Session 3: Deep dive into life-cycle refrigerant management

Recovery, recycling, reclamation

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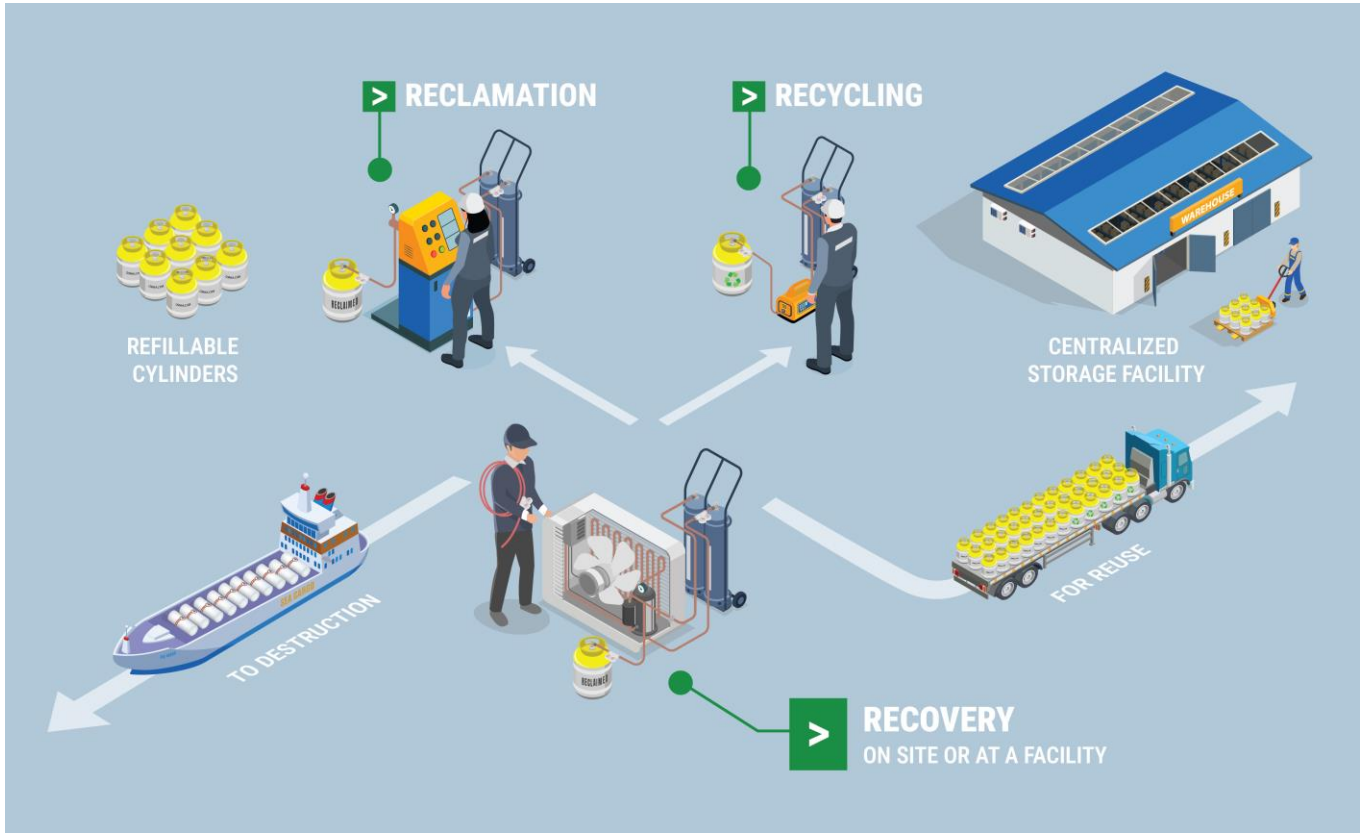
Break-out group on Recovery, Recycling and Reclamation

- ✓ Definitions
- ✓ Importance of Refrigerant Recovery
- ✓ Effective Refrigerant Recovery for Recycling and Reclamation
- ✓ Obstacles and challenges
- ✓ Policies
- ✓ Conclusions



Definitions Montreal Protocol Handbook

Recovery: *Means the collection and storage of controlled substances from machinery, equipment, containment vessels, etc., during servicing or prior to disposal*.

Recycling: *Means the reuse of a recovered controlled substance following a basic cleaning process such as filtering and drying. For refrigerants, recycling normally involves recharge back into equipment, it often occurs "on-site".*

Reclamation (Reclaim): *Means the re-processing and upgrading of a recovered controlled substance through such mechanisms as filtering, drying, distillation and chemical treatment to restore the substance to a specified standard of performance. It often involves processing "off-site" at a central facility.*

The largest opportunity to recover refrigerants comes at the equipment

"end-of-life" phase.

Importance of Refrigerant Recovery

Refrigerant recovery of used refrigerants is the first step before recycling, reclamation, or destruction can take place.

It remains low in many A5 and nA5 parties.

Recovered refrigerant can be **reused** by either:

- Recycling
- Reclamation

Supports the **circular economy** by reducing the need to produce new refrigerants, which presents a **significant opportunity to minimise emissions and their potential impact on the environment**.

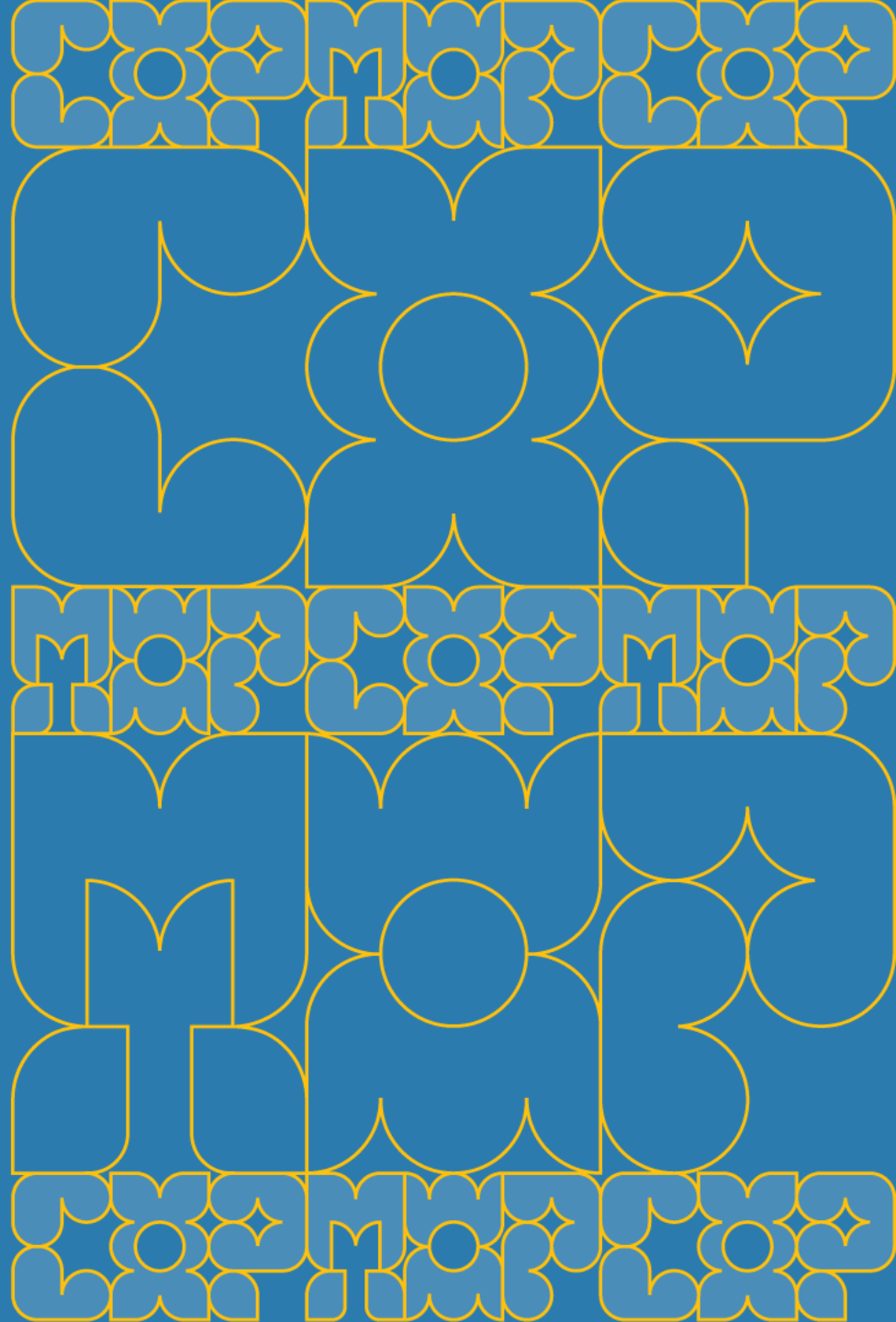
Reused refrigerant does not count towards MP consumption targets and reuse can be used as a tool towards compliance.

Effective Refrigerant Recovery for Recycling and Reclamation

Effective refrigerant recovery for re-use requires a change in behaviour at scale to stop venting to atmosphere through:

- Comprehensive and continued technician training.
- Access to refrigerant recovery machines and equipment.
- Establishing a "**reverse supply chain**" logistics and infrastructure, with sufficient access to cylinders, cylinder /data tracking, recovery equipment, collection networks, storage facilities, so refrigerant can be returned for recycling, reclamation or destruction.
- Sufficient technician time for completing recoveries.
- Chemical analysis to know its composition for reuse.
- Financial mechanisms to support responsible recovery.
- Policy frameworks (regulatory or voluntary) that incentivize recovery.

Obstacles and challenges



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Economic

- There are economic, accessibility and policy obstacles and challenges associated with effective recovery for recycling and reclamation.

- In some countries refrigerant phaseouts and phasedowns can create **complex market dynamics**.
  - Over supply because of stockpiling (low cost of new refrigerants) prior to, or early in phasedowns, or if there are significant number of excess allowances relative to demand creating a lot of “headroom”.
  - Results in weaker incentives to detect leaks and recover for reuse and reclaim; the costs of undertaking those activities is higher than the cost of purchasing new refrigerants.

- Stringent phase down schedules may initially increase new refrigerant prices
  - Market responds by shifting to alternatives and enhancing LRM practices.
  - In some cases, high prices may incentivise illegal trade.

- Fluctuating refrigerant prices may make it difficult to justify capital investments in RRR and **reverse supply chain infrastructure.**

Technical

- Technologies are available for recovery, recycling, reclamation of refrigerants but not accessible in all A5 and low volume countries due to economy size, market conditions and geography.

- When the technologies are broadly available and accessible, technical improvements may still be needed to make RRR processes more efficient and cost effective.

Examples

- Disposable cylinders – how to recover the trapped residual refrigerant known as the “heel”? Refrigerant heels are generally released to the atmosphere when the cylinder is punctured, or the valve is damaged.

- Unsuitable recovery, recycling and reclamation equipment (unable to remove all impurities).

- Inadequate supply of empty recovery cylinders to contain product pending RRR.

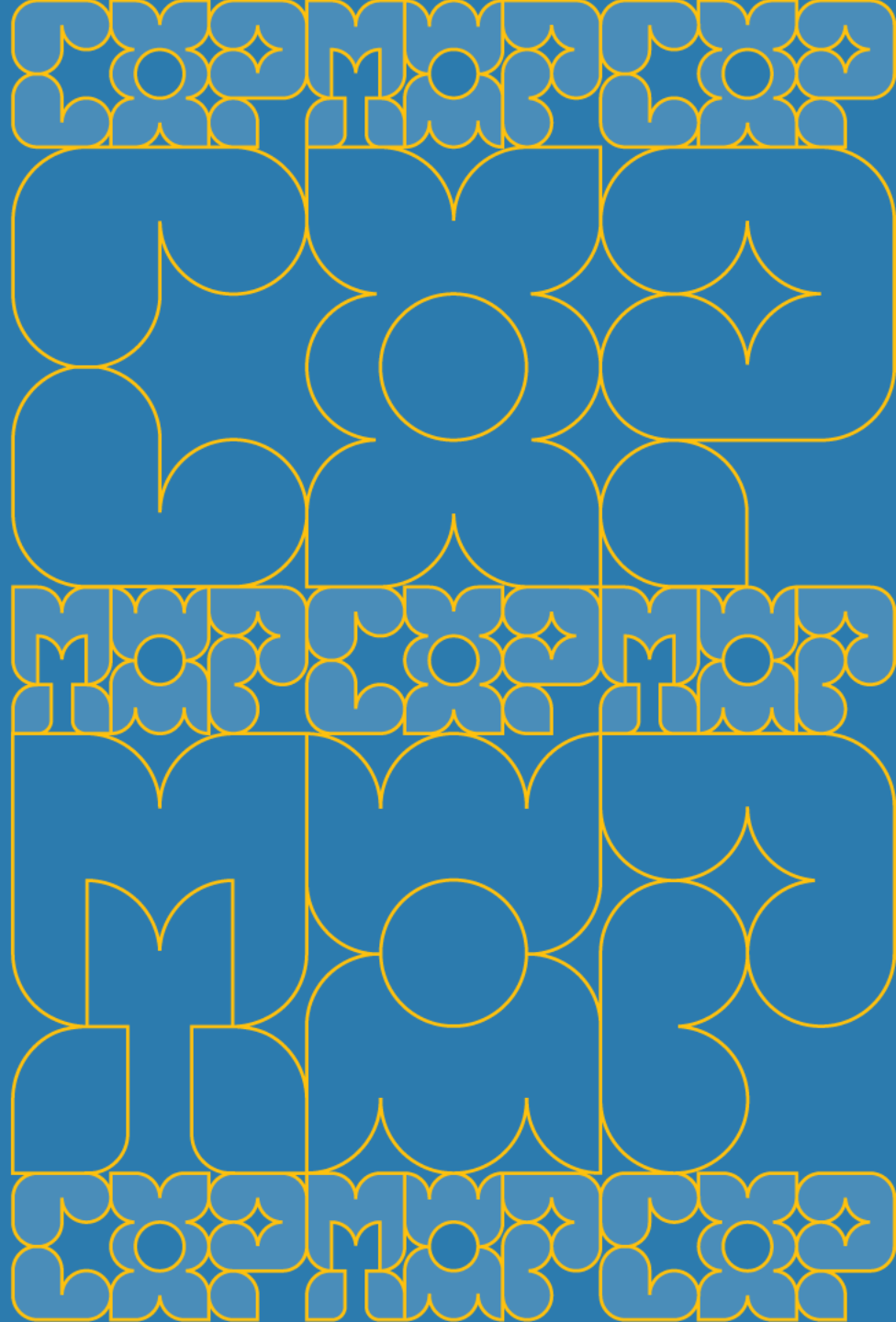
- Contamination of recovered refrigerants, due to improper recovery and mixing of products.

- Inadequate training in RRR and lab analysis to determine appropriate end use for recovered gas.

Quality / Laboratory Analysis for Recycled & Reclaimed Refrigerants

- Laboratory analysis determines composition and level of contamination.
- Laboratory analysis may not be readily available or accessible, therefore the quality of the recycled /reclaimed refrigerant is not guaranteed.
- Recycled and reclaimed refrigerant can be re-used without prior testing; however, system performance may be impacted.
- Some equipment manufacturers /end users avoid using reclaimed refrigerants in their systems, over concerns with quality (potential liabilities with respect to warrantees or equipment guarantees).
- Some equipment manufacturers, for example in the EU have added reclaimed refrigerants in new equipment.
- Standards and commercial agreements may be used to govern quality parameters
  - ✓ For example: ISO5149 , AHRI 700, AHRI 740, UL Standard 1963-2011

Policies promoting 3Rs



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Policies Promoting Recovery, Recycling, Reclamation

- Mandatory and voluntary policies and programmes are currently implemented in many parties.

- Lessons have been learnt from the varying success of policies and programmes:
  - Enforcement is challenging due to the large volume of end-users, distributors, and independent contractors that are involved.
  - Effective LRM requires stakeholder support, particularly when developing reverse supply chain infrastructure and technician training.
  - Voluntary action, compliance offset generation, incentivization and corporate citizenship programmes are important.
  - The safe handling/transportation of refrigerants must be also considered.

- **Example** of a policy obstacle – When is recovered refrigerant a waste?

- Definition of “waste” influences the logistic burden for the transport recovered refrigerants, both within and across borders, for example, the Basel Convention, can **inhibit access to reclaim** or destruction technologies abroad.

Conclusions

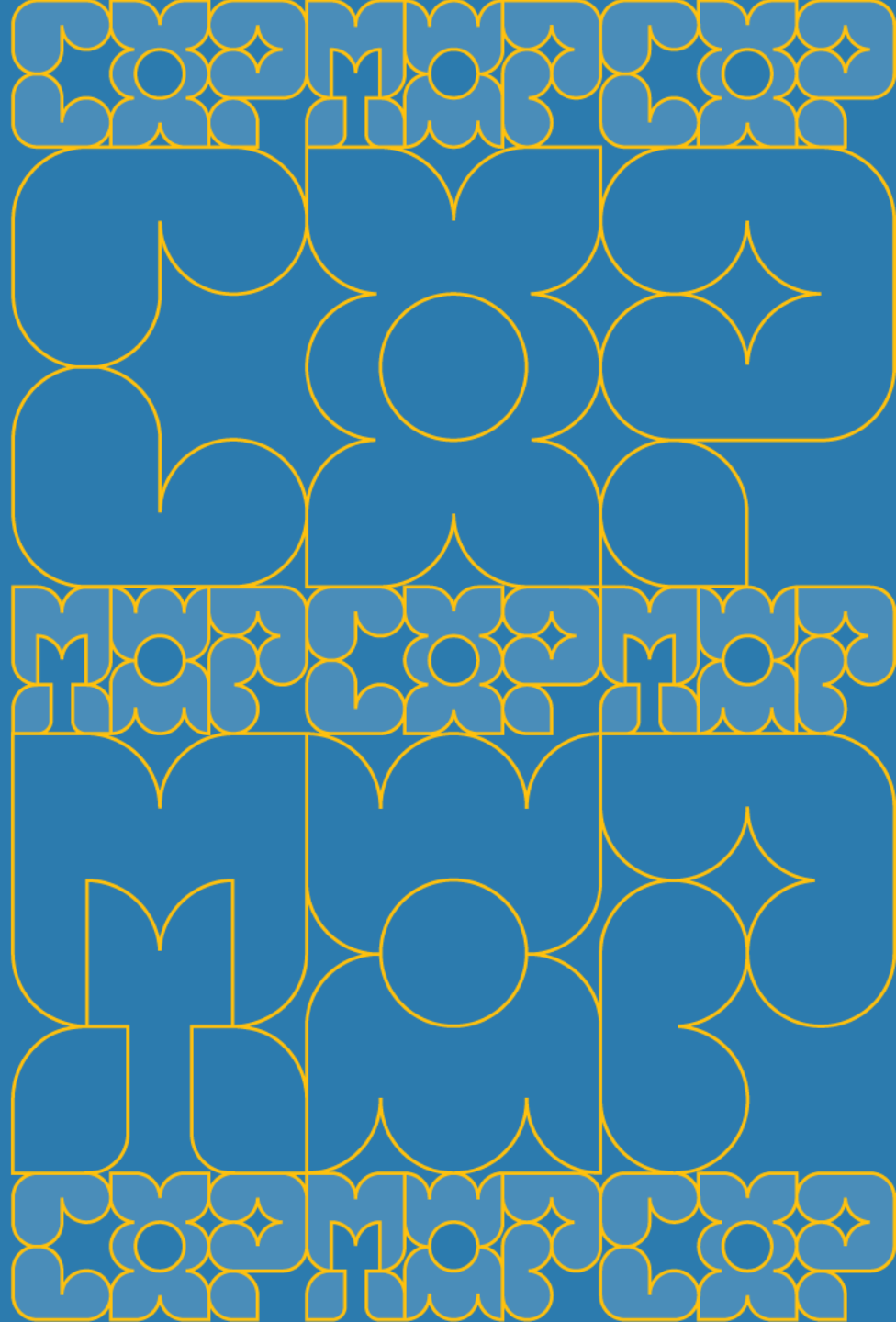
- Recovered refrigerant can be reused as either (a) recycled or (b) reclaimed.

- **Reusing refrigerants through recycling or reclamation** presents a significant **opportunity to prevent potential emissions,** however these benefits can be negated if recovery doesn't occur.

- Effective refrigerant recovery for re-use requires a **change in behaviour at scale and financial investment**: to stop venting to atmosphere through complimentary mechanisms such as training, suitable recovery equipment, establishing a "reverse supply chain", access to laboratories, access to financial mechanisms, and the implementation of appropriate mandatory and voluntary policy frameworks.
- Expanding current financing mechanisms, implementing policies and utilising carbon markets may reduce cost challenges linked to implementing effective recovery especially in A5 parties.

- **We ALL need to work together** - Parties and the private sector (companies, contractors, technicians, end users).

Thank you



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