Star Ammonia Solutions

Efficient, environmentally-responsible refrigeration systems

STAR REFRIGERATION

Alcumus® Safer, Healthier, Stronger

CHAS®

CERTIFIED OHSAS 18001

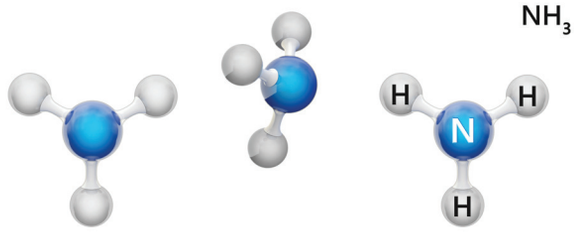
CERTIFIED ISO 9001

Why Ammonia?

Using ammonia as a refrigerant offers a number of benefits:

Efficiency

Ammonia (NH_3, R717) has some distinctive properties that make it extremely effective at transferring heat, resulting in excellent efficiency levels when used in refrigeration systems.



It has the ability to absorb and retain large amounts of heat. Good thermodynamic efficiency, combined with a low viscosity means that systems using ammonia don't need to work as hard as those using alternative refrigerants in order to achieve the same refrigerating effect; which translates to more efficient performance and lower operating costs.

Sustainability & Future-Proofing

As a natural refrigerant, ammonia doesn't contribute to global warming or ozone depletion, making it an environmentally responsible choice.

Ammonia also has the significant benefit of not being part of the EU F-gas Regulation (517/2014), which imposes restrictions on the use of traditional synthetic HFC refrigerants with high Global Warming Potentials. Sustainable, future-proof, efficient and widely available at a low cost; ammonia has been used as a refrigerant for over 150 years and represents a solution in which users can invest with confidence.

Detectability

Ammonia is a well established refrigerant with a distinct smell that is easily detectable even at low concentrations. Ammonia has a B2L classification (BS EN 378-1: 2016) and must therefore be handled with care. Ammonia vapour is lighter than air and can be easily vented to atmosphere via high level mechanical ventilation.

Low Charge Ammonia Systems

What is Low Charge Ammonia?

Low charge ammonia refrigeration systems are specially designed to deliver optimal performance whilst reducing the refrigerant charge to the lowest practical level. Such systems are able to reduce refrigerant charge by up to 95% compared to traditional systems, with Star solutions offering charges as low as just 0.15kg per kW of refrigeration capacity.

Low charge ammonia systems help improve safety by greatly reducing the quantity of refrigerant present on site.

This can be particularly valuable in the case of residential or public areas, for example, where large ammonia charges may be undesirable.

Achieving Low Charge

Star low charge ammonia systems employ a number of measures to ensure that the refrigerant charge is kept to a minimum. These include:

- Packaged configuration; multiple system components are grouped together on a single skid
- Optimised Low Pressure Receiver with integrated flooded subcooler
- Enhanced evaporators
- Combination and elimination of components
- Short refrigerant pipe runs

Low charge systems also aim to reduce leak paths by minimising on-site pipe work and valve stations. This can be achieved by opting for multiple, modular packages in place of a large centralised plant; a configuration which has the added benefit of being more easily maintained.

STAR REFRIGERATION

*Exact refrigerant charge (kg/kW) will vary by application.

Energy Focus

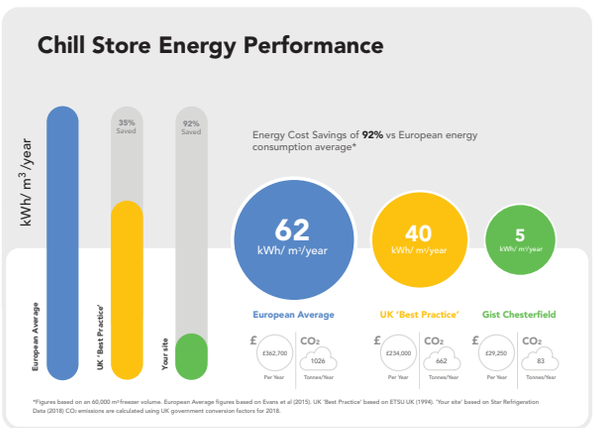
Understanding the performance of your refrigeration plant is key to ensuring the lowest possible operating cost for your business. Star offers a variety of tools which allow operators to evaluate and benchmark their systems.

Specific Energy Consumption

Specific Energy Consumption (SEC) relates to the annual consumption of a facility per unit of storage space and is a useful metric when evaluating performance of temperature controlled storage facilities.

Star has the ability to benchmark the performance of facilities against European Average and UK Best Practice figures in order to provide valuable feedback to operators.

A recent installation of Star's **Azanechiller** air-cooled ammonia chillers for a temperature controlled application resulted in a Specific Energy Consumption figure of just 5 kWh/ m^3/year; some 87% lower than historical UK Best Practice.



Ethos Energy Management

For sites that wish to understand, monitor and optimise their plant performance, Star has developed Ethos, an energy management and plant optimisation service for refrigeration equipment.

The system monitors and analyses data from your system and identifies actions to save electricity.

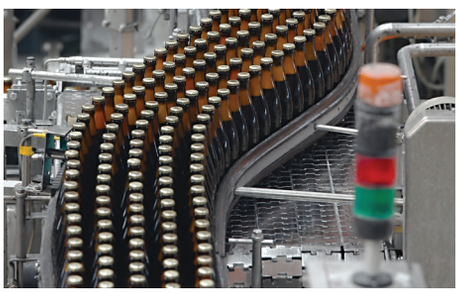
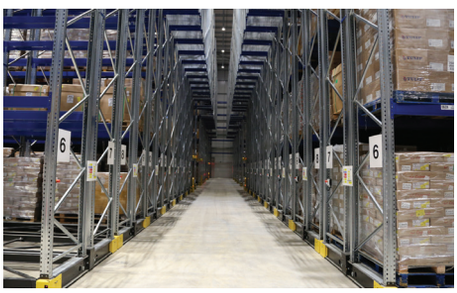
It also provides data on available plant capacity, which facilitates future investment planning. Ethos can be installed on both new and existing systems.

Ethos

Performance Optimisation & Energy Management

Star Market Sectors

Star Refrigeration has an unrivalled track record of providing turnkey ammonia solutions. With in-house design, project management, M&E and aftercare capabilities, Star delivers total project solutions for end users.

Star works closely with a broad range of industry sectors, including:

- Food Manufacturing
- Temperature Controlled Storage & Distribution
- Freezing & Chilling
- Dairy
- Brewing & Distilling
- HVAC
- Leisure & Ice
- Data Centres
- Pharmaceutical & Process
- Petrochemical & Nuclear
- District Heating
- Industrial Heating

Star Ammonia Systems

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 certain Star plants still running after almost 40 years. Star offers a variety of ammonia solutions, including its packaged Azanechiller, Azanefreezer and Neatpump ranges, manufactured in Glasgow, UK. Examples of Star-built ammonia 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 Ammonia solutions includes:

Azanechiller 2.0

Packaged, air-cooled ammonia fluid chiller

- High efficiency
- Low refrigerant charge
- 140kW to 1200kW per unit

Azanefreezer 2.0

Air-cooled ammonia packaged unit

- Suitable for low temperature cooling and food processing applications
- Low refrigerant charge
- Integrated reverse cycle defrost
- 100kW to 650kW per unit

Neatpump

Air and Water Source Heat pumps:

- District Heating
- Industrial Heating Processes
- Temperatures up to 85°C

Bespoke Solutions

Variety of bespoke ammonia solutions, including:

- Centralised systems
- Ammonia / CO_2 cascade
- Heat pumps

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 works 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

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 FREEZING & CHILLING SYSTEMS

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

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

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

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

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

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

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

London
Unit 8, Imperial Business Estate,
Gravesend, DA11 0DL
Telephone: 01474 568221 Email: star.london@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
Unit 1, Apollo Court, Monkton South Business Park
Hebburn, NE31 2JZ
Telephone: 0191 415 7755 Email: star.newcastle@star-ref.co.uk

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

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

Azane Inc USA
913 SW Higgins Ave
STE 105, Missoula, MT. 59803
Telephone: +1 888-882-9947 Email: info@azane-inc.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 **@StarRefrig**

Contact us today for full details +44 141 638 7916

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