

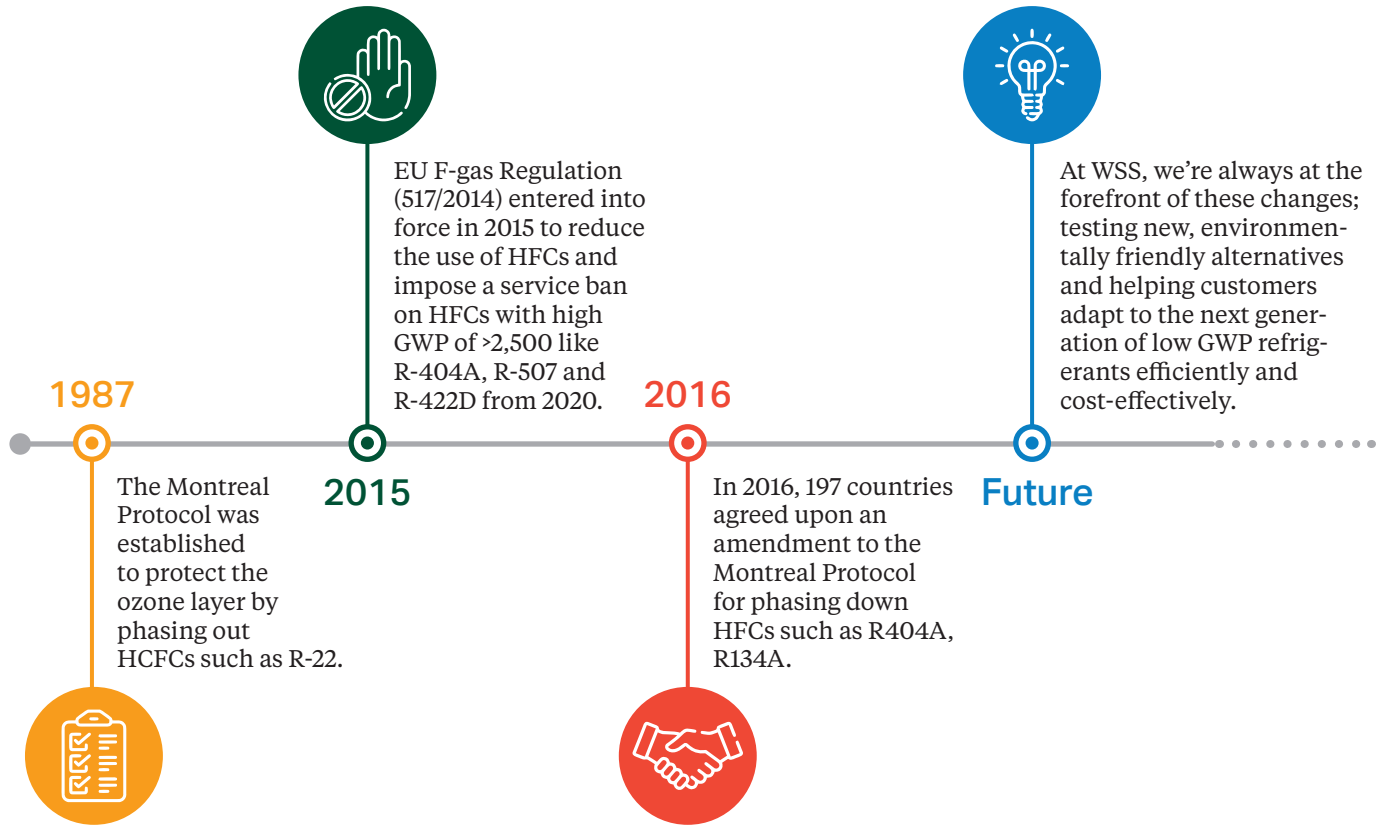
Reduce Emissions with Responsible Refrigeration



Prepare for a low Global Warming Potential (GWP) future

Refrigeration systems perform the vital function of maintaining temperatures on board. Nonetheless, they are operating on refrigerants which are known for having a negative effect on the environment. Now, environmental regulations require the refrigerants to

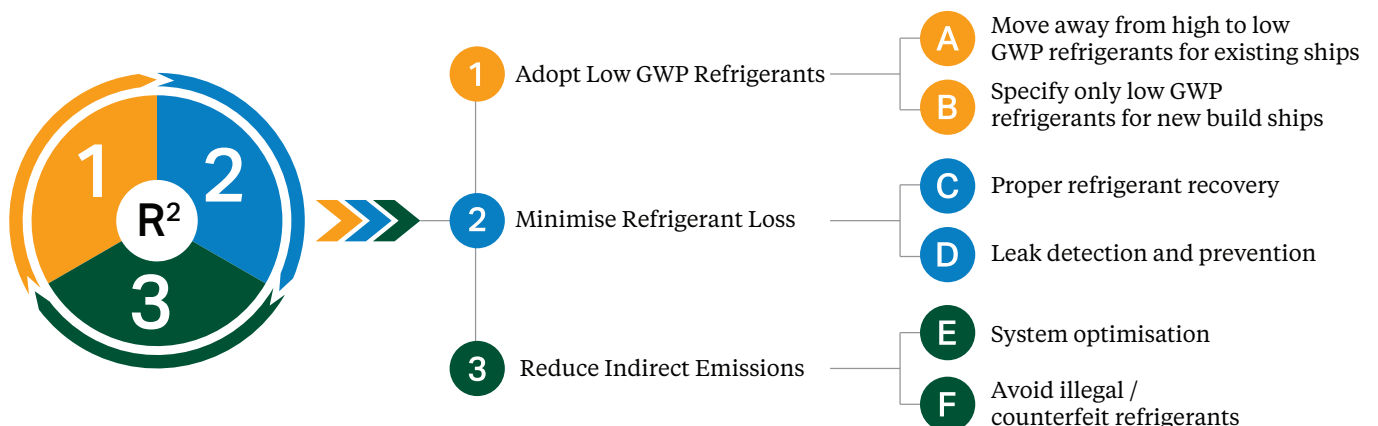
be low in GWP, and there are deadlines for that. Driven by international agreements to protect the climate and the ozone layer, refrigerants high in GWP are being phased out in favour of more environmentally friendly solutions.



Responsible refrigeration (R²)

A crucial aspect of keeping in line with environmental regulations involves maintaining the integrity of the refrigeration system; leaks increase energy consumption — the biggest environmental impact from a refrigeration system. For example, a 10% loss in refrigerant increases energy consumption by up to 20%.

To keep your system free of leaks and working at its optimal state, we provide a complete range of tools, spares and maintenance equipment. A well-maintained system will help you stay within the boundaries of environmental regulations and keep your refrigeration costs down.



Affected by the new regulations?

Your immediate retrofit solution



Low GWP (Class A1) Replacements for R-404A

For existing systems, the fact that the popular R-404A has been phased out in the EU from 2020, with other regions soon to follow, means there is an urgent need for existing users to switch over to lower GWP alternatives. Unicool R-407F has been our recommendation as the most cost-effective solution for the existing R-404A system. R-407F is fully compatible with existing R-404A systems for low and medium temperature applications, requiring no technical upgrade or retrofitting.

With a GWP of 1824, R-407F can immediately cut the global warming impact of the refrigerant by 53.5% and help reduce energy consumption by improving the efficiency of the existing system.

New generation of low GWP refrigerant solutions

A new generation of three to five low GWP HFO/HFC blends have been identified and newly added to our comprehensive WSS global cylinder exchange programme to better serve the needs of ships owners and operators for low GWP refrigerants in new installations.

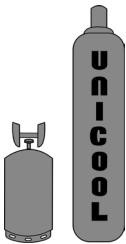
Like the current HFC range of refrigerants, the HFO and HFC blends are non-toxic, non-flammable and have

been assigned the A1 safety classification under EN 378 and ASHRAE standards.

Recently, a new range of low GWP HFO and HFC blends has been introduced to provide better support to ship owners looking to minimise the environmental impact of the refrigeration systems on board. They are R-448A, R-449A, R-452A and R-407H.

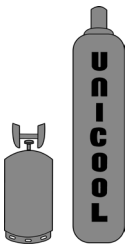
New range of low GWP HFO and HFC blends

R-448A and R-449A



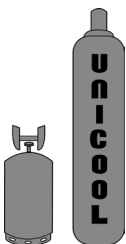
R-448A and R-449A are very similar in terms of their properties and performance. Out of the many R-404A replacements that have been developed, R-448A and R-449A are non-flammable solutions with the lowest GWPs currently in the market. They are also excellent replacements for the existing R-404A system, reducing the global warming impact by over 64% and the energy consumption of the existing system. With the price and availability of R-404A severely affected by regulations, R-448A and R-449A have also been chosen by many EU and US owners as direct replacements for their existing systems.

R-452A



R-452A is designed for low-temperature applications with an air-cooled condenser. It can reduce global warming impact by 45.4% and has low discharge pressure, making it suitable for new installation and retrofit of existing reefer containers.

R-407H



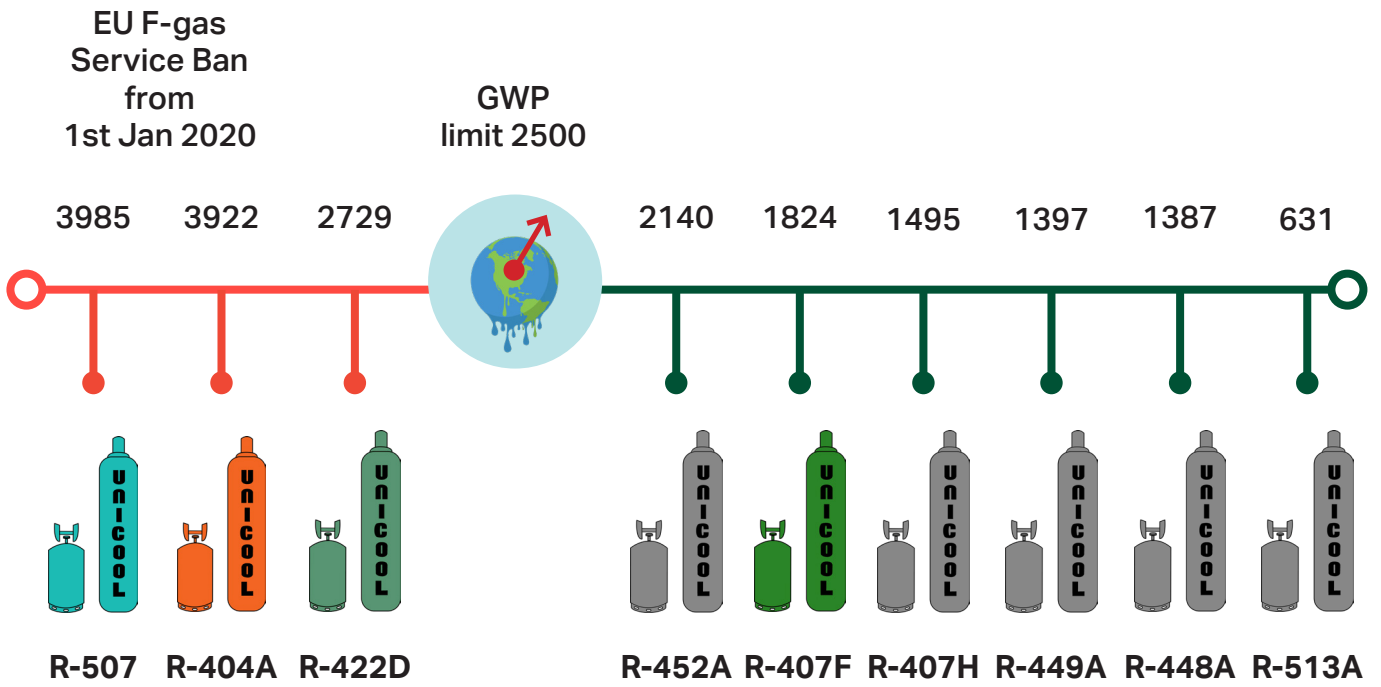
R-407H is recommended for new installations and has also been adopted by some ship owners. It has a GWP of 1495, that is 61.9% lower than R-404A.

For ships currently using R-507, if the system does not include a flooded evaporator, owners can follow the same retrofit recommendation as R-404A. If it does have a flooded evaporator, upgrading the entire system to a lower GWP solution should be considered. Likewise, ships using the R-422D refrigerant should consider a complete system upgrade.

Low GWP (Class A1) Replacement for R-134a

Among the R-134a alternatives that have been developed, R-513A is getting popular among ship owners. With a GWP of 631 (which represents 55.9% reduction in global warming impact) and the ability to provide similar capacity to R-134a in existing systems, R-513A is suitable for both new and existing systems.



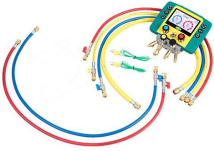


Overview of HFC's Global Warming Potential



Features of refrigeration systems to minimise environmental impact

	R-448A	R-449A	R-407H	R-407F	R-452A	R-513A
GWP	1387	1397	1495	1824	2140	631
GWP Reductions (%)	64.6%	64.4%	61.9%	53.5%	45.4%	55.9%
Suitable for new installations	✓	✓	✓	✓	✓	✓
Suitable for existing R404A system	✓	✓		✓	✓	
• Provide similar capacity	✓	✓		✓	✓	
• No major retrofitting work	✓	✓		✓	✓	
• Improve system efficiency	✓	✓		✓		
Suitable for existing R-134a system						✓
• Provide similar capacity						✓
• No major retrofitting work						✓
Application	Low Temp	Low Temp	Low Temp	Low Temp	Air-cooled Condenser	Medium Temp

Essential refrigeration equipment & tools

Minimise Refrigerant Loss		<p>Refrigerant Recovery Package</p> <p>This package is a must-have for every crew. The package consists of carefully selected quality equipment, designed for crew members to handle refrigerant recovery or charging processes, evacuation, leak checks and maintenance for air conditioning and refrigeration systems on board.</p>
		<p>U.V. Tracer Kit</p> <p>Invisible refrigerant leaks are tiny or intermittent leakages typically hidden in inaccessible areas which may not be detected with conventional methods. The Unitor™ Refrigerant Leak Detection U.V. Tracer Kit is an effective tool for pinpointing invisible refrigerant leaks in the system.</p>
		<p>Hand Held Refrigerant Leak Detector</p> <p>It enables crew to perform refrigerant leak inspection and find leaks in the system. It is battery powered and able to detect all types of refrigerants (HCFC, HFC and HFO).</p>
		<p>Refrigerant Leak Monitoring System</p> <p>To help existing maritime users of Samon's refrigerant leak monitoring system to maintain their system better, WSS is now Samon's exclusive distributor for all shipowners, ship-management teams, and ship suppliers and retailers in the maritime industry, supplying spare parts such as sensors, detectors, and calibration tools.</p> <p>A refrigerant leak monitoring kit is available for existing ships that are looking to install a new system to minimise refrigerant leaks.</p>
Reduce Indirect Emissions		<p>Digi-manifold Set (4-way)</p> <p>This digital tool enables cost and time savings, as only one tool is required to support all common refrigerants used in maritime applications. With the ability to convert the pressure to temperature readings as well as calculate superheat and subcool automatically, it is recommended for all ships, particularly those undergoing a refrigeration system conversion and ships using multiple types of refrigerants on board.</p>
		<p>Refrigeration Handy Tool Case</p> <p>The kit contains both specialised refrigeration tools and general tools that are necessary for day to day ship-board operation and maintenance of refrigeration systems.</p>
		<p>Collection of Fittings</p> <p>An assorted collection of the most common types of brass fittings that are used in various refrigeration piping and connection applications.</p>
		<p>Hand Oil Pump</p> <p>Allow crew to pump refrigeration oil into the system or compressor crankcase while the unit is in operation, no need for system shutdown during oil charge.</p>

Value-adding services available

Building a strong relationship with our customers is important to us. At Wilhelmsen, we pride ourselves on going the extra mile beyond selling high-quality products to coming up with additional services that help you navigate existing and future regulations to come in the maritime industry.



Convenience — Global Cylinder Exchange Programme

Know the whats, wheres, and whens of all your cylinders with our global cylinder exchange programme: our accurate, secure, and cost-effective stock management system. With this, you can have your Unitor™ cylinders delivered, exchanged, serviced, and re-supplied on a worldwide stage — we'll go to wherever your vessels are.

By providing full traceability, you can be assured of the authenticity of the refrigerants. Additionally, it helps you to eliminate the risks of receiving illegal or counterfeit refrigerants.



Quality Guaranteed

Some refrigerants are cheaper upfront, but they'll cost you in other ways: refrigerants susceptible to moisture contamination can cause corrosion in compressors in a short period of time — you'll pay more via lesser operating efficiency and frequent mechanical breakdowns.

With Unicool refrigerants, purity and moisture content are guaranteed as per AHRI Standard 700 - filled and sealed only by approved suppliers.



Reliable — Cylinder Safety and Maintenance

Strict rules govern cylinder inspections before filling and those that fall below our standards are scrapped, because the integrity of our cylinders is our hallmark.



Worry-free — Complete Compliance

The ISPS Code enforces strict rules on the close monitoring of high-pressure cylinder movements. Thankfully, global track and trace does just that; allowing us, and thereby, you, to stay fully compliant.

Our gas products and services also comply with all international regulations for global warming reduction and the prevention of ozone depletion.



Technical Expertise

We have a wide range of documents available detailing all the specific technical data, properties, and other information on our products and their usage to help you maximise your resources effectively.

Switch to low GWP refrigerants today

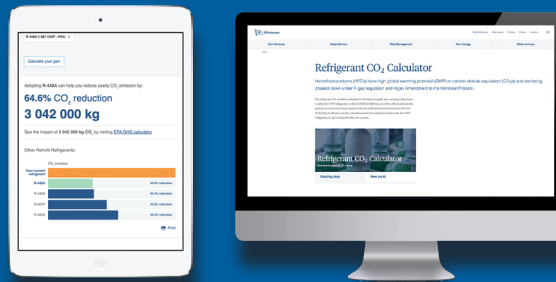
We are here to equip you with the best refrigeration solutions to make your experience as smooth-sailing as possible while keeping up with long-term compliance through changing circumstances and new regulations.

Reach out to your WSS sales representative for more information about our refrigerant solutions. For more information, visit <https://www.wilhelmsen.com/marine-products/refrigeration-solutions> or scan the QR code at the bottom of this page.

Refrigerant CO₂ Calculator

Find out how much CO₂ emission reduction you can achieve with low GWP refrigerants.

Designed for both existing ships and new builds, our Refrigerant CO₂ Calculator will help you calculate your potential CO₂ savings.



Scan to try it now



Find out more about



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Contact your local WSS customer service for prices and availability.

Responsible Refrigeration