

# Star CO<sub>2</sub> Solutions

Sustainable natural refrigeration systems







# Why CO<sub>2</sub>?

Carbon dioxide (CO<sub>2</sub>) refrigeration systems offer a number of benefits



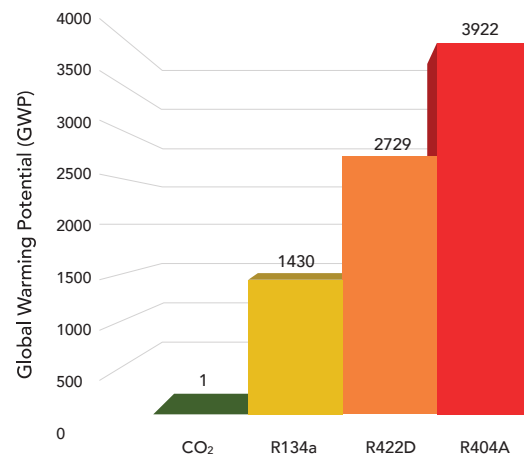
# Key Benefits of CO<sub>2</sub> systems

## Sustainability

CO<sub>2</sub> is a naturally occurring substance which is found in abundance throughout our environment; it is in the air that we breathe and the beverages that we drink.

CO<sub>2</sub> has a global warming potential (GWP) of just one, thousands of times lower than many traditional synthetic refrigerants.

Furthermore, with an Ozone Depletion Potential (ODP) of zero, CO<sub>2</sub> has no effect on the ozone layer, making it a sustainable and environmentally sound refrigerant choice.



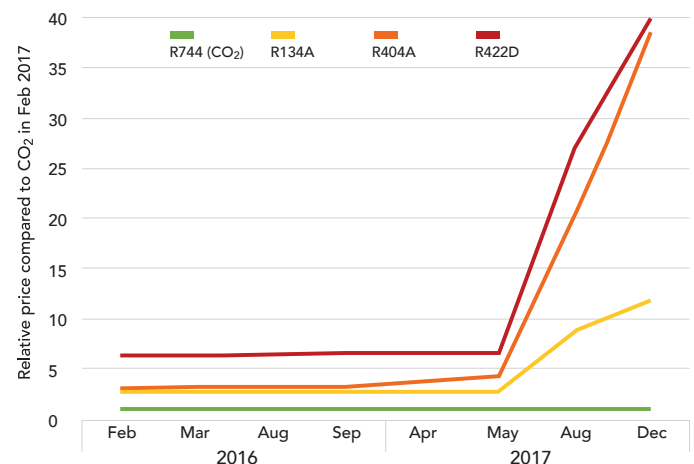
Refrigerant GWP Comparison

## Future Proofing

Increasingly stringent environmental legislation sees operators of refrigeration systems under increasing pressure to reduce or eliminate their use of traditional, high-GWP refrigerants.

This is highlighted by the revised EU F-Gas Regulation (517/2014), which will see the availability of HFCs reduced by 79% between the years of 2015 and 2030, whilst simultaneously introducing step-wise bans on the installation and servicing of systems using higher-GWP refrigerants.

In addition, the Kigali Amendment to the Montreal Protocol, agreed in 2016, saw 197 countries across the globe commit to cutting the production and consumption of HFCs by more than 80 percent by the year 2047. The continued use of HFC systems is consequently becoming both less feasible and more expensive over time; as evidenced by the adjacent refrigerant price evolution chart.



F-Gas Price Evolution 2016 - 2017

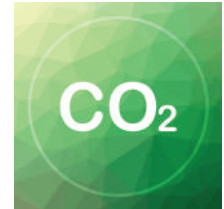
As a low-GWP natural refrigerant, CO<sub>2</sub> is unaffected by HFC restrictions; thereby representing a reliable, long term and future-proof solution in which businesses can invest with confidence.



# Key Benefits of CO<sub>2</sub> systems

## Safety

CO<sub>2</sub> has an A1 safety rating (BS EN378-1: 2016), being classified as non-flammable with low toxicity. As a result, CO<sub>2</sub> systems are straightforward to implement, with fewer safety stipulations than systems using toxic or flammable refrigerants.



CO<sub>2</sub> operates at higher pressures than traditional refrigerants; a factor which should be considered when designing the system.

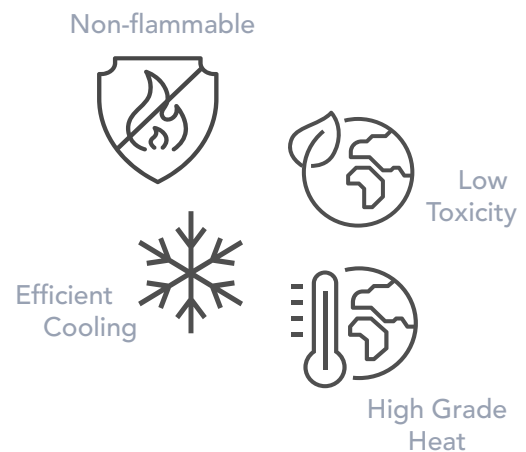
It is interesting to note however that the higher pressures associated with CO<sub>2</sub> also result in smaller compressors and system components.

## Performance

In addition to favourable environmental and safety qualities, CO<sub>2</sub> systems also offer attractive energy performance.

CO<sub>2</sub> is very effective at transferring heat, allowing higher evaporating temperatures than many traditional refrigerants. It is also relatively insensitive to pipe work pressure drops, resulting in higher suction pressures and improved efficiency.

Mild climates such as the United Kingdom are ideal for air cooled transcritical CO<sub>2</sub> systems, allowing them to function in their most efficient operating mode for large portions of the year.



Star Refrigeration's CO<sub>2</sub> systems are designed to ensure optimal performance for your specific application. Star offers a number of features to further enhance the performance of its CO<sub>2</sub> systems, including its optimised Low Pressure Receiver (LPR) design for semi-flooded evaporator operation.













CO<sub>2</sub> systems also operate at higher discharge temperatures than traditional refrigerants. By recovering waste heat that would otherwise be rejected to atmosphere, CO<sub>2</sub> systems offer a source of high grade heat for use elsewhere on your premises, facilitating the reduction or elimination of other conventional heat sources.

# Star Market Sectors

With over 25 years of CO<sub>2</sub> experience, Star Refrigeration has an unrivalled track record of providing turnkey CO<sub>2</sub> solutions. With in-house design, project management, M&E and aftercare capabilities, Star delivers total project solutions for end users.



As a business, Star work closely with a broad range of industry sectors, including:

<b>Food Manufacturing</b> 	<b>Temperature Controlled Storage &amp; Distribution</b> 
<b>Freezing &amp; Chilling</b> 	<b>Dairy</b> 
<b>Brewing &amp; Distilling</b> 	<b>HVAC</b> 
<b>Leisure &amp; Ice</b> 	<b>Data Centres</b> 
<b>Pharmaceutical &amp; Process</b> 	<b>Petrochemical &amp; Nuclear</b> 



# Star CO<sub>2</sub> Solutions



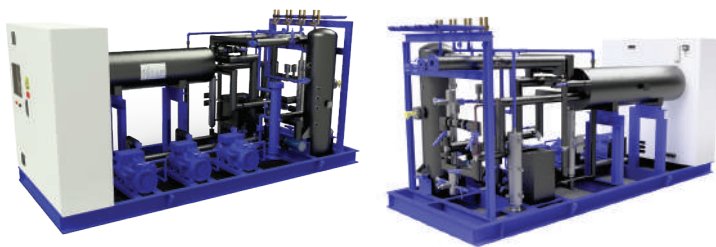
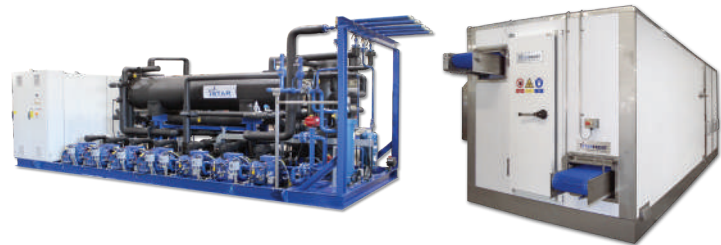
Star Refrigeration provides robust, engineered industrial solutions that are built to last. The expected life span of Star-built products is over 20 years, with some Star plants still running after almost 40 years.

Star offers a variety of standard and bespoke packaged CO<sub>2</sub> products, including its in-house Envichill, Envicold and Envifreeze ranges, manufactured in Glasgow, UK. Examples of Star-built CO<sub>2</sub> systems are shown below. As an independent company, Star also has the ability to objectively compare outsourced units and components from across the entire marketplace, selecting only those which are best suited to your specific application.

Our range of CO<sub>2</sub> solutions includes:

## Envifreeze

Two stage transcritical plant for food production and temperature controlled storage applications

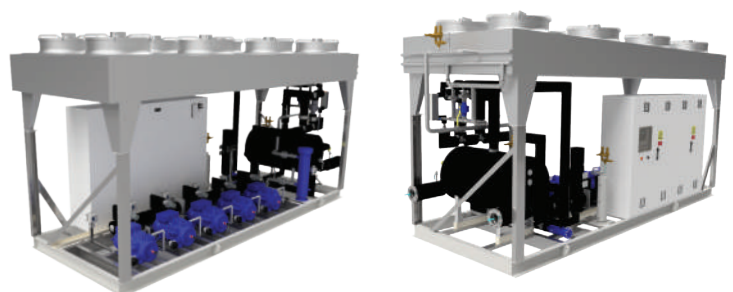


## Envichill Envicold

Single stage transcritical plant for temperature controlled storage applications

## Envichiller

Single stage transcritical plant for chiller applications



# Total Solutions Provider

Founded in 1970, Star Refrigeration is the UK's largest independent industrial refrigeration engineering company, specialising in the provision of high quality natural refrigeration and heating solutions.

As a turnkey provider, Star work in partnership with customers throughout the project life cycle; from initial design through to commissioning and maintenance.

With over 300 employees across the UK, Star delivers award winning, first class installations and unbeatable aftercare; helping end users to reduce energy consumption, increase efficiency and drive down lifecycle operating costs.

Star Refrigeration is the parent company to six other business units:



Star Technical Solutions (STS) is the technical advisory service of the Star Refrigeration Group. Operating as an independent consultancy, STS provides technical advice to clients on a wide range of refrigeration engineering issues.



Starfrost specialises in the design, manufacture, installation and aftercare of industrial freezing and chilling equipment, delivering innovative IQF & Spiral systems for the global food processing industry.



Star Renewable Energy provides the design and manufacture of bespoke air and water source heat pumps, a natural alternative to traditional methods of heating for medium to large capacity applications.



Star Learning Solutions provides practical and online training for the Continuing Professional Development (CPD) of refrigeration, air conditioning and heat pump professionals world-wide.



Star M&E Solutions offers a unique blend of mechanical and electrical expertise across a wide range of markets, both public and private sector.



Azane is a world-leading manufacturer of low-charge ammonia refrigeration solutions.

# UK Branch Network

## Aberdeen

Unit 5 Wellheads Crescent, Wellheads Industrial Estate  
Dyce, Aberdeen, AB21 7GA  
Telephone: 01224 723301 Email: star.aberdeen@star-ref.co.uk

## Bellshill

4 Murray Place, Righead Industrial Estate  
Bellshill, ML4 3LP  
Telephone: 01698 841535 Email: star.bellshill@star-ref.co.uk

## Manchester

Unit C6, Brookside Business Park, Greengate  
Middleton, Manchester, M24 1GS  
Telephone: 0161 655 0240 Email: star.manchester@star-ref.co.uk

## Newcastle

15 Tower Road, Glover Industrial Estate  
Washington, Tyne & Wear NE37 2SH  
Telephone: 0191 415 7755 Email: star.newcastle@star-ref.co.uk

## Leeds

Astley Lane Industrial Estate, Swillington  
Leeds, LS26 8XT  
Telephone: 01132 320000 Email: star.leeds@star-ref.co.uk

## Bristol

Unit 11, Gordano 19, Garonor Way, Portbury  
Bristol, BS20 7XE  
Telephone: 01275 375600 Email: star.bristol@star-ref.co.uk

## Derby

Wincanton Close, Ascot Drive  
Derby, DE24 8NB  
Telephone: 01332 756041 Email: star.derby@star-ref.co.uk

## Oxford

13A Couching Street, Watlington  
Oxfordshire, OX49 5QF  
Telephone: 01491 614161 Email: star.oxford@star-ref.co.uk

## London

Unit 8, Imperial Business Estate,  
Gravesend, DA11 0DL  
Telephone: 01474 568221 Email: star.london@star-ref.co.uk

## Starfrost Lowestoft

Craftsman's Way  
Lowestoft NR32 3FB  
Telephone: 01502 562206 Email: sales@starfrost.com



Star Refrigeration's network of offices across the UK provide services including maintenance, service, spares, new equipment/installations, retrofits and consultancy. We specialise in industrial refrigeration including temperature controlled storage & distribution, food production, beverage, process, pharmaceutical, petrochemical, leisure & ice, data centres and HVAC. Contact your local office for more details.

## Glasgow Head Office

Thornliebank Industrial Estate  
Glasgow, G46 8JW

Tel: 0141 638 7916  
Email: star@star-ref.co.uk

[www.star-ref.co.uk](http://www.star-ref.co.uk)  @StarRefrig

Contact us today for full details +44 141 638 7916