

Lifecycle Refrigerant Management Framework for India

Global and Indian Scenario

11.02.2026

International Forum for Environment, Sustainability and Technology

Global Scenario

1

Technician Training, Certification and Licensing

Norway

Only certified personnel are permitted to handle refrigerants and hazardous waste.

Isovator, a subsidiary of the **Norwegian Foundation for Refrigerant Recovery (SRG)**, is the authorised certification body and every technician is certified by them.

A city-wise register of certified technicians and companies is publicly accessible online.

Australia

Technicians working on refrigeration and air-conditioning equipment are mandated to have a **refrigerant handling licence (RHL)**

Companies handling fluorocarbons, such as purchasing, storing, or disposing of them, must have a **Refrigerant Trading Authorisation (RTA)**

Australian Refrigeration Council (ARC) is the body which provides all these licenses

Japan

The **Japan Refrigerants and Environment Conservation Organisation (JRECO)** is in charge of ensuring that the refrigerant handlers are properly trained. They do so by certifying them after a training session and a test.

Only certified technicians are permitted to handle refrigerants. A fine and imprisonment is imposed on the person or organisation found not in compliance.

USA

Environmental Protection Agency (EPA) administers the certification program. Technicians have to complete EPA-approved third-party training and then pass proctored exam via organisations like ESCO, NATE, or HVAC Excellence.

EPA maintains national registry of all certified technicians and registered companies

China

China does not have a national regulation mandating certification or licensing for AC technicians to perform installation, service, or refrigerant recovery.

There are certification courses, but these are not mandated by regulation.

2

Financial Mechanism

Norway

Norway has a tax on the production and import of refrigerants based on the GWP.

This finances the LRM framework and a refund scheme for technicians upon destruction of refrigerants.

This tax is administered and collected by the Norwegian Tax Administration. While the regulations and practices are delegated to the Norwegian Environment Agency (NEA)

Australia

All refrigerant importers are part of **Refrigerant Reclaim Australia (RRA)**, which implements the LRM system.

RRA is funded by a levy on the import of refrigerants.

This fund is used to run the refrigerant take-back programme, including the cost of transportation and to establish the necessary infrastructure.

Japan

In Japan, there is no financial system to incentivise the technician.

The consumer or business covers the costs of collection, transportation, recycling, and proper return of the appliances.

Their system is based on strong regulations and monitoring mechanisms.

USA

In USA, there are multiple reclamation and destruction facilities. Each facility provides individual incentives to technicians to collect gas.

These may include:

- Buy-back/credit for reclaimable gas
- Free or subsidised recovery cylinders
- Logistics support
- Destruction facilities mostly don't give any incentives

China

China has not imposed any specific taxes on refrigerant imports or production to fund refrigerant management.

Government has provided funding for establishing recycling centres with a focus on refrigerant recovery.

3

Refrigerant Collection Process

Norway

When the technician recovers refrigerant, they take the cylinder to approved collection points.

At collection points, cylinders of recovered gas are consolidated into larger tanks managed by SRG

SRG then notifies the NEA and sends the consolidated tank to Isovator to analyse the quantity, composition, and type.

Then the refrigerant is sent for destruction.

The documentation process for the refrigerant runs in parallel to the collection process.

This documentation is used for the tax refund after the analysis. Tax refund is based on the GWP of the refrigerant.

The administration and transportation costs is deducted by SRG.

Service technician → collection point (SRG) → Isovator → destruction facility

Australia

The refrigerant is recovered by the technician. The cost of recovery, as well as the transportation, is borne by the user.

The technician sells the recovered refrigerant to the refrigerant wholesaler at RRA's collection points. RRA has 500 collection points across the country.

The wholesalers decant the small cylinders into larger ones and send them to a reclamation or destruction facility based on the quality of refrigerant received

Japan

The consumer or business has to inform the retailer or the municipality to take back the appliance at EOL. The cost is borne by the user.

The retailer or municipality has to ensure that the equipment reaches the manufacturer's designated recycling site.

E-waste handler is responsible for recovering the refrigerant and sending it to an approved reclamation or destruction site.

They have to keep a record for the same.

3

Refrigerant Collection Process

USA

Refrigerant is recovered by technicians using EPA-approved recovery equipment.

Based on the incentives, these are given to reclamation centres or destruction facilities.

Technician needs to document the service provided and maintain it for 3 years

China

Recent 2024 regulations prohibit refrigerant emissions and relies on enterprise-level practices for recycling and refrigerant recovery.

Refrigerant manufacturers like Sino-Chem Group Lantian Co., Ltd. have established specialised facilities for recovery and purification process

4

Documentation and Monitoring Mechanism

Norway

It is the responsibility of the producer (for pre-charged equipment) and refrigerant importer to collect and aggregate data on the use of refrigerant and submit it to NEA

Australia

Businesses and technicians have to maintain records of purchases, recoveries, and submitted refrigerants.

The ARC has a network of auditors which conduct prearranged or spontaneous audits

Annual licence renewal requires proof of compliance, including recovery records

Japan

Recovery certificate at disposal and record of refrigerant deposited to reclamation or destruction site is maintained.

USA

Technicians and companies have to maintain service records of refrigerant usage for 3 years. This includes service dates, amount of refrigerant used for leaks, recovered, and disposal records for EPA audits.

China

China has mandated extensive documentation.

Technicians / companies must maintain service and recovery logs.

5

Larger AC Systems

Norway

For larger AC systems, leak inspection frequency is mandated to ensure leak detection, which is the duty of the AC users/operators.

Australia

The installation of an alarm system for refrigerant leakage detection is required in some cases by AS/NZS 5149

Japan

Periodic inspection and documentation of commercial ACs is mandatory for leakage detection

If the leakage rate is above a specified threshold, then it must be reported to the government

Before discarding a commercial AC, users have to get the refrigerant recovered from a certified refrigerant recovery operator and take a recovery receipt

All responsibilities lie with AC user or operator with penalties if regulation not followed

USA

Leak detection tests are mandated for larger AC systems (≥50 lbs refrigerant charge)

Leaks must be fixed by equipment owners if exceeding the allowable leakage rates

Refrigerant recovery is mandatory before dismantling the equipment

All responsibilities lie on equipment user or operator

China

China has not mandated any specific regulations for larger AC systems.

European Union (EU) F-Gas regulation – Leak inspection frequency

Refrigerant type	Refrigerant charge (tonnes CO ₂ e or kg refrigerant)	Leak inspection frequency (months)	
		No fixed leak defection	With fixed leak detection
HFC and HFC/HFO Blends	5t CO ₂ e ≤ refrigerant charge < 50t CO ₂ e	12	24
	50t CO ₂ e ≤ refrigerant charge < 500t CO ₂ e	6	12
	refrigerant charge ≥ 500t CO ₂ e	3	6
HFO	1kg ≤ refrigerant charge < 10kg	12	24
	10kg ≤ refrigerant charge < 100kg	6	12
	refrigerant charge ≥ 100kg	3	6

6

Reclamation/Destruction System

Norway

Gases are rarely reclaimed in Norway, as the system is designed to incentivise destruction.

Currently, all the refrigerants collected by SRG are sent to France for destruction.

Australia

High volume of recovered refrigerants is retained by wholesalers for reclamation and purified to AHRI-700 standards for resale

Japan

Only government-authorized fluorocarbon recyclers or destructors are permitted under specified standards.

Destruction is more common due to larger number of destruction facilities

USA

More refrigerants are reclaimed in the USA.

With the phase-down of production and import of virgin refrigerants, there is a large market for reclaimed refrigerants.

China

China prioritises reclamation over destruction for refrigerants collected at end-of-life

Major subsidies focus on better recycling and reclamation

India Scenario

Practice and Regulations

Technician Training, Certification and Licensing

No regulation mandating that only licensed or certified technicians can install or service air conditioners, or recover refrigerants

NCVET is the overarching regulator for vocational training, overseeing standards, certification bodies, and compliance under Pradhan Mantri Kaushal Vikas Yojana (PMKVY)

The Electronics Sector Skills Council of India (ESSCI) develops the syllabus for AC technicians training

Financial Mechanism

There is no established financial or institutional mechanism in India for funding LRM system

Refrigerant Collection Process

Under the second amendment of E-Waste (Management) Rules in 24 July 2023 for the first time refrigerant duties were regulated

Manufacturers are responsible for the management of refrigerant generated during the manufacture of equipment. Refurbishers and recyclers are responsible for the management of refrigerants at EOL by adopting approved destruction technologies as per CPCB

No regulation on targets or how to monitor this.

In practice, refrigerant recovery and reuse is common during servicing, while venting is common during EOL

Documentation and Monitoring Mechanism

Under Ozone Depleting Substances (Regulation and Control) Rules, Every person who produces, imports, exports or sells any ODS shall maintain records and file reports as per required format

Records to be made available for inspection

Under PESO and Gas Cylinders Rules 2016, comprehensive data on refrigerant cylinder movement is collected.

Larger AC Systems

No specific regulations on larger AC systems

Reclamation / Destruction System

CPCB-approved Treatment, Storage, and Disposal Facility (TSDF) sites exist which do receive some amounts of refrigerants

Some reclamation sites, as pilots, were established which are mostly shut down

Findings from Stakeholder Engagement and Technician Survey

Installation & Commissioning Stage

- Installation is the single most critical stage for lifetime refrigerant leakage.
- 75% technicians believe that Poor installation is the main reason for leakage.
- Although standards, tools, and guidelines exist, implementation on the ground is weak due to informal handling, absence of accountability and regulatory oversight.
- No mandatory documentation exists for refrigerant type, charge size, or installation quality at commissioning.

What this means for LRM

- Leakage is **structural and preventable issue**, not technology-driven.
- Without regulating installation quality and refrigerant access, downstream recovery and reclamation efforts will remain ineffective.

Servicing Stage

- The servicing market is highly informal and unregulated.
- Technicians are not sufficiently trained and remain dependent on informal learnings.
- AC servicing is a seasonal employment, dominated by self-employed technicians.
- **Routine venting** remains the dominant practice despite the fact that 95% technicians say that they are aware that releasing refrigerant harms the environment.
 - Absence of recovery machine and cylinders.
 - Demand for quick and cheap servicing.
 - Lack of incentives for recovery efforts.
- **Reuse, and resale of impure refrigerant** are also commonly practiced:
 - Small financial gains
 - Absence of reclamation facilities
- Even trained technicians bypass best practices due to demand for cheap and quick service.
- 65% technicians keep some kind of record, but administrative reporting is not mandated.

Reclamation Stage

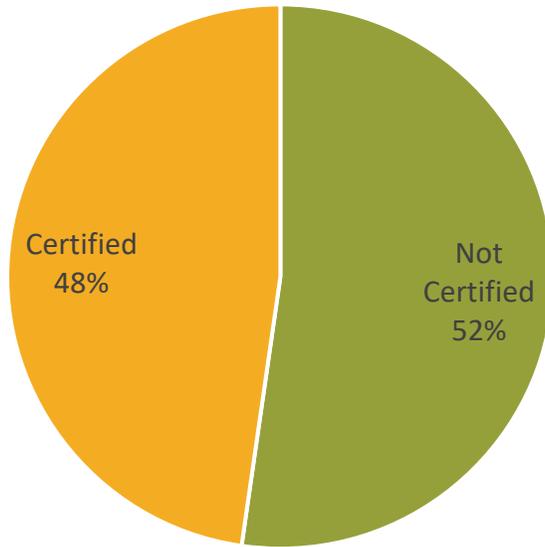
- Demand for reclamation is extremely low, due to low refrigerant recovery and reusing of impure refrigerant without reclamation.
- Recovered refrigerant is often mixed or contaminated, with no affordable testing or verification mechanisms.
- Reverse supply chains are absent; technicians and agencies lack collection and aggregation pathways.
- Only a few reclamation facilities exist, and they are under-utilised due to low volumes and high logistics cost.
- Cost of reclamation is comparable to virgin refrigerant, removing price competitiveness.

End of Life and Destruction Stage

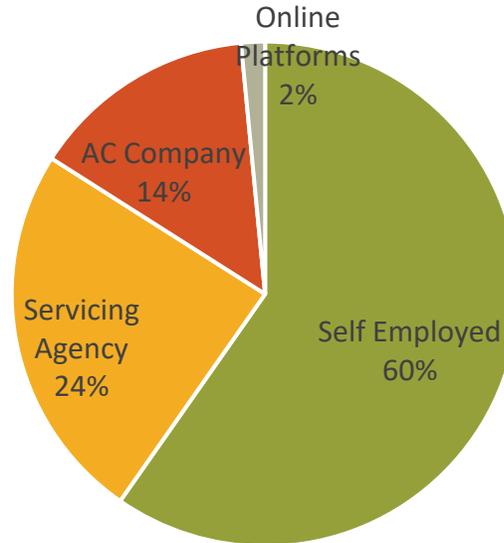
- Most appliances reach recyclers with negligible and impure refrigerant, limiting destruction impact.
- Venting at recycler level is common, justified by low refrigerant quantities and lack of incentives.
- Informal resale chains delay or bypass formal end-of-life treatment.
- Refrigerant destruction is not prioritized in e-waste operations focused on metal and plastic recovery.
- TSDF and cement kiln destruction options exist but costs are fully borne by recyclers.

Employment and Certification Status

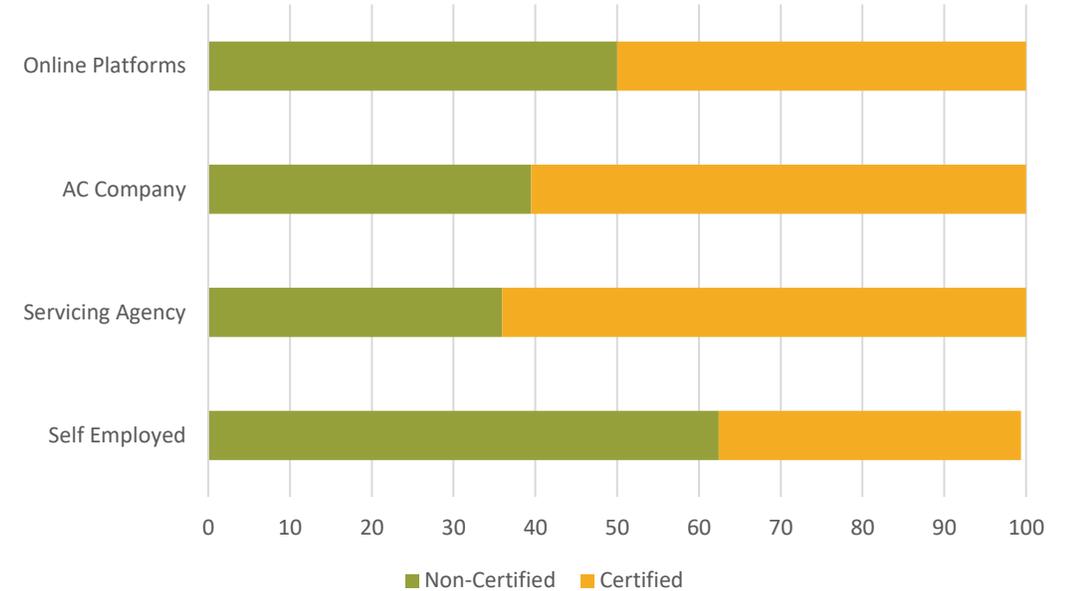
Certification Status



Work Association



Place of Work Vs Certification



- More than half of technicians are not formally trained or certified
- 60% of AC servicing technicians are self-employed, and majority of them operate without certification.
- Direct engagement with technicians is necessary for successful implementation of any LRM policy.

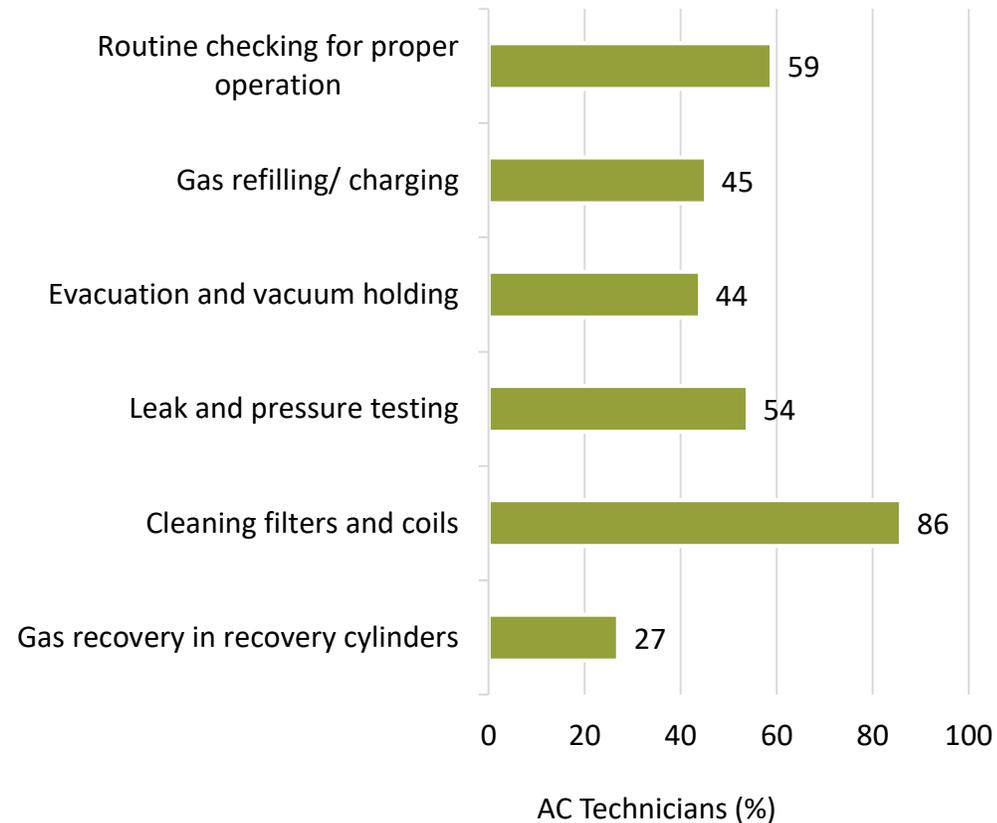
Skills & Training Reality



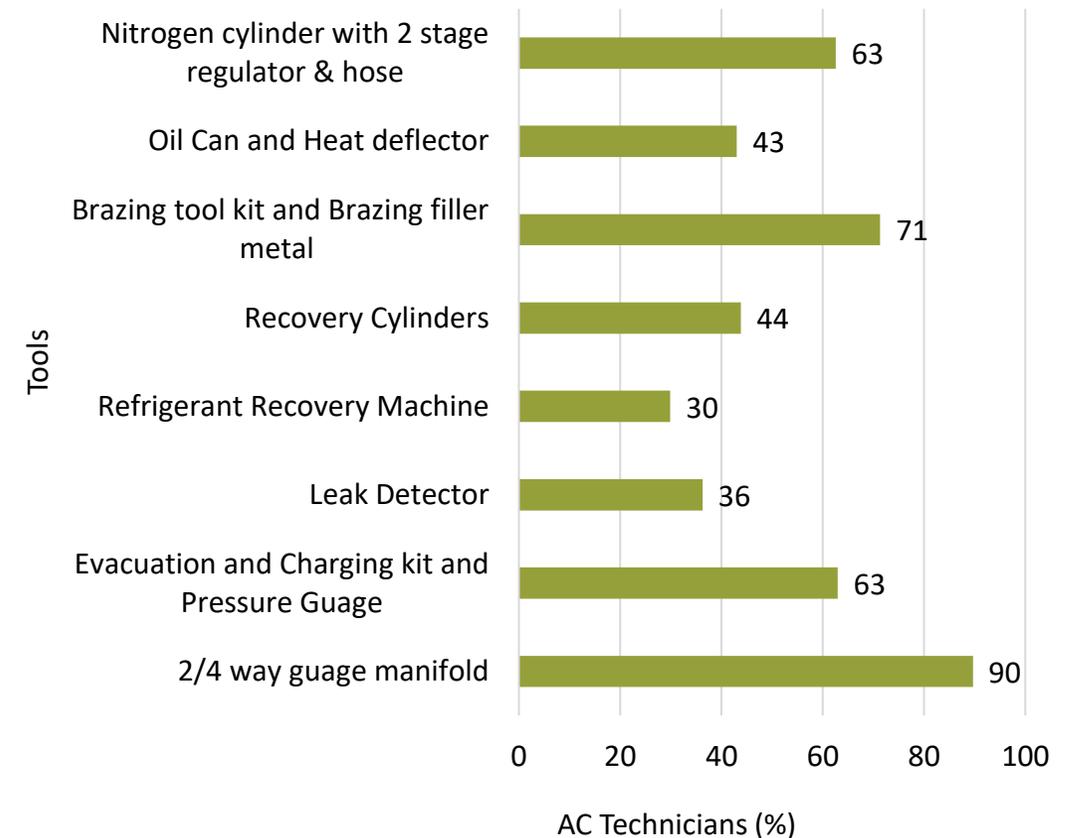
- A large inflow of new technicians into the AC servicing sector due to rapid increase in cooling demand. Most of them are not certified.
- The main reason for not getting certified is unavailability of training centers.
- The most common barrier to certification is lack of nearby training centers, indicating in access rather than unwillingness.
- Already earning well without certification indicates that certification currently does not provide financial or career incentives in the market.

Servicing Practice and Access to tools

Task Performed in Servicing

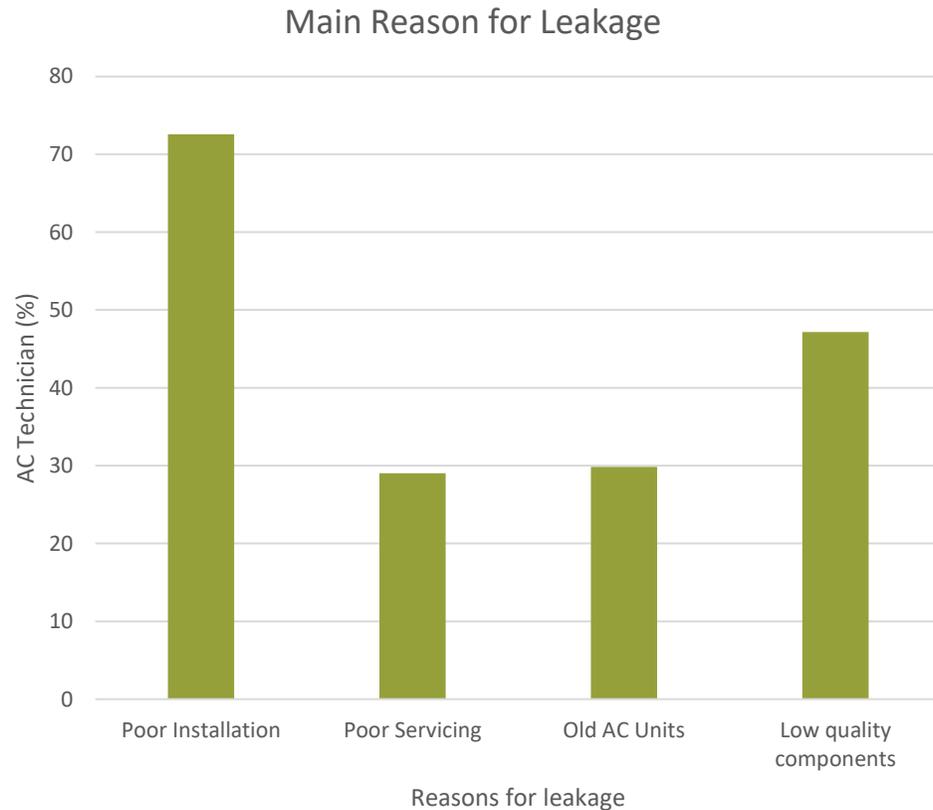


Access to Servicing Tools



- Around 30% technicians have access to recovery machines and performing refrigerant recovery.
- Only 50% technicians perform leak and pressure testing not necessarily using leak detector.

Refrigerant Handling



- Poor installation is identified as the leading cause of refrigerant leakage.
- Low-quality components and poor servicing practices are also significant contributors.
- Age of AC units alone is not the dominant driver of leakage.
- LRM must prioritize installation standards, technician competence, and quality control, not only end-of-life recovery.
- Preventive measures at installation and servicing stages can substantially reduce future recovery burden.