

Sustainable Cooling

Toward Advancing LRM Implementation

3 November 2026

Daikin Industries, Ltd.

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Support for Building Refrigerant Circular Economy Models in Vietnam and Malaysia Utilizing Japanese Systems and Technologies

- MOEJ is implementing a **recovery and reclamation model projects in Malaysia and Vietnam in collaboration with Daikin Industries and others.**
- We aim to leverage domestic experience in system design, practical collection, reclamation, and destruction, human resource development, and public-private partnerships to support the establishment of a refrigerant circular economy.

① Pilot Implementation of a Model Scheme for HFC Recovery and Reclamation from ACs

- Malaysia: Recover HFCs from used residential air conditioners through air conditioner retailers.
- Vietnam: Recover HFCs from used commercial air conditioners through Daikin service providers.

② Business and Policy Dialogue with the Governments of Both Countries

Recovery and Reclamation in Malaysia





Recovery and Reclamation in Vietnam





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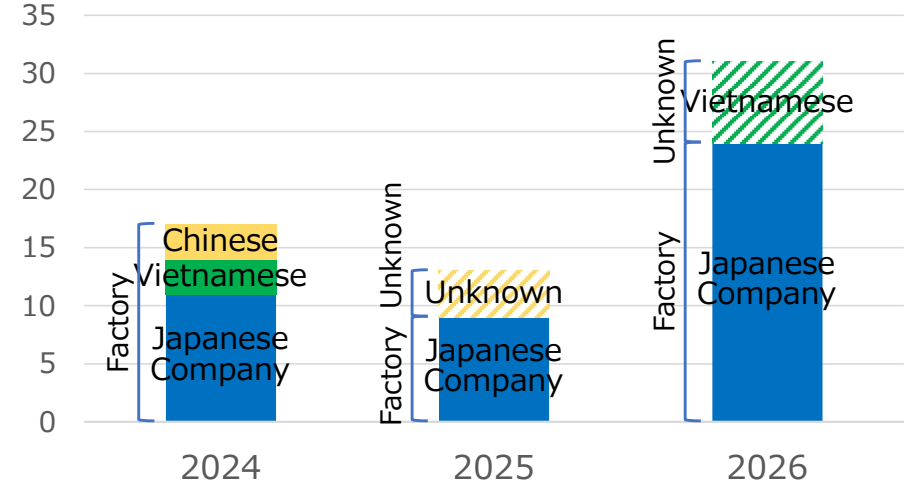
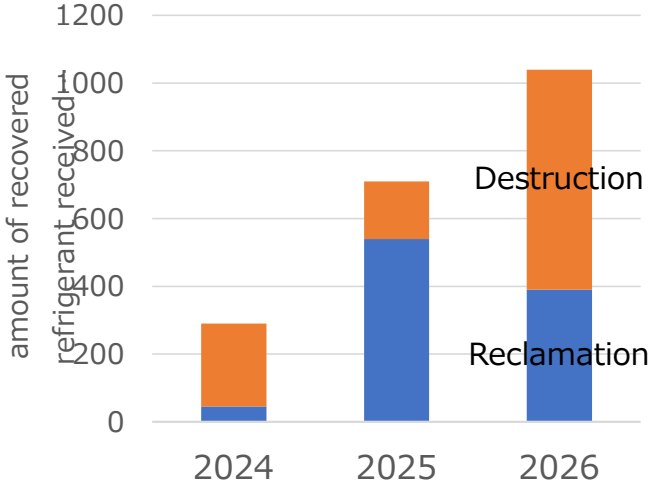
Trend in Refrigerant Recovery

- Request for Refrigerant recovery and volume are increasing year by year.
- Most of the refrigerants are recovered from factories of Japanese companies, and it is **necessary to raise awareness of relevant regulations among a wide range of stakeholders**.
- Many recovered refrigerants cannot be reclaimed due to **low purity of recovered refrigerants**.

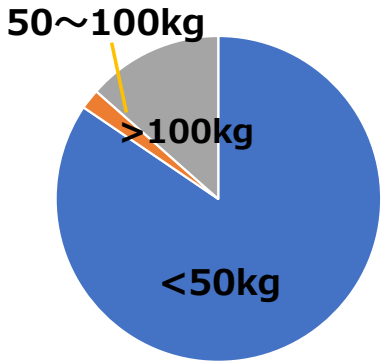
In Vietnam, Decree06 (2022) and Decree119 (2025) make it mandatory to collect used refrigerants from designated equipment from January 1, 2024.



Trends of Number of Refrigerants Recovery and Recovered site



Trend in Recovered Refrigerant Received and process



Amount of refrigerant recovered per site

※The amount of recovered refrigerant received by MZ_VINA, the only reclamation company in Vietnam, was tabulated.
※The amount of recovered refrigerant directly transported to the destruction company and destroyed was not tabulated.
※FY2026 figures were annualized based on results through July 2026.

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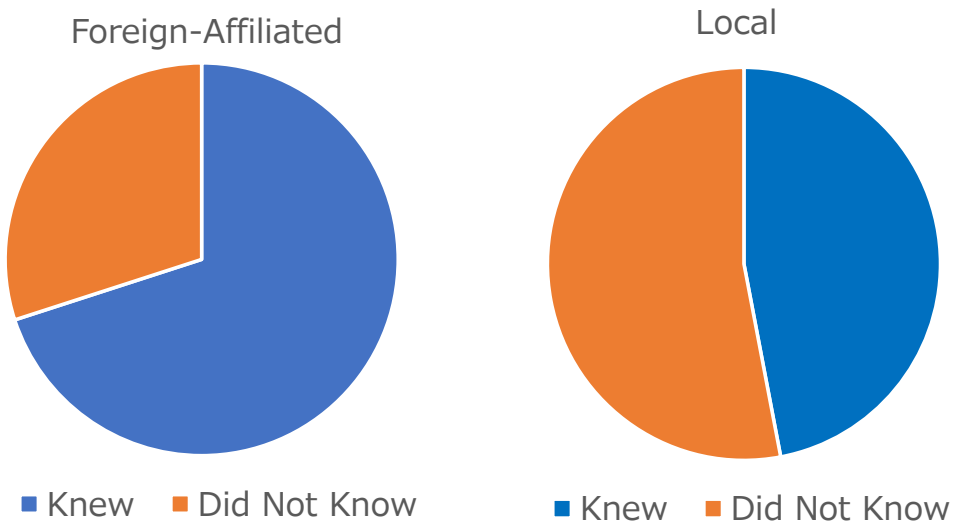
Survey results from meeting participants

- While about 3/4 of foreign-affiliated companies are aware of the legal revision, the awareness of local companies is **less than half**.
- **"List of approved contractors" is required**, and provide **"administration support tools"** is suggested for the solutions. (e.g., instruction manuals for equipment registration and reporting)

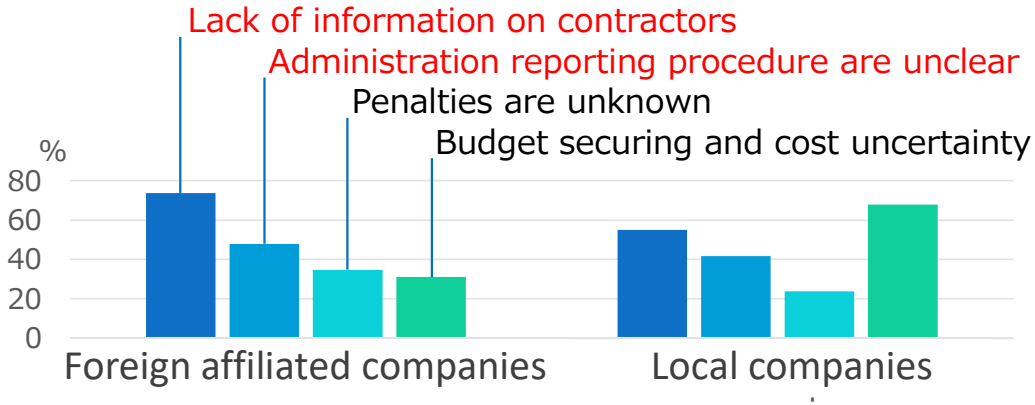
【Awareness of the revision of laws and regulations】

Foreign-affiliated : have a high level of awareness
Local: **have less than half of the awareness**

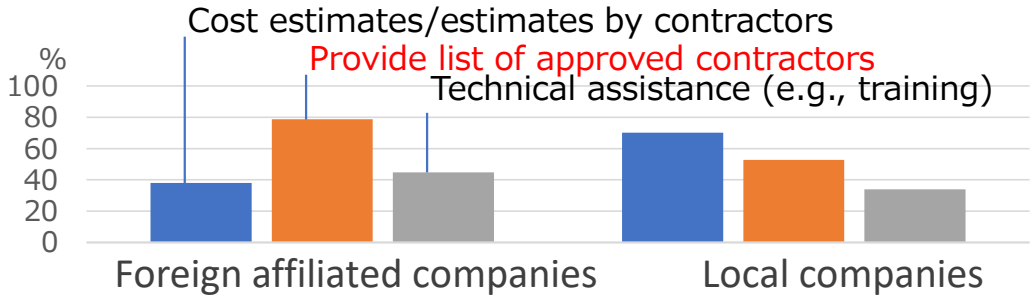


120 responses from mainly the industrial park seminar participants (68% foreign-affiliated companies; 32% local companies).

【Practical barriers to new regulations】



【Support required】



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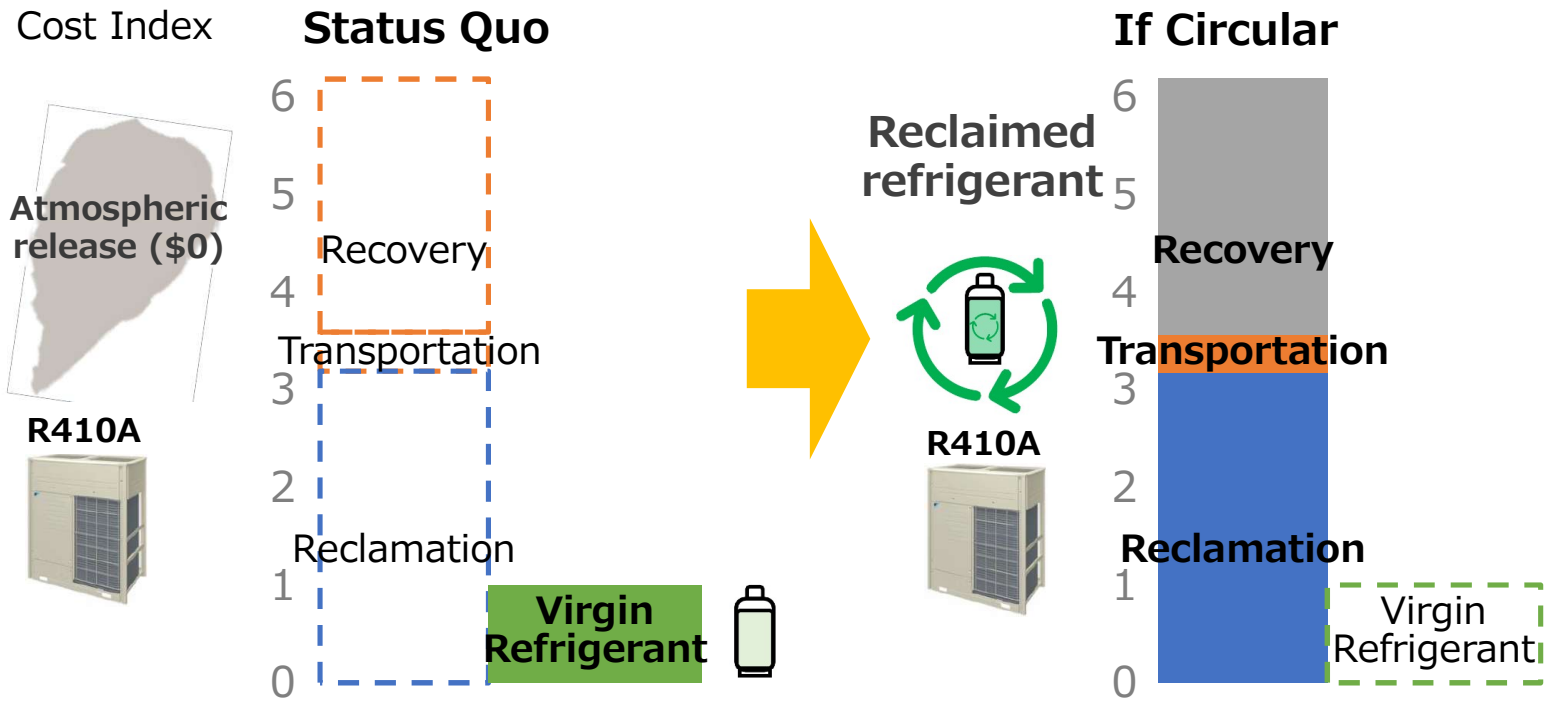
Economic viability consideration

- **The cost of refrigerant recovery and reclamation alone is higher than the cost of purchasing virgin refrigerant.**
- It is possible to consider the cost of proper disposal of used refrigerants and equipment at the end of life and the profit from the sale of valuable materials **in a comprehensive manner** in order to make effective use of limited resources.



Cost estimation in case of 10kg refrigerant of R410A from a VRV System

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Recovery Rate per Unit

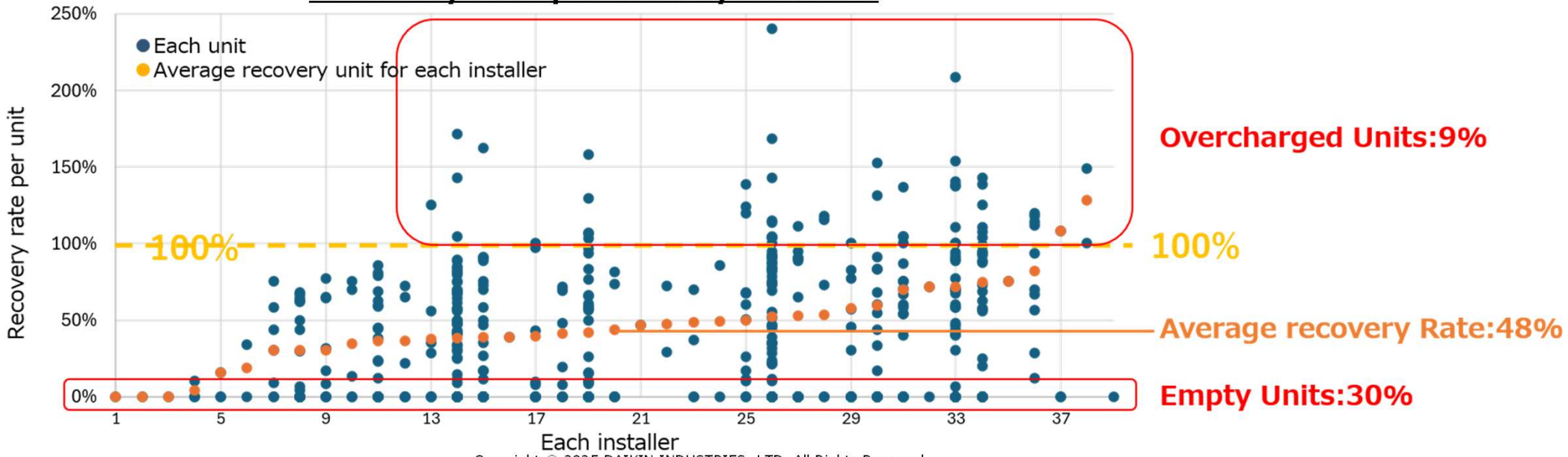
Installer/Engineer Skill improvement is required in addition to refrigerant recovery training

- 499 units were collected from 159 houses with the cooperation of 39 installers
- The average **recovery rate per unit is 48%.** (about 70% in Japan)
- There were many **empty units:30%.** (6～8% in Japan)
- Variations in recovery rates among installers are very large.
  ⇒ **refrigerant recovery training is required**
- **Overcharged unit (9%)** : overcharged during service, indicating lack of skills
  ⇒ **Installer/Engineer Skill improvement is required**

Breakdown

Refrigerant	Collected unit qty	
R22	369	74%
R410A	94	19%
R32	36	7%
Total	499	100%

Recovery rate per unit by installer



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Review of Actual Pump-Down Operations

Asked installers (three companies) to record pump-down operations and reviewed the actual work procedures

→The work was not done exactly according to the documented procedure.

→Some workers appeared not to fully understand the purpose of the procedure, while others, despite having experience, did not follow the basic procedures.

⇒ **Careful and thorough training is required to communicate the purpose of the work and the importance of following basic procedures.**

⇒ **Providing training not only once but repeatedly through a qualification renewal system appears to be effective.**

Sample of actual working



・The work was carried out without checking the condition of the air conditioner using the gauge manifold.
・The vacuum pump was not used.



・Pump down operation time is short.
・Torque wrench was not used.

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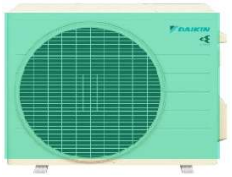
Economic viability consideration

- **Increasing the amount of refrigerant recovered per unit improves the economic viability**
- **Some institutional scheme is necessary to achieve economic viability for refrigerant recovery from Residential AC**

Recovered amount per unit

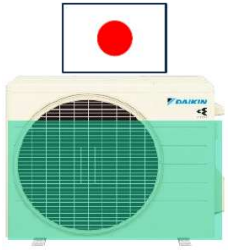


Approx. 500～900g
Initial refrigerant charge

pump down of used AC

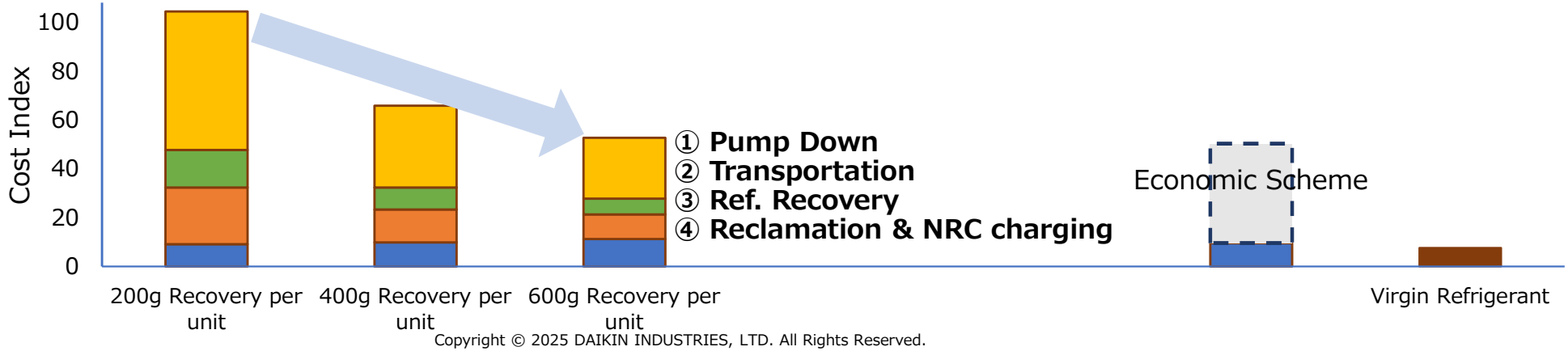


Approx.330g
Rate of empty:30%



Approx.680g
Rate of empty: less than 10%

Cost impact of refrigerant recovery amount per unit



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Key Messages

1 Every stakeholder plays its own role – from installation to equipment disposal

Across the life cycle: governments, manufacturers, technicians, equipment owners, transport and storage companies, and **the reclaimers and destruction companies who carry out proper treatment**.

2 Contain refrigerant across the life cycle

Prevent leaks during use, and recover refrigerant at end of life.

3 It is about people

All of this depends on people. **Technicians need training, and a system that keeps their skills up over time**. **Users need to understand the value of refrigerant and act on it.** Encouraging that change in behavior is just as important.

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