

Best Practices for End of Life Refrigerant Management

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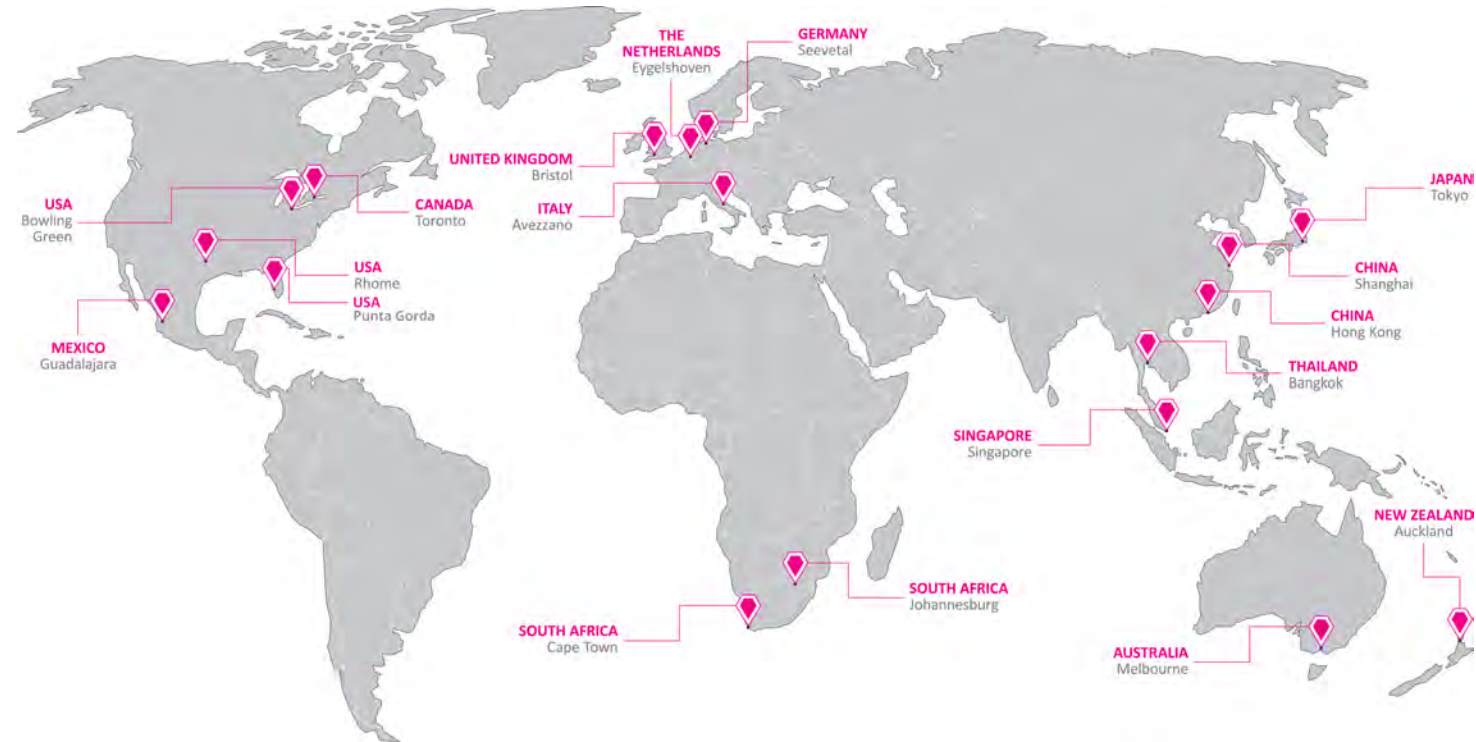


Introduction to A-Gas

A-GAS[®]
TOGETHER WE CAN



- The global leader in Lifecycle Refrigerant Management (LRM).
- World leading platform in recovery, reclamation and destruction in adherence with Montreal Protocol guidelines.
- Fully circular solution, focused on preventing the release of refrigerant gases to atmosphere.
- ~8.6m CO₂-e MT abatement in 2022.
- Commitment to reduce carbon emissions by >50% by 2028 and to achieve net-zero by 2035.



Build a Sustainable Future

What is LRM? – A ‘Circular’ Solution



Recovery

- Recovery of refrigerants from existing systems in a safe and compliant manner to avoid the release to atmosphere.

Reclamation

- Oil and Moisture removal/Separation of mixed refrigerants and purification to AHRI-700 specification.

Destruction

- Destruction of ‘End of Life’ gases (where no re-use is possible, or by customer choice) using a TEAP approved destruction technology.

Supply

- Supply of reclaimed refrigerant to reduce the need for virgin product.
- Sale of all lower GWP alternatives.

The Pillars of LRM



The Importance of Recovery

~1.5GT Global annual emissions from the ODS & HFC banks are estimated to equate to ~1.5GT CO₂e per annum*.

~75% In A-Gas' core markets, of the ~130kMT which comes to end of useful life each year ~75% are not recovered.

- Global cooling demand expected to grow, especially in developing countries.
- HFC Banks are increasing and will dominate global quantities by the early 2030s.
- HFC Banks in developed countries are the largest overall - as equipment reaches end-of-life in the next decade there is a risk of increased emissions.
- Recovery minimises direct refrigerant emissions to atmosphere - must form part of the HFC emission reduction strategy.

*Source: COPA 'Global Emissions of ODS & HFC Banks'

Incentivising Recovery

Drivers:

- ✓ Increased education and awareness around the harmful environmental impacts of these gases and the environmental benefits recovery brings.
- ✓ Tailored recovery options based on the needs of each customer segment.
- ✓ Targeted incentives to drive better recovery practice.
- ✓ Increasing investment in reclamation and destruction technology.

Case Studies:

- Market leading air conditioning OEM – we provided bespoke onsite refrigerant recovery from numerous job sites; refrigerant was reclaimed and re-supplied negating the need for virgin product.
- Food processing plant retrofit – on site recovery of high GWP refrigerant and replaced with energy efficient lower GWP refrigerant.

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RAPID EXCHANGE

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REFRI-CLAIM



Reclamation

- ✓ Used recovered refrigerant processed through mechanisms such as **filtering, drying, Non-Condensable Gas removal, separation/distillation**.
- ✓ Re-blending of recovered gas into reclaim refrigerant may require the use of virgin products.
- ✓ **Verification of purity and other quality parameters to AHRI 700 standards** to determine whether the reclamation process has been successful, and the refrigerant is fit for re-use.
- ✓ The **separation & reclamation** process for mixed refrigerants / cocktails requires **significant investment and expertise**.
- ✓ We have invested millions of dollars in market leading reclamation technology in multiple regions around our Group.



Why Reclaim Supports Transition

Benefits:

- Using a kg of reclaim refrigerant **mitigates the requirement for a kg of virgin product** thereby contributing to the circular economy.
- **New equipment** continues to be sold containing high GWP gases; use of reclaim enables servicing and maintenance until equipment can be retrofitted or replaced.
- **Existing equipment** can be maintained using reclaimed refrigerant meeting therefore negating the reliance on virgin.
- Reclaim supports the **market transition through HFC phasedowns and quota** environments while HFC demand remains strong - e.g., in Australia, HFC-404A grew from 2,800 tonnes of the refrigerant bank in 2006 to 22,400 tonnes in 2021.*
- Reclaim provides time for development of appropriate **training and upskilling** of technicians to safely handle flammable refrigerants.
 - Important to assess the environmental, technical, safety and cost implications associated with each option (virgin, use of reclaim, or lower GWP alternatives) in decision-making.



Destroy at End of Life

“Where product is either ineligible for reclamation or there is no longer sufficient demand for re-use after all other options have been exhausted”.

- PyroPlas® employs argon plasma arc technology to destroy waste Ozone Depleting Substances and global warming refrigerant gases; it has a **DRE of 99.9999%**.
- PyroPlas® proprietary technology works by producing an intense high temperature plasma to pyrolyse end-of-life refrigerants to achieve clean, safe, controlled and transparent destruction.
- It has been used for the destruction of refrigerants and halons in Australia, Mexico, UK and the USA.
- As dictated by the Montreal Protocol, Argon Plasma-arc technology is a **TEAP** (Technology and Economic Assessment Panel) approved technology for destroying ODS and HFCs.
- The technology has been used commercially since 1996 with decades of operating credibility and performance.

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Barriers in Article 5 Countries

Lack of:

- Information on the size of the installed banks and stockpiles.
- Access to LRM infrastructure.
- Qualified Technicians and training.
- Education and awareness.
- Financial incentives to fund upskilling of technicians to perform recoveries.
- Policies, regulations and enforcement around recovery and handling at end of life.
- Economies of scale
 - Reclamation / separation – investment difficult to justify at virgin product pricing.
 - Destruction – investment requires proven access to recovered gas at scale.

Requirements

- Integrated local logistics to support recovery, handling and transport activities.
- Removal of barriers to support ease of product import and export for reclamation and destruction
 - *Inconsistent classification of recovered refrigerant at end of life between countries. 'Hazardous wastes' classification impacts transboundary movement – subjecting product to requirements of the Basel Convention on the Control of Transboundary Movements of Hazardous Waste. This restricts access to efficient reclaim and destruction technology, leading to reduced recovery.*

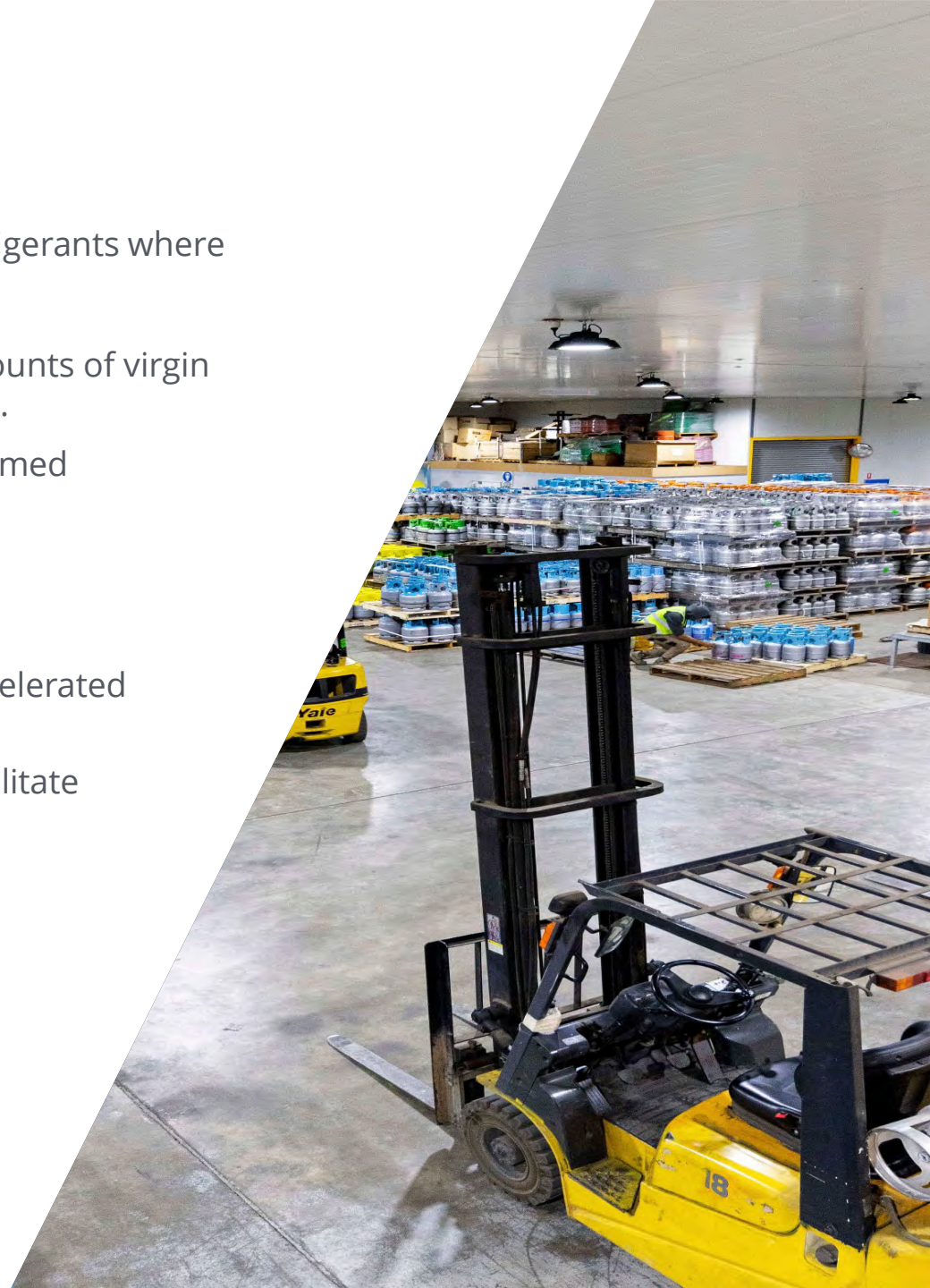
In Conclusion

- LRM is a key enabler of the circular economy and transition to lower GWP refrigerants where they are suitable, safe and available.
- By maximizing recovery, recycling, reclamation and reuse we can limit the amounts of virgin HFCs required and reduce premature destruction for products still in-demand.
- LRM bridges the gap created by HFC phase-down targets and quotas, as reclaimed refrigerant sits outside this framework.

LRM Enablers

- Education – increasing volumes becoming available for recovery, requiring accelerated efforts through all industry stakeholders to avoid increasing emissions.
- Collaborative efforts to reduce barriers to transboundary movements and facilitate permitting.
- Carbon finance mechanisms to incentivise LRM activities.

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Thank you

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