Environmentally conscious, energy efficient packaged ammonia chillers
Ammonia – The Natural Choice

Star Refrigeration’s Azanechiller range of air and water-cooled ammonia packaged chillers has been designed to meet the environmental and legislative challenges facing users of cooling across a wide range of applications including:

- Building services
- Food processing
- Temperature controlled storage
- Process cooling
- Ice and curling rinks

Low Environmental Impact

Legislation is in place to phase out chlorofluorocarbon (CFC) and hydro-chlorofluorocarbon (HCFC) refrigerants due to their harmful effect on the Earth’s ozone layer. This has led to the development of a new range of synthetic hydrofluorocarbon (HFC) refrigerants. The effect that these refrigerants have on global warming when released into the atmosphere is thousands of times greater than carbon dioxide. This has resulted in tighter legislation on the sale and usage of HFC refrigerants under the F-Gas Regulation (EN 842/2006). The long-term future for HFC’s is uncertain, with some countries in Europe already banning their use or enforcing heavy taxation.

The Azanechiller overcomes these environmental and long-term availability concerns. Ammonia is a naturally occurring refrigerant, with zero ozone depletion potential and zero global warming potential.

Naturally Efficient Refrigerant

Ammonia offers exceptional efficiencies across a wide range of operating conditions, cooling water or other secondary fluids including glycol. For typical water chilling applications, ammonia offers a 20% increase in performance compared with standard screw chillers using HFCs.
Naturally Efficient Operation

Azanechiller brings together carefully selected, high efficiency components and these are integrated together using Star’s Telstar PLC controller to ensure optimum performance throughout the year. Key energy efficient control features include:

- **Floating head pressure control (FHPC)**
  The UK average ambient dry bulb temperature is 12°C, whereas many chillers are optimised to operate at peak ambient temperatures of +35°C or higher. FHPC is standard on all Azanechillers and controls condensing temperatures based on load and ambient temperature. The flooded evaporator design, coupled with glycol oil cooling means that the chiller doesn’t require discharge pressures to be held artificially high during low ambient conditions. Floating the compressor condensing head temperature in line with ambient temperatures enables improvements in energy efficiency of up to 3% per 1K of temperature reduction. During periods of low ambient temperature this equates to an improvement in full load efficiency of 30%.

- **Floating suction pressure control (FSPC)**
  For the majority of cooling applications, chillers rarely operate at their design capacity. Cooling requirement can vary widely throughout the year due to changes in ambient temperature. Direct expansion chillers typically operate with a set evaporating temperature, irrespective of the cooling requirement. Star’s flooded evaporator design and PLC control system enables the compressor suction pressure to rise during part load conditions, providing energy efficiency benefits. This is standard on all Azanechillers and is achieved automatically through the onboard PLC controller. A 1K rise in evaporating temperature can improve operating efficiency by 3%.

- **Close evaporator temperature approach**
  The use of Star’s low pressure receiver system ensures flooded evaporator operation. This eliminates the need for a wasteful superheat zone within the evaporator which is typically required for direct expansion systems. Flooded operation results in a closer approach between the refrigerant evaporating temperature and outlet water temperature.

- **Efficient compressor loading philosophy (ECLP)**
  Azanechiller ECLP controls compressor sequencing to optimise energy efficiency. The control logic determines the number of compressors, slide valve position and motor inverter speed* to provide the maximum compressor COP.

*AA200/300/400 and AW200/350/450 models only
Naturally Efficient Equipment

Azanechiller is a complete refrigeration package plant integrating high quality, industrial components with our TELSTAR PLC control system to offer unrivalled performance, reliability and quality.

High Efficiency Screw Compressor
Designed for industrial installations, the Bitzer screw compressor offers the following benefits:

- High COP
- Efficient part load capacity control using motor inverter (AA200 / 300 / 400 and AW200 / 350 / 450 models only) or infinite slider control (AA550 and AW600 onwards)
- High-quality and reliable shaft seal
- Patented lubrication system and rugged bearing design providing high reliability
- Flanged motor coupling avoiding costly compressor alignment work
- Compact design
- Simple maintenance & servicing

The compressors are located for easy maintenance access.

High Efficiency, Low Noise Drive Motors
IP55, high efficiency compressor drive motors are fitted to the entire Azanechiller range. These motors are also specially designed to offer low noise operation.
High Efficiency Condenser
All air-cooled Azanechillers are fitted with low noise, EC motor variable speed fans to maximise system efficiency at part load conditions. Fan speed varies depending on ambient temperature and condensing pressure. As fan power is proportional to the cube of the speed, a 10% reduction reduces power by 27%.

Epoxy coated fins along with internal/external coil and fan guards are provided as standard to protect the condenser from damage during installation and operation.

An optional adiabatic cooling package enables the air-cooled Azanechiller to operate at lower condensing conditions during periods of warmer ambient temperatures and in high ambient locations. Air onto the air-cooled condenser passes through a moisture loaded pad, bringing its temperature closer to a wet bulb condition. This has the ability to reduce peak summer ambient temperatures onto the condenser by 7K to 8K.

Low Charge, High Efficiency Heat Exchangers
The use of semi-welded plate heat exchangers (PHEs) for the evaporator and condenser (water-cooled AW series), ensures optimum efficiency and minimum footprint. Azanechiller has been designed to enable easy access to the plates for maintenance. The PHE internal gasket arrangement eliminates the possibility of ammonia leakage into the secondary circuit, protecting any cuprous components such as valves and heat exchangers.

The evaporators are also fitted with removable insulated jackets to reduce condensation.

Star Low Charge, Low Pressure Receiver (LPR)
Star Refrigeration’s LPR works in conjunction with plate heat exchangers (PHE) to provide flooded evaporator operation, whilst protecting the compressor from liquid carryover. The LPR offers the following advantages over chillers operating with gravity feed or DX technology:

- The LPR system supplies sub-cooled liquid at high pressure which is then expanded at the PHE inlet. This stimulates evaporation, ensuring the complete plate surface is available for heat exchange and enhancing the performance.
- The LPR system is critically charged and operates with an HP float type regulator. Only enough liquid is introduced into the system to meet the maximum load requirements. This allows us to design a system with a very low refrigerant charge. Coupling the LPR to a PHE evaporator and PHE condenser allows us to offer a chiller with a specific refrigerant charge of 0.1 kg/kW of duty.
- Since the circulation of ammonia through the PHE in the LPR system is driven by system pressure difference, the LPR can be positioned independent of the PHE. This enables a compact package unit design, small enough to fit inside the condenser.

Other features:
All Azanechiller components have been selected to minimise the risk of refrigerant leakage, reduce refrigerant charge, simplify maintenance and prolong plant life expectancy. Examples include:

- Integrated ammonia gas detection system
- Fully automatic oil recovery
- Welded steel pipework construction
- Dual relief for ease of maintenance, with bursting discs for leak free operation and standard three way changeover valve for ease of maintenance
- Powder coated mild steel electrical panel (option for stainless steel) complete with ventilation, anti-condensation heaters and light
- Mitsubishi PLC
- HMI user interface
- Aluminium plate flooring
- Epoxy paint finish
There are six models of air-cooled Azanechiller with nominal capacities ranging from 218kW up to 750kW based on cooling water 12°C to 6°C. Alternative secondary fluids including glycol enable Azanechiller to operate at secondary fluid temperatures down to -10ºC without modifications to the standard design.

Azanechiller has been designed to meet the space constraints of new or existing buildings. All necessary components are mounted on the package, eliminating the need to build a plant room.

Azanechiller offers a low noise packaged chiller solution. Our night operation setting enables the chiller to operate at reduced noise levels (and capacity) during sensitive periods of the day (typically evenings).

Optional heat recovery off the oil cooling circuit takes waste heat from the compression process and can be used for applications such as pre-heating of boiler water and heating of glycol for defrosting.

Natural Air

The AA range of Azanechiller is a complete ammonia system housed inside an air-cooled condenser. The unit comes pre-charged and tested, simplifying site installation works and minimising commissioning time. It is ideally suited for both new and retrofit applications including HVAC, temperature controlled distribution, ice rinks, food and process cooling.

Each chiller in the range consists of the following major components:

- Two screw compressors
- IP55, high efficiency drive motors
- Star low charge, low pressure receiver
- Semi-welded PHE evaporator
- Air-cooled condenser with EC fans, epoxy coated fins, coil and fin guards
- Electrical control panel
- PLC controller
- Ammonia gas detection system

There are six models of air-cooled Azanechiller with nominal capacities ranging from 218kW up to 750kW based on cooling water 12°C to 6°C. Alternative secondary fluids including glycol enable Azanechiller to operate at secondary fluid temperatures down to -10ºC without modifications to the standard design.

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### Air-Cooled Units - Technical Schedule

<table>
<thead>
<tr>
<th>MODELS</th>
<th>Capacity (kW)</th>
<th>Capacity Steps %</th>
<th>Dry Bulb Temperature (°C)</th>
<th>Power Supply</th>
<th>Sound Pressure Level (dB(A) @ 10m) (ISO1680)</th>
<th>Dimensions (m) (L x W x H)</th>
<th>Dry Weight (kg)</th>
<th>Operating Weight (kg)</th>
<th>Refrigerant Charge (kg)</th>
<th>Full Load Current (A) / Power kW</th>
<th>Water Pipes Size (NB)</th>
<th>Water Flow Rate (m³/h</th>
<th>No. Of Fans</th>
<th>Air Flow Volume (m³/s)</th>
<th>Total Absorbed Fan Power (kW)</th>
<th>Fan Speed (rpm)</th>
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</thead>
<tbody>
<tr>
<td>AA200</td>
<td>218</td>
<td>19% to 100% variable</td>
<td>35</td>
<td>400/3/50</td>
<td>71</td>
<td>3.5 x 2.8 x 2.7</td>
<td>6100</td>
<td>6250</td>
<td>75</td>
<td>141 / 82 (163)</td>
<td>100</td>
<td>31.3</td>
<td>6</td>
<td>28.8</td>
<td>7.5</td>
<td>860</td>
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<tr>
<td>AA300</td>
<td>311</td>
<td>12.5% to 100% variable</td>
<td>35</td>
<td>400/3/50</td>
<td>71</td>
<td>4.5 x 2.8 x 2.7</td>
<td>7350</td>
<td>7500</td>
<td>100</td>
<td>204 / 120 (163)</td>
<td>100</td>
<td>44.6</td>
<td>8</td>
<td>38.4</td>
<td>10.0</td>
<td>860</td>
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<tr>
<td>AA400</td>
<td>408</td>
<td>Fluid &lt; 4°C 25% to 100% variable</td>
<td>35</td>
<td>400/3/50</td>
<td>71</td>
<td>5.5 x 2.8 x 2.7</td>
<td>9150</td>
<td>9300</td>
<td>120</td>
<td>278 / 163 (163)</td>
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<td>58.6</td>
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<td>48.0</td>
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<td>860</td>
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<td>AA550</td>
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<td>Fluid &gt; 4°C 12.5% to 100% variable</td>
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<td>400/3/50</td>
<td>71</td>
<td>8.4 x 2.8 x 2.7</td>
<td>13,900</td>
<td>14,200</td>
<td>150</td>
<td>405 / 240 (163)</td>
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<td>AA650</td>
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<td>9.4 x 2.8 x 2.7</td>
<td>15,000</td>
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<td>AA750</td>
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<td>10.4 x 2.8 x 2.7</td>
<td>16,200</td>
<td>16,400</td>
<td>200</td>
<td>486 / 289 (163)</td>
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<td>112.5</td>
<td>20</td>
<td>96.1</td>
<td>25.0</td>
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**BITZER SCREW COMPRESSORS**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Motor Power (kW)</th>
<th>Enclosure</th>
<th>Water On / Water Off (°C)</th>
<th>Water Flow Rate (m³/h)</th>
<th>No. Of Fans</th>
<th>Air Flow Volume (m³/s)</th>
<th>Total Absorbed Fan Power (kW)</th>
<th>Fan Speed (rpm)</th>
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<tbody>
<tr>
<td>2</td>
<td>37 - 1 / 5</td>
<td>IP55</td>
<td>12 / 6</td>
<td>31.3</td>
<td>6</td>
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<td>44.6</td>
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<td>38.4</td>
<td>10.0</td>
<td>860</td>
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<td>2</td>
<td>110 - 5 / 5</td>
<td>IP55</td>
<td>12 / 6</td>
<td>80.4</td>
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<td>76.8</td>
<td>20.0</td>
<td>860</td>
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<tr>
<td>2</td>
<td>110 - 5 / 5</td>
<td>IP55</td>
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<td>93.9</td>
<td>18</td>
<td>86.4</td>
<td>22.5</td>
<td>860</td>
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<tr>
<td>2</td>
<td>132 - 5 / 5</td>
<td>IP55</td>
<td>12 / 6</td>
<td>112.5</td>
<td>20</td>
<td>96.1</td>
<td>25.0</td>
<td>860</td>
</tr>
</tbody>
</table>
Natural Water

The AW range of water-cooled Azanechiller is a complete refrigeration package mounted on a common skid for location in a plantroom or housing. The unit comes pre-charged and tested, to simplify site installation works and minimising commissioning time. It is ideally suited for both new and retrofit applications including HVAC, temperature controlled distribution, ice rinks, food and process cooling.

Each chiller in the range consists of the following major components:

- Two screw compressors
- IP55, high efficiency drive motors
- Star low charge, low pressure receiver
- Semi-welded PHE evaporator
- Semi-welded PHE condenser
- Electrical control panel
- PLC controller

There are six models of water-cooled Azanechiller with nominal capacities ranging from 235kW up to 856kW based on cooling water 12°C to 6°C. Alternative secondary fluids including glycol enable Azanechiller to operate at fluid temperatures down to -10°C without modifications to the standard design.

Azanechiller has been designed to meet the space constraints of new or existing buildings. All necessary components are mounted on the package, eliminating the need for additional site wiring or ammonia pipework installation.

Optional heat recovery from the oil cooling circuit takes waste heat from the compression process and can be used for applications such as pre-heating of boiler water and heating of glycol for defrosting.
### Water-Cooled Units - Technical Schedule

<table>
<thead>
<tr>
<th>Models</th>
<th>AW200</th>
<th>AW350</th>
<th>AW450</th>
<th>AW600</th>
<th>AW700</th>
<th>AW850</th>
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<tbody>
<tr>
<td><strong>Capacity (kW)</strong></td>
<td>235</td>
<td>348</td>
<td>446</td>
<td>610</td>
<td>708</td>
<td>856</td>
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<tr>
<td><strong>Capacity Steps %</strong></td>
<td>19% to 100% variable</td>
<td>12.5% to 100% variable</td>
<td>25% to 100% variable</td>
<td>Fluid &lt; 4°C 12.5% to 100% variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>400/3/50</td>
<td>400/3/50</td>
<td>400/3/50</td>
<td>400/3/50</td>
<td>400/3/50</td>
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<td><strong>Sound Pressure Level (dB(A) @ 10m) (ISO1680)</strong></td>
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<td>71</td>
<td>71</td>
<td>71</td>
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<tr>
<td><strong>Dimensions (m) (L x W x H)</strong></td>
<td>4.0 x 1.5 x 2.2</td>
<td>4.0 x 1.75 x 2.2</td>
<td>4.0 x 1.75 x 2.2</td>
<td>4.95 x 2.0 x 2.2</td>
<td>4.95 x 2.0 x 2.2</td>
<td>4.95 x 2.0 x 2.2</td>
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<tr>
<td><strong>Dry Weight (kg)</strong></td>
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<td>4700</td>
<td>5300</td>
<td>9000</td>
<td>9400</td>
<td>9600</td>
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<tr>
<td><strong>Operating Weight (kg)</strong></td>
<td>4220</td>
<td>4830</td>
<td>5440</td>
<td>9150</td>
<td>9570</td>
<td>9800</td>
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<tr>
<td><strong>Refrigerant Charge (kg)</strong></td>
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<td>38</td>
<td>52</td>
<td>63</td>
<td>77</td>
<td>86</td>
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<tr>
<td><strong>Full Load Current (A) / Power kW</strong></td>
<td>126 / 74</td>
<td>184 / 110</td>
<td>254 / 150</td>
<td>300 / 180</td>
<td>366 / 220</td>
<td>366 / 220</td>
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<tr>
<td><strong>Water Pipes Size (NB)</strong></td>
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<td>100</td>
<td>100</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td><strong>Quantity</strong></td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Motor Power (kW) (I - Inverter, S - Star/delta)</strong></td>
<td>37 - I / S</td>
<td>55 - I / S</td>
<td>75 - I / S</td>
<td>90 - S / S</td>
<td>110 - S / S</td>
<td>110 - S / S</td>
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<tr>
<td><strong>Enclosure</strong></td>
<td>IP55</td>
<td>IP55</td>
<td>IP55</td>
<td>IP55</td>
<td>IP55</td>
<td>IP55</td>
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<tr>
<td><strong>Water On / Water Off (°C)</strong></td>
<td>12 / 6</td>
<td>12 / 6</td>
<td>12 / 6</td>
<td>12 / 6</td>
<td>12 / 6</td>
<td>12 / 6</td>
</tr>
<tr>
<td><strong>Water Flow Rate (m³/h)</strong></td>
<td>33.7</td>
<td>50.0</td>
<td>64.0</td>
<td>87.6</td>
<td>101.6</td>
<td>122.9</td>
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<tr>
<td><strong>Water On / Water Off (°C)</strong></td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
</tr>
<tr>
<td><strong>Water Flow Rate (m³/h)</strong></td>
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<td>56.3</td>
<td>71.8</td>
<td>98.2</td>
<td>114.3</td>
<td>138.1</td>
</tr>
<tr>
<td><strong>Water On / Water Off (°C)</strong></td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
<td>29 / 35</td>
</tr>
<tr>
<td><strong>Water Flow Rate (m³/h)</strong></td>
<td>3.2</td>
<td>3.8</td>
<td>5.3</td>
<td>7.9</td>
<td>8.4</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Options for larger oil coolers on all chillers when moving outside above design.
Option for larger motors on AW600, AW700 & AW850 when condenser water off temperature increases.
Cool Service
Established in Glasgow in 1970, Star Refrigeration has 300+ employees nationwide providing fast response, 24-hour technical support from a network of nine branches to customers throughout the UK. Star has an unrivalled track record of high quality products and services across a broad range of industry sectors including building services, pharmaceutical, petrochemical, brewing and distilling, food production, cold storage, distribution and leisure.

Total Cooling Solution Provider
Our in-house design, project management, M&E and aftercare capabilities mean Star can provide a total project solution for end users. Examples include:

- Design, supply and installation of auxiliary equipment (e.g. pumps, air handling units, buffer vessels, offloading, temporary cooling and pipework)
- Electrical services design and installation works (e.g. mains LV electrical panels and wiring)
- Role of principal contractor under CDM
- Tailored maintenance and service packages
- Enhanced warranty packages

Cool Company
Star Refrigeration is the parent company to four other business units:

Star Technical Solutions (STS) is our technical advisory group, operating as an independent consultancy providing advice on cooling and refrigeration engineering issues. Services available include site energy audits, development of specifications to tender, client training, regulatory assessment and support and assisting clients to meet their legal responsibilities.

Star Learning Solutions (SLS) provides both practical and online training for HVAC and refrigeration users and suppliers. SLS products include the award winning website elearning-training.com, offering a range of online courses covering subjects such as refrigeration fundamentals, f-gas and CO₂.

Penec provides mechanical and electrical services including design and manufacture of LV and control panels, site electrical installation, NICEIC testing & reporting and planned preventative maintenance.

Starfrost specialises in the design, manufacture, installation and aftercare of freezing and chilling equipment. Through its overseas partners, Starfrost provides in-line cooling solutions throughout the world.
Cool Products

Azanechiller is part of Star’s range of cooling and heating solutions for the building services, food, leisure, temperature controlled storage and process cooling markets. Our products also include:

Indigochiller

Indigochiller – A range of water and air-cooled high efficiency packaged chillers with capacities ranging from 200kW to 850kW. Indigochiller is an ideal solution for responsible users wanting a reduced carbon footprint and looking for long term reliability. Supplied as a complete factory tested product, Indigochiller is suitable for cooling applications using water.

Freechiller

Freechiller – Specifically designed for elevated water temperature applications, this ‘free cooling’ solution achieves seasonal COSPs greater than 12. Freechiller is ideally suited for 24/7 heat load applications such as data centres where life cycle costs are half that of traditional cooling solutions. With more than 20 years of installation experience and more than 3,000,000 hours of operation without loss of cooling, Freechiller offers unrivalled longevity and reliability. Freechiller is available using HFC or ammonia and with capacities ranging from 300kW to multi-megawatt, multiple chiller installations.

Envitherm 50

Envitherm – This innovative water to water heat pump solution uses trans-critical carbon dioxide (CO₂) to provide simultaneous cooling and heating. The production of hot water at 70°C means Envitherm is ideally suited for generation of hot water in hotels, offices, public buildings and factories.