

RECOVERY, RECYCLING AND RECLAMATION OF REFRIGERANTS

Recover

Recovery is the removal of refrigerant in any condition from any appliance and storing it in an approved color-coded container. To facilitate the recovery of refrigerants, manufacturers must provide service ports or a stub for attaching a service access valve.

Identification of AHRI Refrigerant Class

Refrigerants are classified by AHRI primarily for categorizing reclaiming/recycling equipment, which must be classified for each type of refrigerant the equipment may remove. Refrigerants are divided into the four major classifications listed below:

- Class I: Liquid Refrigerants: Normal boiling point greater than 68°F (20°C). These products are normally packaged in drums.
- Class II: Low-Pressure Refrigerants: These refrigerants meet the definition of a compressed gas and have a minimum cylinder service pressure not exceeding 500 psig (3,447 kPa gage).
- Class III: High-Pressure Refrigerants: These refrigerants meet the definition of a compressed gas and have a minimum cylinder service pressure exceeding 500 psig (3,447 kPa gage).
- Class IV: Flammable Refrigerants.

Note: AHRI refrigerant classes and cylinder colors are specified in a separate Guidebook

Recycle

Recycling is the reuse of refrigerant without meeting all of the reclamation requirements. For stationary equipment, the appliances must have the same owner. Recycling generally involves the removal of contaminants by filtration.

Reclaim

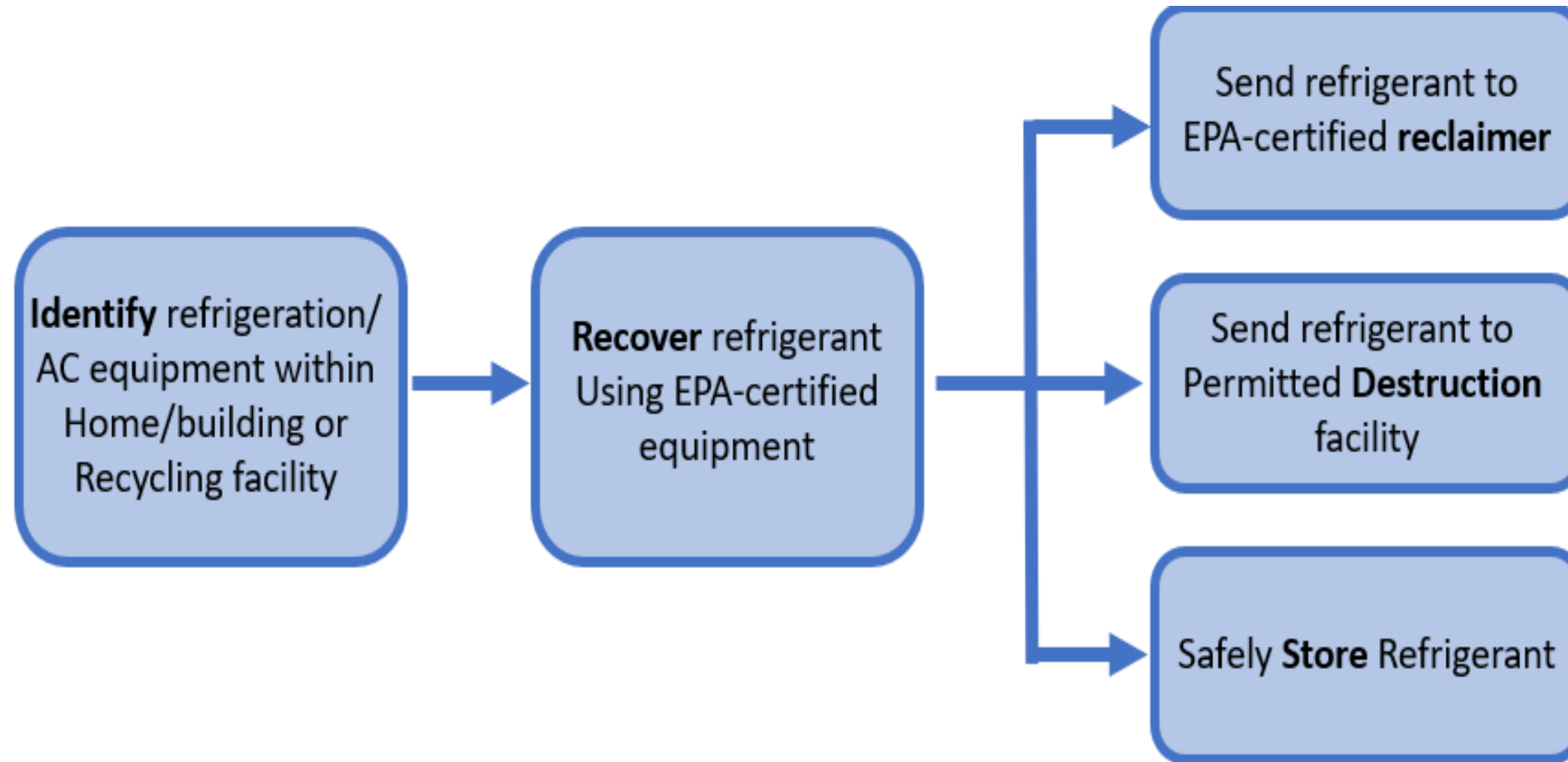
Reclamation means that the refrigerant is reprocessed, all of the contaminants are removed, and the refrigerant may be distilled or reformulated. Reclaimed refrigerant must meet ISO 12810 or AHRI 700 or equivalent specifications for content purity prior to resale.

AHRI Standard for Reclaimed Refrigerant

In the US , reclaimed refrigerant is defined as refrigerant that has been reprocessed to at least the purity specified in AHRI Standard 700 and has been verified to purity using the analytical methodology prescribed. Certified ratings include the following:

- Water (ppm by weight)
- Chloride (pass/fail)
- Acidity (ppm by weight)
- High Boiling Residue (% by volume)
- Particulates/Solids (pass/fail)
- Non-Condensables (% by volume)
- Volatile Impurities, Including Other Refrigerants (% weight)

US EPA Refrigerant Evaluation and Disposal Process



The Clean Air Act Prohibition on Venting

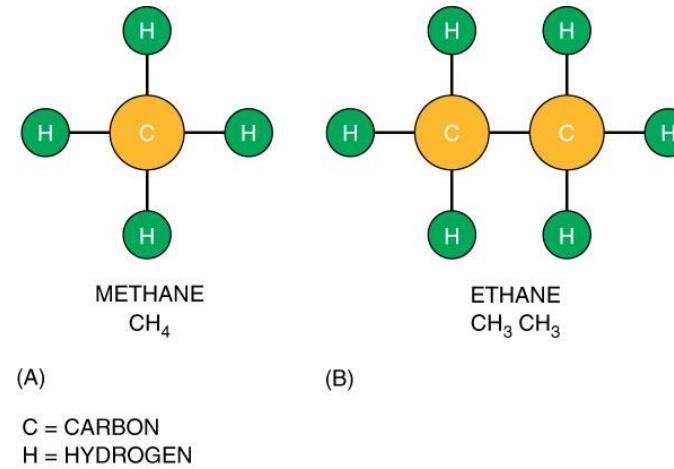
US EPA Section 608 Regulations

Section 608 of the US EPA prohibits individuals from intentionally venting ODS refrigerants (including CFCs and HCFCs) and their substitutes (such as HFCs), while maintaining, servicing, repairing, or disposing of air conditioning or refrigeration equipment.

Refrigerant Types

- Environmentally friendly
- Non-toxic
- Non-flammable
- Chemically stable
- Recyclable
- Relative low cost
- Detectable at low concentrations

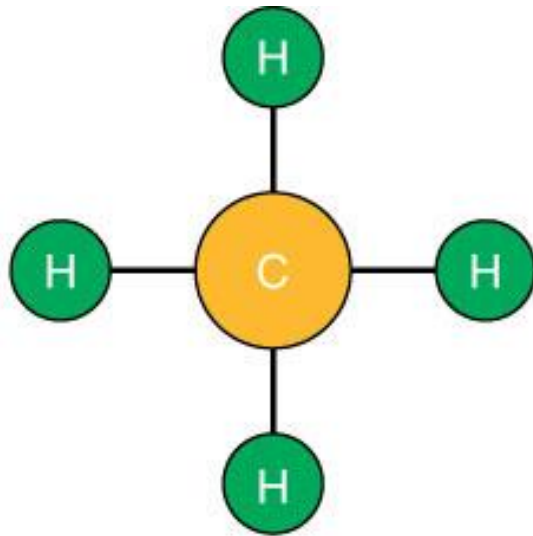
Ethane and Methane



- Most refrigerants in use today originate from one of these two base molecules.
- Methane and ethane are referred to as pure hydrocarbons.
 - Pure hydrocarbons contain only hydrogen and carbon.
 - Other hydrocarbons include propane and butane.

Ethane and Methane

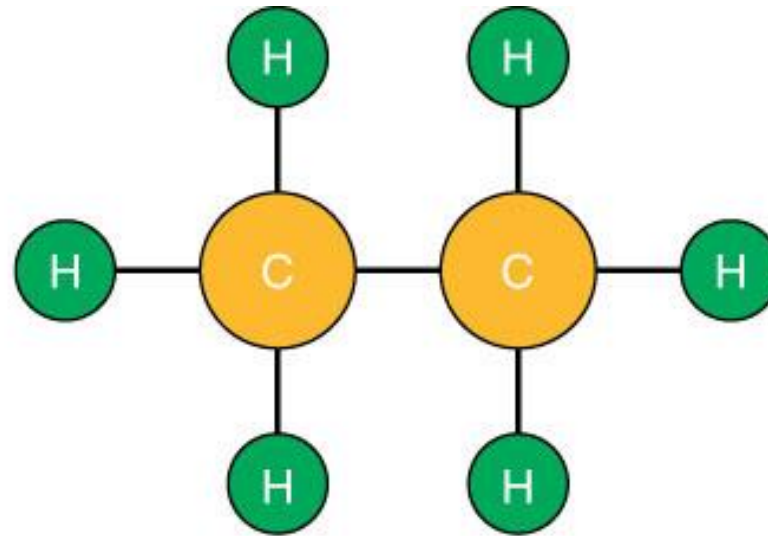
- (A) Methane molecule (B) Ethane molecule



METHANE
 CH_4

(A)

C = CARBON
H = HYDROGEN



ETHANE
 $\text{CH}_3 \text{CH}_3$

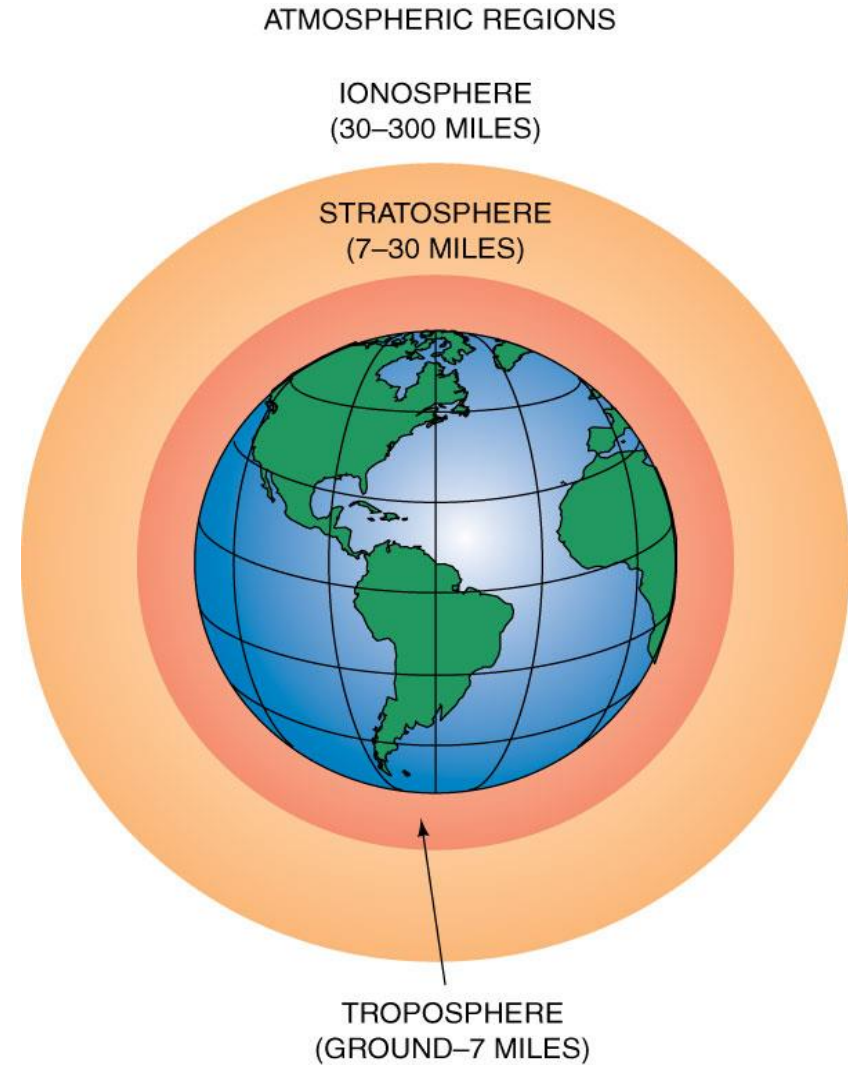
(B)

Classes of Refrigerants in Use Today

- Hydrocarbons (HC)
- Natural Refrigerants NH₃ and CO₂
- Hydrofluorocarbons (HFC)
- Hydrochlorofluorocarbons (HCFC)
- Chlorofluorocarbons (CFC)

Ozone Depletion

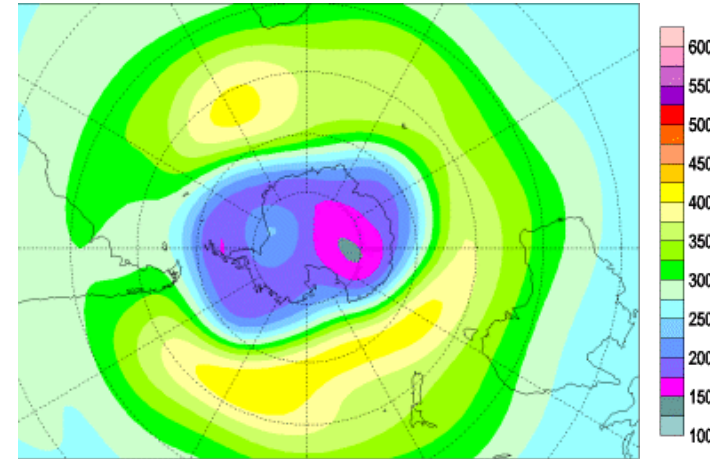
- Atmospheric regions
- Ozone is present in the Stratosphere



Recovery, Recycling & Reclamation – Why?

HCFCs

- Destroy the ozone layer
- Threaten life on earth
- Cause global warming



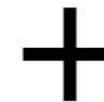
HFCs

- Cause global warming

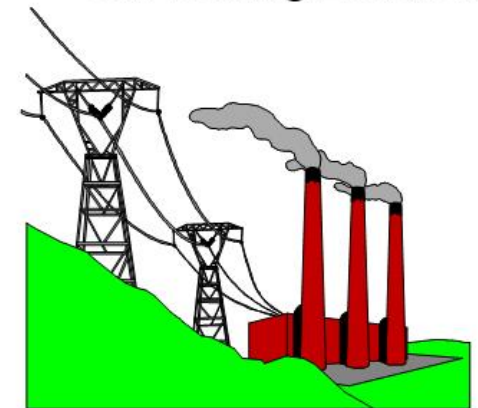


Refrigerant Emissions:
• Installation/Servicing
+ Leaks + Failures + End of Life

1 kg R-22 = 1,820 kg CO₂
1 kg R-134a = 1,430 kg CO₂
1 kg R-410A = 2,088 kg CO₂
1 kg R-404A = 3,922 kg CO₂



CO₂ Emissions from
Generating Electricity



CO₂ emissions are due to energy
generated to run heating, refrigeration,
and air conditioning equipment

Ozone Depletion causes

- Skin cancer.
- Eye-related issues, including cataracts.
- Decreased plant growth rates.
- Compromised immune systems.

Global Warming

Definition : The heat absorbed by a Unit weight of a Refrigerant (Gas) released in the atmosphere . compared to the same weight of CO₂ in a given time period. The reference GWP of CO₂ being 1

- Also referred to as the greenhouse effect.
- Earth's inability to release heat by radiation back to the atmosphere.

Ozone Depletion Potential (ODP)

- CFC refrigerants have high ozone depletion potentials.
- HCFC refrigerants have lower ozone depletion potentials.
- HFC and HC refrigerants have an ozone depletion potential of zero.

Global Warming Potential (GWP)

- CFC refrigerants have high global warming potentials.
- HCFC refrigerants have lower global warming potentials.
- HC refrigerants have low global warming potentials.
- HFC refrigerants have very low global warming potentials.
- Ammonia and CO₂ Refrigerants have zero GWP

Recovery, Recycling and Reclamation

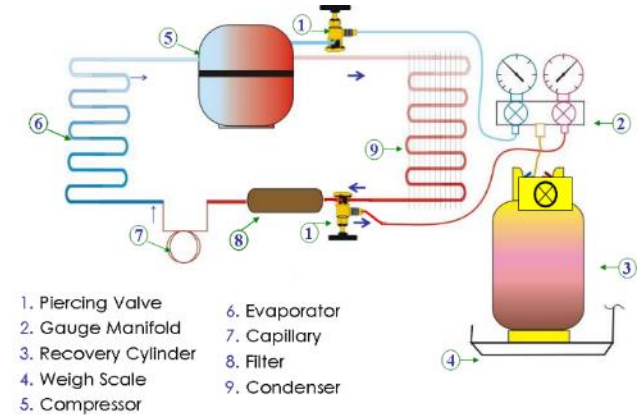
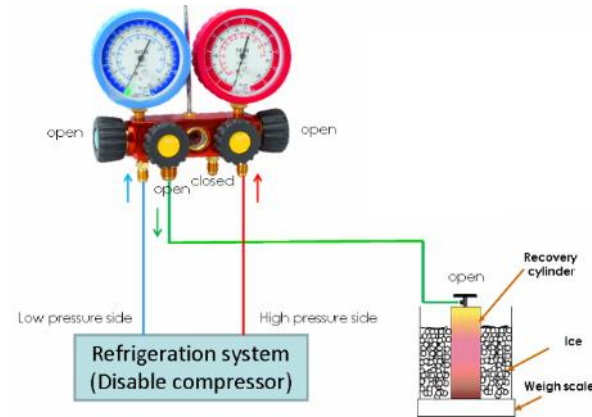
- **Recover:** To remove refrigerant in any condition from a system and store in an external container
- **Passive** (No external recovery machine used, to be used only with single substance / refrigerant)
 - Charge migration method
 - Use of system compressor
- **Active**
 - With a recovery machine



Recovery Methods and Machines

- **Passive** (No external recovery machine used, to be used only with single substance substance / refrigerant)

- Charge migration method
- Use of system compressor



- **Active**

- With a recovery machine



Refrigerant Handling

- Always be thoroughly familiar with surroundings.
- Wear personal protection equipment (PPE) including safety glasses, gloves, and protective clothing.
- Recovered refrigerant may be acidic. BE CAREFUL.
- Do not inhale refrigerant vapors.

Refrigerant Handling

- Store tanks in a cool, dry place.
- Always maintain equipment and tools including recovery equipment, gauges, hoses, and refrigerant cylinders.
- Dedicate hoses for use with specific refrigerants to reduce cross-contamination.
- Change oil and filters regularly on recovery equipment.

Refrigerant Oils

- Alkylbenzenes
- Glycols
- Esters

Refrigerant Oils

- A list of refrigerants with their appropriate oils.

CFC REFRIGERANTS	APPROPRIATE LUBRICANT		
	MINERAL OIL	ALKYL BENZENE	POLYOL ESTER
R-11	+		
R-12	+	+	✓
R-13	+	+	✓
R-113	+	+	✓
R-114	+	+	✓
R-115	+	+	✓
R-500	+	+	✓
R-502	+	+	✓
R-503	+	+	✓

HCFC REFRIGERANTS	APPROPRIATE LUBRICANT		
	MINERAL OIL	ALKYL BENZENE	POLYOL ESTER
R-22	+	+	✓
R-123	+	+	
R-124		+	✓
R-401A	+	+	✓
R-401B		✓	✓
R-401C		✓	✓
R-402A		+	✓
R-402B	+	+	✓
R-403A		✓	✓
R-403B		✓	✓
R-405A		✓	✓
R-406A	+		
R-408A		+	✓
R-409A	+	+	✓

HFC REFRIGERANTS	APPROPRIATE LUBRICANT		
	MINERAL OIL	ALKYL BENZENE	POLYOL ESTER
R-23			+
R-32			+
R-125			+
R-134a			+
R-143a			+
R-152a			+
R-404A			+
R-407A			+
R-407B			+
R-407C			+
R-410A			+
R-410B			+
R-507			+

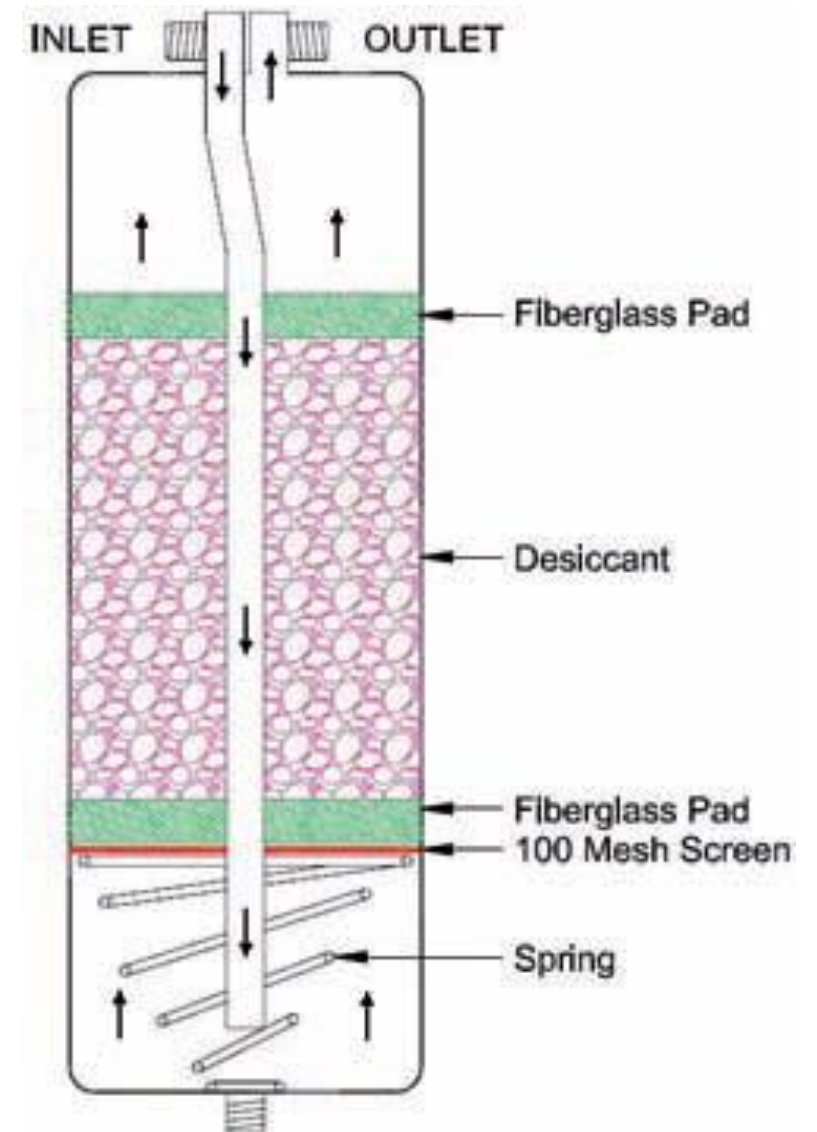
+ GOOD SUITABILITY

✓ APPLICATIONS WITH
LIMITATIONS

NOTE: ALWAYS CONSULT WITH THE COMPRESSOR
MANUFACTURER FOR THE APPROPRIATE LUBRICANT.

Recycling Method and Machines

- Removal and absorption of:
 - Acid
 - Moisture
 - Particulate matter
- Recycling filter must be regularly changed according to manufacturers' recommendation and refrigerant contamination state.



Reclamation Methods and Machines

- Process used refrigerant to new product specification either by distillation or electrostatic methods
- Chemical analysis of the refrigerant required to determine that appropriate product specifications are met
- Some reclamation centers are currently open in India . More will come up.
- Refrigerants R-12, R-134a, R-401B, R-401A, R-409A, R-22, R-407C, R-410A, R-410B, R-411A, R-411B, R-502, R-404A, R-402A, R-402B, R-408A, R-500, R412A . . . and more



Reclamation Centers in India



ANDHRA PRADESH

Mr. T. Veerender Nath
Maega Services
3-3-780/B, Kuthbiguda, Esamia Bazaar
Hyderabad -500 027d

Tel: 040-2465 3602
Mobile: 98492 03750
E-Mail: veerender.nath@gmail.com

CHANDIGARH

Mr. Anant Wadhwa
Anant Enterprises
5397/1, Modern Residential Complex
Manimajra, Chandigarh-160101

Tel: 0172-2735163
Mobile: 9814701541-9417566241
E-Mail: anant.wadhwa@gmail.com

GUJARAT

Mr. Naranbhai M Patel
Kirti Freeze
Kirti House, Ashirwad Complex
Ashram Road Ahmedabad -380009

Tel: 079-2658 0466
Mobile: 9426301242
E-Mail: naranbhai.mpatel@gmail.com

KARNATAKA

Mr. C. J. Mathew,
Dewpoint Appliances (P) Ltd
808, 10th A main, 1st Stage
Indiranagar, Bangalore - 560038

Ph: 080-25299325
Mobile: 9845070594
E-Mail: cjmathew@gmail.com

RAJASTHAN

Mr. Surendra Bohra
Bohra Services
60 Gem Enclave, Pradhan Marg
Malaviya Nagar Jaipur- 302017

Tel: 0141-2522400
Mobile: 9414066545
E-Mail: surendra.bohra@gmail.com

UTTAR PRADESH

Mr. Rajesh Misra
Isha Enterprises
A-103, Sector-B, Aliganj Opp. Aliganj Post Office
LUCKNOW - 226 024

Tel: 0522-2949637
Mobile: 9415024423
E-Mail: isha.enterprises@gmail.com

WEST BENGAL

Mr. Navin Lamba
Crystal Refrigeration Company
7, A.J.C. Bose Road Kolkata 700017

Tel: (033) 2283-4424, 2287-4488
Mobile: 98307-42907, 98308-20648
E-Mail: crystalrefrigeration@gmail.com

रिक्वर किए गए रेफ्रिजरेट का शुद्धिकरण

एचएफसी एवं एचएफसी की रिक्वर की गई
एच सी एफ सी को-आउट मैनेजमेंट योजना के तहत एक कदम

क्या आप विभिन्न एचसीएफसी एवं एचएफसी की रिक्वर की गई
यह सोचते लगते हैं कि उनका क्या करें?
आप हमारी शुद्धिकरण सेवाओं का लाभ उठा सकते हैं!!

Reclamation of Recovered Refrigerant

An initiative of National CFC Consumption Phase-out Plan (NCCoPP)
& now under HCFC Phase-out Management Plan (HPMP)

Are you recovering HCFCs & HFCs?
Do not know what to do with them?
You can avail the facility of reclamation services!!



उपलब्ध सेवाएं

- कम से कम 'संसाधन शुल्क' पर रेफ्रिजरेट का शुद्धिकरण।
- आप रिक्वर गया रेफ्रिजरेट शुद्धिकरण केंद्र पर जमा कर सकते हैं।

शुद्धिकरण के फायदे

- शुद्धिकरण किया गया रेफ्रिजरेट लगभग शुद्ध गुणवत्ता के बराबर का होता है और इसे शुद्ध रेफ्रिजरेट की जगह पुनः प्रयोग किया जा सकता है। इससे खर्च कम होगा।
- शुद्धिकरण किया गया रेफ्रिजरेट किसी भी उपकरण या चक्र में प्रयोग किया जा सकता है।
- सर्विसिंग के लिए शुद्धिकरण किए गए एच सी एफ सी एवं एच सी रेफ्रिजरेट के प्रयोग से मौजूदा उपकरण 2030 के बाद भी चलते रहेंगे।
- सुधार केंद्रों पर आर-22, आर-502, आर-134ए, आर-404ए, आर-407सी और आर-410ए जैसे रेफ्रिजरेट्स की विशाल रेंज का शुद्धिकरण संभव है।
- शुद्धिकरण प्रक्रिया, रीसाइकलिंग प्रक्रिया से कहीं ज्यादा प्रभावकारी है।

Services on Offer

- Reclamation of refrigerant for a minimal "processing charge"
- Recovered refrigerant can be deposited at Reclamation Centres

Advantages of Reclamation

- Reclaimed refrigerant is near virgin (pure) quality & can be reused in place of virgin refrigerant
- This will result in cost saving
- Reclaimed refrigerant can be used in any appliance or equipment
- Using reclaimed refrigerant HCFCs & HFCs for servicing can help to keep the existing equipment running far beyond 2030
- Reclamation of a wide range of refrigerants such as R-22, R-502, R-134a, R-404A, R-407C and R-410A is possible at the reclamation centres
- Reclamation process is far more effective than the recycling process

आप वर्तमान शुद्धिकरण केंद्रों का किस प्रकार लाभ उठा सकते हैं?

- विभिन्न रेफ्रिजरेट्स को रिक्वर करके अलग-अलग सिलिंडरों में भर कर रखें।
- शुद्धिकरण में मदद के लिए रेफ्रिजरेट्स को आपस में मिलाने से बचाएं।
- रिक्वर हुए रेफ्रिजरेट को शुद्धिकरण केंद्रों पर लाएं।
- मूलतः संसाधन शुल्क अदा करके पुनः प्रयोग के लिए इसका शुद्धिकरण करवाएं।
- आप न सिर्फ वातावरण का बचाव करेंगे बल्कि काफी मात्रा में पैसा भी बचावेंगे।

लघु शुद्धिकरण केंद्र

- एनसीओपी एवं एचसीएफसी को-आउट मैनेजमेंट योजना में भारत में शुद्धिकरण केंद्रों की शुरूआत की।
- सात केंद्र स्थापित किये जा चुके हैं।
- इसी तरह के केंद्र देश भर में खोले जाएंगे।

How you can benefit from the existing Reclamation Centres?

- Recover and store the various refrigerants in separate cylinders. Cross contamination of refrigerants should be avoided to aid reclamation
- Bring the recovered refrigerant to the reclamation centres
- Get it purified for reuse by paying the minimal "processing charge"
- You will not only save the environment but also substantial amount of money.

Mini Reclamation Centres

- Reclamation Centres introduced in India
- Seven centres have been established in Country
- More centres would be coming up across the country

शुद्धिकरण क्या होता है?

रिक्वर (प्रयोग किया हुआ) हुए रेफ्रिजरेट को डिस्टिलेशन सहित, विभिन्न प्रक्रियाओं द्वारा शुद्ध रेफ्रिजरेट के स्तर तक लाने के प्रक्रिया को शुद्धिकरण कहते हैं।

Why Reclamation?

Reclamation is the processing of recovered (used) refrigerant to the level of virgin refrigerant by using various processes including distillation.

What is Reclamation?

Commonly used refrigerants like HCFCs (R-22) deplete Ozone Layer in the stratosphere and HFC refrigerants contribute to global warming. Production of HCFCs will gradually drop to zero by 1 January 2030 expect 2.5% of the base line for service sector. The availability of HCFCs beyond January 2020 will be scarce, as the production will reduce. This will give rise to a substantial price increase of HCFCs in the near future. Reclamation of recovered refrigerant will provide cost effective solution for the continued availability of these refrigerants for servicing and to keep the existing equipment in operation beyond 2030.



अधिक जानकारी के लिए कृपया यहां सम्पर्क करें:

अनन्त इन्टरप्राइजेज
दुकान नं. 15-बी, खालसा मार्केट, गोबिन्दपुरा,
मनिमजरा, चण्डीगढ़ (यू.टी.)
दुकान : 9417333569, 9417566241
ई-मेल : ozone.chandigarh@gmail.com

For further information, please contact:

Anant Enterprise
Shop No. 15-B, Khalsa Market, Gobindpura,
Manimajra, Chandigarh (U.T.)
Ph. : 9417333569, 9417566241
E-mail : ozone.chandigarh@gmail.com



Reclamation Centers in India

ANDHRA PRADESH

Mr. T. Veerender Nath

Maega Services

3-3-780/B, Kuthbiguda, Esamia Bazaar
Hyderabad -500 027d

Tel: 040-2465 3602

Mobile: 98492 03750

E-Mail: tvnath@rediffmail.com

CHANDIGARH

Mr. Anant Wadhwa

Anant Enterprises

5397/1, Modern Residential Complex
Manimajra, Chandigarh-160101

Tel: 0172-2735163

Mobile: 9814701541/9417566241

E-mail: czone.chandigarh@gmail.com

GUJARAT

Mr. Naranbhai M Patel

Kirti Freeze

Kirti House, Ashirwad Complex
Ashram Road Ahmedabad -380009

Tel: 079-2658 0466

Mobile: 9426301242

E-Mail: zeelpower@sify.net.in

KARNATAKA

Mr. C. J. Mathew,

Dewpoint Appliances (P) Ltd

808, 10th A main, 1st Stage
Indiranagar, Bangalore - 560038

Ph: 080-25299325

Mobile: 9845070594

E-Mail: cjmathew@gmail.com

Reclamation Centers in India

RAJASHTHAN

Mr. Surendra Bohra
Bohra Services

60 Gem Enclave, Pradhan Marg
Malaviya Nagar Jaipur- 302017

Tel: 0141-2522400

Mobile: 9414066848

E-mail: surendra@landmarkin.in

UTTAR PRADESH

Mr. Rajesh Misra
Isha Enterprises

A-1/3, Sector-B, Aliganj Opp. Aliganj Post Office
LUCKNOW - 226 024

Tel: 0522-2969637

Mobile: 9415024423

E-mail: isha.enterprises@rediffmail.com

WEST BENGAL

Mr. Navin Lamba
Crystal Refrigeration Company

7, A.J.C. Bose Road Kolkata 700017

Tel: (033) 2283-4424, 2287-6488

Mobile: 98307-62907, 98308-20848

E-mail: crystalrefrigeration@gmail.com

Business Opportunity

- Cost of Reclamation of refrigerant per Kg. = INR 120/-
- Cost of new Refrigerant HCFC-22 per Kg. = INR 600/-
- **Saving for Dealer/RAC technician per Kg. = INR 480/-**

Opportunity is open for all RAC Dealers to partner with any of the Reclamation Centre in India



Any Questions?