance of this step is even more pronounced when the products require cooling. With sufficient cooling during transport, high-quality products will maintain quality and ultimately not pose a safety risk to consumers. During transport, controlled temperature regimes prevent product deterioration and safeguard their properties. This crucial link in the cold chain must be addressed as the need to move finished goods to consumers becomes more widespread as population densities shift to urban areas.

Different temperature requirements apply to various products. HC maintains distinct storage temperatures suited to the specific products transported. Controlled temperatures result in improved quality and customer satisfaction.

Copyright by HC ©

PHARMACEUTICAL PROCESS

For companies involved in pharmaceutical manufacturing, the challenges of regulatory compliance and ensuring safety are numerous. Precise temperature control is crucial for effective process cooling and cold storage. In the pharmaceutical industry, strict adherence to conditions and critical parameter maintenance are essential at every process stage.

Room temperature, typically 20°C to 25°C, is the setting for many pharmaceutical activities. However, certain drug substances that degrade under room-temperature conditions require cold storage, ranging from 8°C to 15°C. Furthermore, highly degradable drugs, vitamins, and chemicals necessitate cold storage conditions ranging from 2°C to 8°C. Lowering the temperature can significantly slow chemical reactions and microbial growth.

Fridge storage, on the other hand, involves temperatures between -4°C and 2°C. As these stored goods often include high-value products, maintaining a precise temperature range becomes critical due to their sensitivity to temperature fluctuations. The loss of refrigeration can result in substantial monetary losses, production and supply chain disruptions, and stock losses.

Companies turn to CO_2, Ammonia refrigeration, and alternative refrigerants to address these challenges. Custom industrial refrigeration systems are designed to meet the specific process requirements for the cold storage of pharmaceuticals. Pharmaceutical companies utilise cold storage warehouses to safeguard syrups and injections from denaturation. These facilities incorporate state-of-the-art control and monitoring equipment, ensuring a temperature-controlled and climate-controlled environment. Cold temperatures are vital in preventing the contamination of pharmaceutical materials from being compromised.

The refrigerants commonly used in most cold storage facilities include ammonia (NH_3), carbon dioxide (CO_2), and HFC/HFO compounds. Ammonia is the predominant refrigerant used in large-scale food and beverage refrigeration systems. However, CO_2 refrigerant has become the preferred choice for facilities with freezer applications due to its exceptional performance at low temperatures.

Copyright by HC ©

PETROCHEMICAL | CHEMICAL

In the realm of chemical and petrochemical processes, HC acknowledges that, while they may not be governed by the same stringent control observed in the pharmaceutical field, they recognise the pivotal role temperature control plays in achieving exceptional efficiency in transformative operations.

Distillations, crystallisations, and condensations demand proficient heat removal methods; thus, refrigeration systems are imperative to secure desired outcomes.

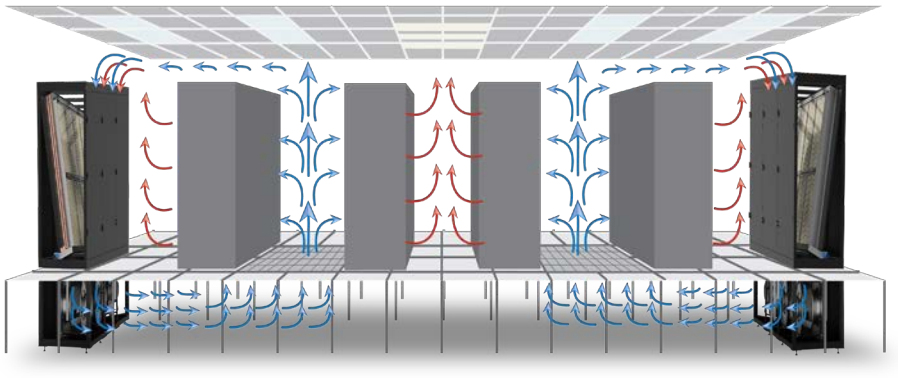
Large-scale cooling plants are paramount in the chemical and petrochemical industries, facilitating essential processes. Given these industries' substantial flow rate requirements and diverse geographical locations, that river water or seawater is often harnessed as the preferred refrigerant choice.

The common utilisation of compression and absorption cycles in the pursuit of effectively cooling down the hot streams subsequent to heat dissipation during various operations. Additionally, the significance of employing heat exchangers to maximise operational efficiency by efficiently heating other segments of the process that necessitate hot streams.

Copyright by HC ©

DATA CENTRES

In the fast-paced world of data centres, cooling solutions are pivotal in ensuring reliability, efficiency, and sustainability. Air conditioning and dry coolers have emerged as indispensable tools for modern data centre operators, offering a range of benefits that extend from energy efficiency and precision cooling to scalability, reduced environmental impact, and cost savings.

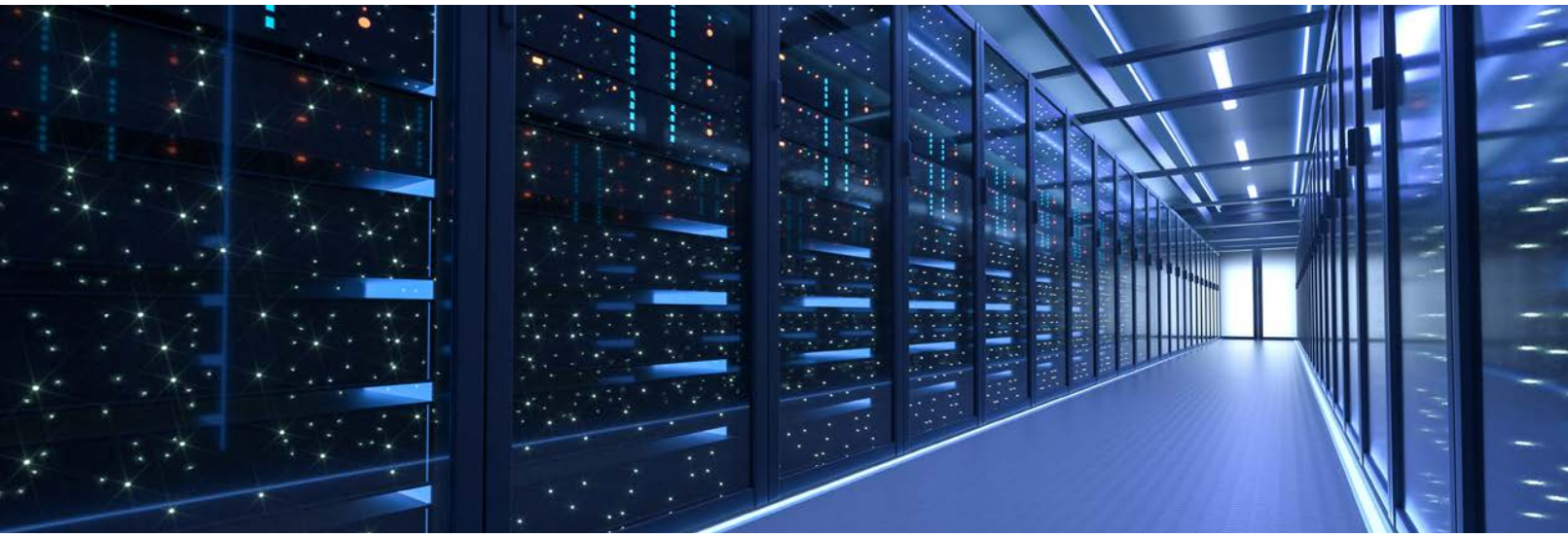


As data centre requirements continue to evolve, adopting these innovative cooling technologies is not just a smart business decision; it's an essential step towards meeting the growing demand for data processing while minimising the environmental impact. Embracing efficient cooling is a win-win scenario, enhancing data centre performance and environmental responsibility.

Clustered servers in data centres can raise temperatures and lead to overheating, equipment failures, and fire hazards and safety risks, causing substantial downtime and losses for organisations. Implementing effective cooling is vital to ensure uninterrupted services and prevent hazards, while data integrity and regular maintenance further underscore cooling's importance.

To address these challenges, custom-designed air conditioning and temperature control prove indispensable, enabling extended operation, improved airflow, and humidity control, reducing downtime, enhancing server reliability, and reducing energy consumption.

Supplementing cooling with sustainable options, like energy-efficient servers and strategic arrangements, optimises performance while identifying and addressing "hot spots" further regulates temperature and airflow.



Copyright by HC ©

DISTRICT COOLING | HEATING

District cooling is focused on providing a comfortable environment inside buildings, regardless of the temperature outside. A comfortable living environment inside buildings is offered to hotels and urban or commercial areas.

District cooling is based on the centralised generation of cooling streams such as chilled and heated water. This cold or warm water is then distributed to residential and commercial areas, where homes and offices are kept comfortable through the cooling stream. By centralising the cooling process, production costs reduce and efficiencies increase.

Providing a cooling solution to an entire building means that the operational and maintenance costs of the equipment are shared between the whole built environment and the individual solutions provided by each facility. Providing complete cooling and heating solutions to a commercial building block enables HC to provide the best equipment for the project, whereby the customer benefits considerably in energy savings.

The equipment size required for the specific area depends on the density of the built environment, which requires comfortable work and living space. District heating and cooling production requires varying equipment and technologies. Maintaining low temperatures on the high pressure side of the system improves efficiencies. This means that water availability plays a significant role in the overall running efficiency of the system; dry coolers and adiabatic condensers offer efficient solutions.

Copyright by HC ©

ICE RINKS

An ice-skating facility presents a frozen terrain of water or chemically treated surfaces, serving as a hub for various winter recreational activities. These include ice skating, ice hockey, speed skating, figure skating exhibitions, curling, ice shows, and contests.

Within this domain, there are two primary categories of ice rinks:

- "Natural" rinks, relying on cold ambient temperatures for freezing.
- "Mechanically frozen" rinks, where a cooling mechanism is employed to create sub-freezing conditions beneath the surface water, facilitating the formation of an ice layer.

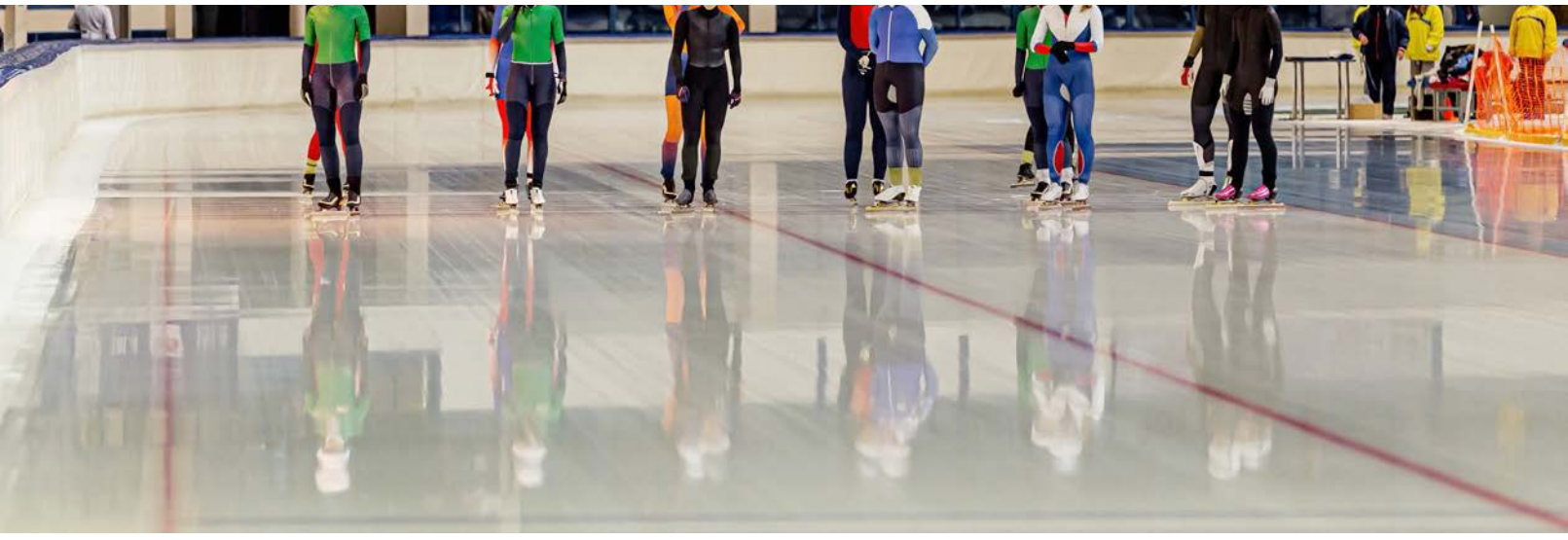
HC, a recognised player in this industry, understands the pivotal role of refrigeration processes in shaping and preserving top-tier ice surfaces for mechanically frozen rinks. HC stands as a provider of cutting-edge, environmentally sustainable refrigeration solutions, including advanced CO_2 systems. These solutions can be broadly classified into two distinct categories: direct and indirect systems.

In the context of the "indirect" refrigeration systems, a liquid refrigerant absorbs heat from a secondary liquid, extracting heat from the rink's surface. A brine solution is then utilised, being pumped, and circulated through pipes evenly integrated into the rink's flooring.

Conversely, in the "direct" system, the floor's thermal energy is eliminated by directing the primary refrigerant fluid through the pipes embedded directly in the bed, eliminating the need for an additional coolant. In direct and indirect configurations, the refrigerant within the lines is meticulously maintained at -15°C. This meticulous temperature control ensures that water atop the rink's surface rapidly solidifies, creating an ideal, smooth skating surface.

Another crucial aspect in constructing ice rinks is the level of insulation. Recognising that ice's dimensions can fluctuate in response to external factors, it's vital to consider insulation carefully. Currently, a prevalent choice among ice rink operators is the utilisation of chillers as their primary refrigeration systems. These systems often employ ammonia as the chief refrigerant, supplemented by brine or glycol as a secondary refrigerant.

Nevertheless, over the past decade, carbon dioxide (CO_2) has become a sustainable alternative for refrigeration in ice rink operations. This advancement offers an eco-friendly and efficient choice for maintaining ice rinks.



Copyright by HC ©

MARINE REFRIGERATION

Marine refrigeration systems play a vital role in preserving food, beverages, and other perishable items on ships and other marine vessels. These systems are a technological marvel designed to operate in challenging conditions where space and power are often at a premium.

Efficiency in Limited Space and Power Availability

One of the hallmark features of marine refrigeration is its highly efficient, compact, and customised package design. This optimisation is essential due to the limited space available on most vessels, where every inch matters. Space constraints necessitate the creation of refrigeration systems that are not only small in size but can also fit into unconventional, oddly shaped areas, ensuring efficient use of the available space.

Refrigeration Systems

Marine refrigeration systems typically employ a vapour compression cycle, a well-established and efficient method for cooling. This process involves a refrigerant circulating through a compressor, condenser, expansion valve, and evaporator, effectively maintaining the desired temperature for storage while removing heat from the refrigerated space.

Overcoming Challenges

Operating in a constantly changing environment is one of the primary challenges marine refrigeration systems face. Vessels can encounter varying ambient temperatures, fluctuating humidity levels, and constant motion and vibrations in a highly corrosive environment. These factors can make maintaining consistent temperatures within the refrigerated compartments difficult.

Marine refrigeration systems must be equipped with sophisticated controls and sensors to address these challenges. These components help adapt to changing conditions and maintain the desired temperature, ensuring the safety and quality of stored items.

Other Applications

Marine refrigeration systems are not limited to preserving perishable items. They also find applications in air conditioning, engine cooling, and providing temperature-controlled medical or laboratory equipment environments.

Copyright by HC ©

ENVIRONMENTAL & SOCIAL FACTORS

The adoption of synthetic refrigerants has raised significant environmental and social concerns, prompting a growing emphasis on transitioning to natural alternatives. These synthetic gases are more commonly known as fluorinated greenhouse gases (F-gases) but also as hydrofluorocarbons (HFCs), hydrofluoro-olefins (HFOs), and hydrochlorofluoro-olefins (HCFOs). These gases all have global warming potentials (GWPs) in excess of their natural counterparts and have a tendency to break down into "forever chemicals" known as PFAS (per - and polyfluoroalkyl substances), which are persistent and toxic.

Aside from environmental implications, synthetic refrigerants also pose considerable social challenges. Workers in the refrigeration industry face potential health risks due to exposure to these hazardous substances, and communities, particularly in developing nations, endure disproportionate consequences of climate change despite their minimal contribution to the issue.

The motivation to switch to natural refrigerants, including ammonia and carbon dioxide, has gained significant momentum. These alternatives are distinguished by their lower global warming potential (GWP) and ozone depletion potential (ODP), making them more environmentally friendly choices.

The shift towards natural refrigerants holds promise for mitigating the effects of climate change. By reducing the emission of potent greenhouse gases, the international community aims to limit global warming and facilitate the restoration of the ozone layer, safeguarding the environment and human health from harmful ultraviolet radiation.

In light of synthetic refrigerants' environmental and social ramifications, the transition to natural alternatives marks a pivotal step in promoting sustainable practices within the refrigeration industry. This concerted effort towards eco-friendly refrigeration solutions exemplifies responsible corporate citizenship and underscores the commitment to fostering a greener and healthier future for all stakeholders.

Copyright by HC ©

www.hcgroup.co.za

HC Group Headquarters
8 Amber Road | Elandsfontein | Johannesburg | South Africa
Tel: +27 11 674-1237 | info@hcgroup.com

Dubai Offices
F-Wing 610 | Dubai Silicon Oasis Authority Dubai | UAE
Tel: +971 4 3712704 | sales@hcaircon.com

Pride • Customer Focus • Ownership • Accountability