Outline of JARAC Activity for Fluorocarbons



Japan Association of Refrigeration and Air-Conditioning Contractors

Table of contents

- 1. Outline of JARAC
- 2. Background: Regulation and Relevant Activities by Industry
- 3. Leakage of HFCs in Japan
- 4. Roles of user
- 5. JRC GL-01
- 6. Training of engineers
- 7. Dissemination and enlightenment of the Freon Emission Control Law
- 8. Retraining of active engineers (Brazing)
- 9. Disposal of recovered refrigerant
- 10. Summary

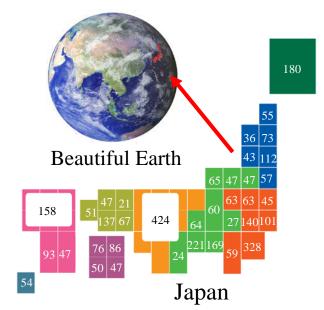
1. Outline of JARAC

Japan Association of Refrigeration and Air-Conditioning Contractors

JARAC is a group of refrigeration and air conditioning equipment contractors.

Member

37 Organizations (3,321 Companies)
JARAC is run by directors selected from each organization.



JARAC's main work is as follows:

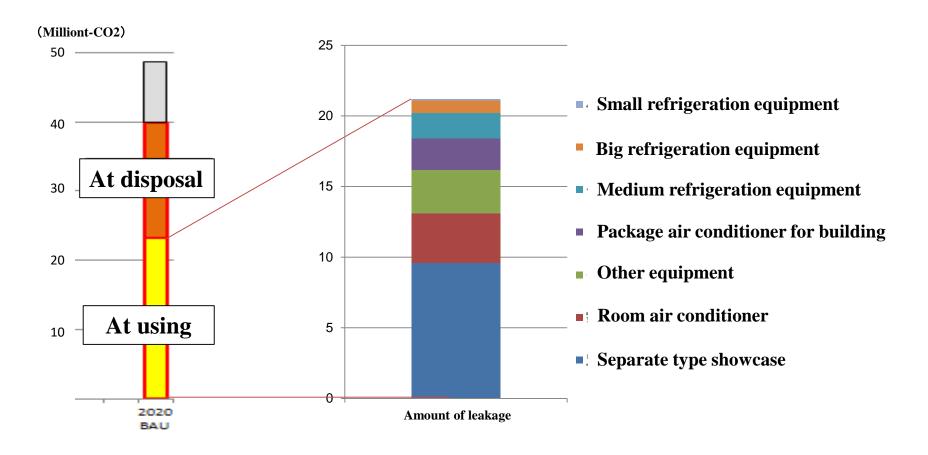
- ➤ Promotion of ozone layer protection and measures to prevent global warming
- Ensuring the quality of refrigeration and air conditioning work
- > Promotion of energy conservation
- ➤ Holding seminars
- > Investigation and provision of technical information

2. Regulation and Relevant Activities by Industry

	International	Japan	Industry
1940 ~	1974 Ozone depletion found 1985 Vienna Convention 1987 Montreal Protocol	1954 High Pressure Gas Control Law 1988 Ozone Layer Protection Law	1949 JRAIA established as "the Japan Refrigerating Machine Manufacturers Association" 1972 JARAC established as "Japan Association of Refrigeration and Air-Conditioning Contractors"
1990 ~	1992 UNFCCC 1997 Kyoto Protocol	2001 Law concerning the Recovery and Destruction of Fluorocarbons 2009 Survey results of Leakage of HFCs in Japan	1993 Refrigerant Recycling Center (RRC) established 1994 Training course for refrigerant recovery technician certification started
2010 ~	2015 Paris (COP21) 2016 Kigali(MOP28) 2019 Rome(MOP31)	2014 Act on Rational Use and Proper Management of FCs (Amended) 2019 Ozone Layer Protection Law (Amended) 2020 Act on Rational Use and Proper Management of FCs (Amended)	 2010 JRC GL-01 Fluorocarbon Leak Inspection and Repair Guideline 2014 Type 2 fluorocarbon refrigerant handling technicians started 2016~2019 Dissemination and enlightenment of the Freon Emission Control Law

3. Leakage of HFCs in Japan

About 10 years ago, METI's investigation revealed that there are very much refrigerant leakage of fluorocarbons when using refrigeration and air conditioning equipment.



4. Roles of user (1/4)

1 Proper installation location for equipment

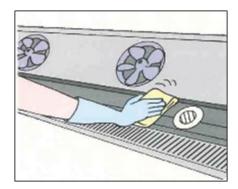
- Ensure that there are no vibration sources around the installation location, and avoid, as far as possible, locations where large vibrations may occur, e.g., where other equipment is close nearby, or near roads traveled by large trucks.
- Avoid corrosive environments with such as exhaust gas, dispersal of seawater.

2 Secure necessary space for the inspection/repair

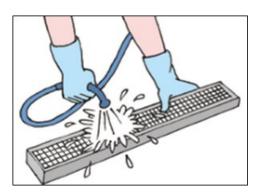
- Ensure the enough space for inspection or repair after installation.
- 3 Maintenance and management of a suitable usage environment
 - Periodically clean drain plates, condenser, and heat exchangers
 - Periodically remove drainage water
 - Be very careful when installing other equipment on top of the equipment. (To prevent equipment damage and degradation of performance)



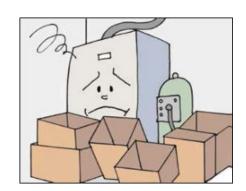
Secure space for inspection/repair



Showcase drain cleaning



Showcase honeycomb cleaning



Keep tidy around outdoor unit

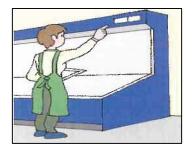
4. Roles of user (2/4)

- **1** Basic leak inspection by user
 - > All commercial refrigeration and air conditioning equipment

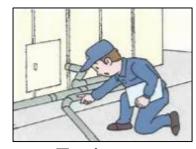








- **②** Periodic leak inspection by engineer
 - ➤ Carrying out periodic leak inspection of equipment by Engineer
 - > Conducted at the frequency shown in the table below



Engineers

Type	Rated output of compressor motor	Inspection frequency
A in sou dition on	7.5kW or more, less than 50kW	At least once every 3 years
Air conditioner	50kW or more	At least once a year
Refrigeration/Freezing equipment	7.5kW or more	At least once a year

4. Roles of user (2/4) Example of basic leak inspection of air-conditioner

Check points and items (only when the inspection can be done safely and easily)

				on can be deno early and eachy,
Check points		Check items		
	1	Frost formation on heat exchanger		① ② ③ ④
T. L. TI.4	2	Smear of oil on heat exchanger or tube		
Indoor Unit	3	Smear of oil on surroundings		
	4	Abnormal vibration or operating sound		
	⑤	Abnormal vibration or operating sound		
Outdoor Unit	6	Smear of oil on surroundings		
Outdoor Omt	7	Flaw, corrosion, or rust of heat exchanger		Some grills rise and lower
	8	Flaw, corrosion, or rust of refrigerant tube		automatically
		(5) (49) (5) (49) (6) (6) (6) (6) (6) (6) (6) (6) (6) (6		
_	-5		7	8
Outdoor unit is	vibra	Outdoor unit is making unusual noises 6	Correction	on on the lower section of a heat exchanger
			on on the lower section of a fleat exchanger	

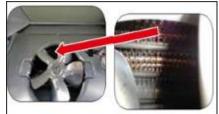
4. Roles of user (2/4) Ex of basic inspection of showcase

Check points and items (

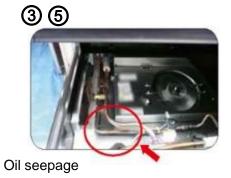
Check points	Check items							
	1	Temperature inside (confirm if its within preset range)						
Indoor	2	Frost formation on heat exchanger						
display case	3	Smear of oil on heat exchanger or tube						
	4	Smear of oil on surroundings						
	⑤	Abnormal vibration or operating sound						
Outdoor Unit	6	Smear of oil on surroundings						
Outdoor Cint	7	Flaw, corrosion, or rust of heat exchanger						
	8	Flaw, corrosion, or rust of refrigerant tube						

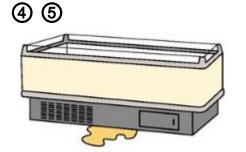


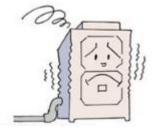


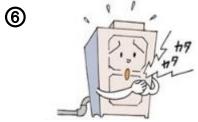


Frost on heat exchanger checked from gaps between fan blades





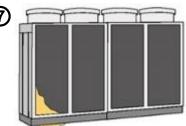




Outdoor unit is vibrating abnormally

Outdoor unit is making unusual noises



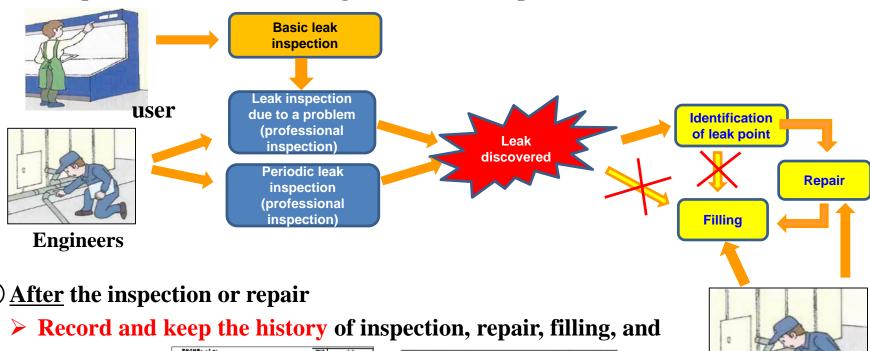




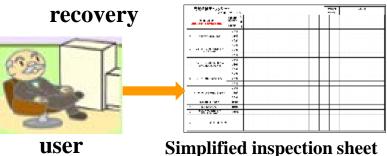
Corrosion

4. Roles of user (3,4/4)

- 3 When a refrigerant leak has been discovered
 - > Prompt identification and repair of leak points
 - > It is prohibited to fill the refrigerant without repairs



4 After the inspection or repair





Inspection record book

Engineers

4. Roles of user (4/4)

Recording and storage of the history of inspection, repair, and refilling

Refrigera	nt Leak	Inspect	tion and I	Maintenar	nce Regis	ster		(Year)	(Month)	(Day)	~	(Yea	ır) (Month)		(Day)		Control#						olementary items
Equip.	(Compar	ny) Name	Э									E	Equipment man	ufactu	urer								
manager	Address									System name		lı	Installation date			(Year) (Month) (Day)							
Equip.	Facility r	name							TEL				L		SS		N		Model	lel			
location	Address								TEL				Equipment used	Prod	duct#				Applica	ition			
Person resp managing e		r							TEL														
Inspection company	1								TEL				Refrigerant quanti		Total filling amount		otal recovery mount	Total le	akage	CO2 to	n		
name/									TEL				kg)										
address									TEL			F	Refrigerant used	ı		In	itial total fill	(kg)					
GWP of pr	imary refri	gerant	R11	R12	R32	R134a	R22	R123	R245fa	R502	R404A		07A R407	_	R410A	R410B	R152a	R142	_	R507A	R543		
			4750	10900	675	1430 mount (kg)	1810	77	1030	4660	3920	2	110 1770)	2090	2230	124	2310) ;	3990	1000		
Date of	work	Inspe	ection/main category		J	Amount filled from recovered portion (kg)	Recovery amount (kg)	Inspec	tion content	Inspec tion result	Cause o leakage, damage	′	Leakage/ damaged location	Re	epair conte	nt ins	of contractor pection/repa recovery/fill	ir/ Tec	hnician name	Technic No.	re	eason if pair not mpleted	Scheduled repair date
																		Т					
		10000000																			-		1

5. JRC GL-01

JRC GL-01: Guideline for leak inspection and repair for reducing fluorinated greenhouse gas emission from commercial refrigerating and air condition equipment and systems (Japan Association of Refrigeration and Air-Conditioning Contractors (JARAC))

http://www.jarac.or.jp/business/cfc_leak/dl/JRC_GL-01-20190530.pdf

- 1. Scope
- 2. Normative References
- 3. Term and definitions
- 4. Requirement of method of leakage inspection
- 5. Requirement of procedure of leakage inspection
- 6. Requirement of periodical inspection
- 7. Requirement of repair of leakage
- 8. Publication of inspection record book
- 9. Requirement of prevention and maintenance of refrigerant leakage

Appended Document A∼M

- A) Judgment criteria for refrigerant system leak inspection
- B) Leak inspection by direct method
- C) Pressure leak testing, vacuum testing (vacuum drying)
- D) Procedures for periodic inspection
- E) Causes of leaks and examples
- F) Procedure for refrigerant recovery work
- G) Procedure for refrigerant filling

- H) Brazing procedure
- I) Flare connection procedure
- J) Preventive measures against piping breakage
- K) Refrigerant piping support
- L) Flow of construction and maintenance (repair)
- M) Checklists for preventing refrigerant leaks (reference)



5. JRC GL-01 (6. Requirement of periodical inspection)

System Leakage Check (visual check)

Appearance of the whole system is checked by visual and auditory perception before direct and indirect inspection.

Direct Inspection

Leak detection equipment method



Detect fluorocarbons leaking from tubes by using electronic detection equipment. This method can detect smaller amount of leakage than other methods, depending on the equipment's accuracy.

Bubble solution method



Suitable to detect pinpoint leakage. Apply bubble solution over the potential leakage point, and detect fluorocarbons blowing out from the point.

Fluorescent agent method



Inject fluorescent agent into tubes, and detect the leakage point by identifying the leaking agent by using ultraviolet lamp.

Indirect Inspection

By utilizing checklists shown below, confirm any abnormal operating condition and conduct diagnosis of leakage.

	eces	超母 (流1)	W(2	正常日 安値 (注2)	31:3190	期日点	下記の視象では ないこと(注3)	tiz
	①低圧圧力 (高発圧力)	Ps	(MPa) (ゲージ田)			性謝がないか	制御による変化	
•	(登高圧圧力 (超線圧力)	Pd	(MPa) (ゲージ田)			妊娠ぎないか	制御による変化	
b	吐出ガス温度		('0)			高速ぎないか	冷解系統のつま り、機様弁の故障	
	① 圧縮機能散用 電散機の電圧		(V)			任過ぎないか	制御による変化	
e	⑥圧縮機能計用電散機の電流		(A)			妊娠ぎないか	制御による変化	
	海岸加深温度	Td	('0')			THE STATE OF THE PARTY.		
ī	吸入ガス温度	Ts	(0°)			HIS PERSON		0000
E.	英竞技和温度	Te	('0')					
8	湖陰粉和甚度	Te	(%)					
d	区进转度	Ts-Te	00	7000		大き過ぎないか	冷放系統のつま り、被後外の転鐘	
e	医细胞腺	To-Td	00			小さ過ぎないか		
1	仮圧降機の退熱		(%)			高者ざないか	冷城系統のつま り、競技弁の故障	
200	吸込空気器度		(%)					318.V
10	攻出空氣温度		(°C)					8190
10	治水入口温度		(%)					BIN
U	冷水出口温度		('0')					16172
	(7.吸込/吹出空気 温度差		00			小さ過ぎないか	無負荷が極端 に小さい	
£	⑥清水入口/出口温 度差		00			小さ過ぎないか	熱食薬が極端 に小さい。液量 が極端に多い	
h	①機器内の配管の 振動					異常に振動して ないか	* 無機による変化	
i	位该水蛭の流れ状 類(サイナラス)					気迫が発生して ないか	い 別負荷が極端 に大きい	
)	検室回数、水体表面 (毎圧点接使用のタ ーボ水楽器)					液質が極端に低 下していないか	0.1	

It is important that inspections are conducted using proper methods that conform to refrigerant leak inspection guidelines, etc., established by industry groups.

6. Training of engineers ①

Training course for refrigerant recovery technician certification. FY1985~FY2019 about 85,000 engineers

- > Established with the aim of certifying recovery engineers to supply high-quality recovery fluorocarbons to RRC-certified recycling facilities.
- For those who do not have experience or technical qualifications, he lectures on the basics of environmental issues, fluorocarbon emission control law, high pressure gas safety law, health and safety, recovery technology, and refrigeration and air conditioning technology.





Certificate



Textbook for training

6. Training of engineers ②

Type 1 Certified Training session for refrigerant fluorocarbons refrigerant handling engineer

FY1985~FY2019 27,913 engineers

For engineers who already have qualifications and experience in refrigeration and air conditioning technology, We give lectures on environmental issues, "Act on Rational Use and proper Management of Fluorocarbons", "High Pressure Gas Safety Act", filling, recovery, and leakage inspection methods, etc.



Certificate



Textbook for training



Pocket manual on FCs handling

6. Training of engineers ③

Class 2 Certified Training session for refrigerant fluorocarbons refrigerant recovery technician certification.

FY1985~FY2019 27,913 engineers

For engineers who have only experience in refrigeration and air conditioning technology, we are lecturing on the basics of refrigeration and air conditioning technology in addition to environmental issues, "Act Rational Use and proper Management of Fluorocarbons", "High Pressure Gas Safety law", health and safety, leak inspection method.



Certificate



Textbook for training



Pocket manual on FCs handling

7. Dissemination and enlightenment of the Freon Emission Control Law

As equipment users have also a responsibility to prevent fluorocarbon leakage, these information sessions are held to explain the appropriate measures to them as seen in the figure above. (Free session about 3hours)

FY2014~FY2018 about **14,000** Users

FY2014~FY2018 about 5,000 Active engineers



session underway



Material for the information session



Handbook on basic inspection



Commercial song (The Song of the Freon Act)

8. Retraining of active engineers (Brazing)

Leakage of refrigerant fluorocarbons from air conditioners and refrigeration machines often occurs from voids at joints when equipment is installed and installed, and it is important to train construction engineers for leakage during use.

FY2014 9 Sessions 91 instructors FY2015 40 Sessions 404 engineers FY2016 28 Sessions 308 engineers FY2017 21 Sessions 193 engineers FY2018 19 Sessions 161 engineers FY2019 20 Sessions 200 engineers (to be implemented)



seminar



Text book



Safety work



Teaching practical skills



Brazing horizontal piping



Brazing work from the front



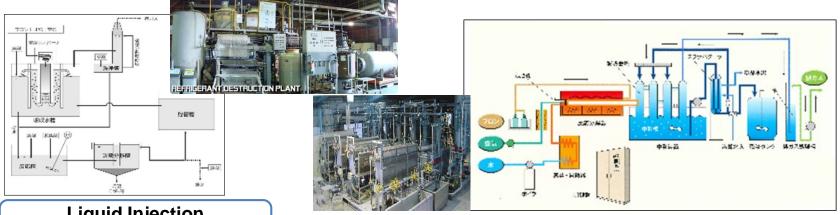
Vertically split copper tube



Evaluation of penetration of brazing materials

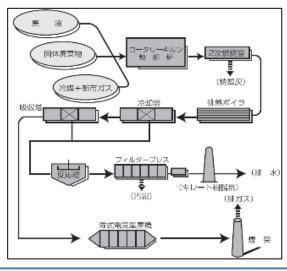
9. Disposal of recovered refrigerant ①

Examples of equipment to destroy refrigerants

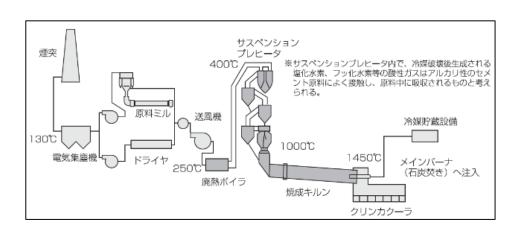


Liquid Injection Incineration Method

Overheated Steam Pyrolysis Method



Rotary Kiln Combustion Method



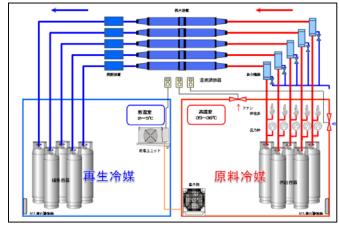
Cement Kiln Method

9. Disposal of recovered refrigerant 2

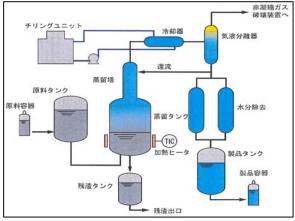
Examples of equipment to recycle refrigerants











Recovery Equipment with Recycle Function

Simplified Distilling Equipment

Distillation Purification Facility

9. Disposal of recovered refrigerant 3

Recycling and destruction operators licensed by the government of Japan are indicated below.





As of Dec. 7, 2017

As of Jan. 16, 2018

10. Summary

- 1. Training of refrigerant fluorocarbon handling engineers to prevent leakage of fluorocarbons
- 2. Dissemination and awareness of freon emission control methods
- 3. Retraining of brazing, flare processing, etc. for refrigerant piping engineers
- 4. Research and research to improve recovery rate
- 5. Introduction of Japanese technology and systems overseas to control emissions of fluorocarbons

Thank you for your listening.



Japan Association of Refrigeration and Air-Conditioning Contractors

Kikaishinko-kaikan, 3-5-8, Shibakoen, Minato-ku, Tokyo 105-0011, Japan

Phone: 03-3435-9411 FAX: 03-3435-9413

E-mail: info@jarac.or.jp URL: http://www.jarac.or.jp