

newsTRAC

NEWSLETTER FOR TECHNICIANS IN REFRIGERATION AND AIRCONDITIONING (RAC) SERVICING SECTOR

ISSUE 2

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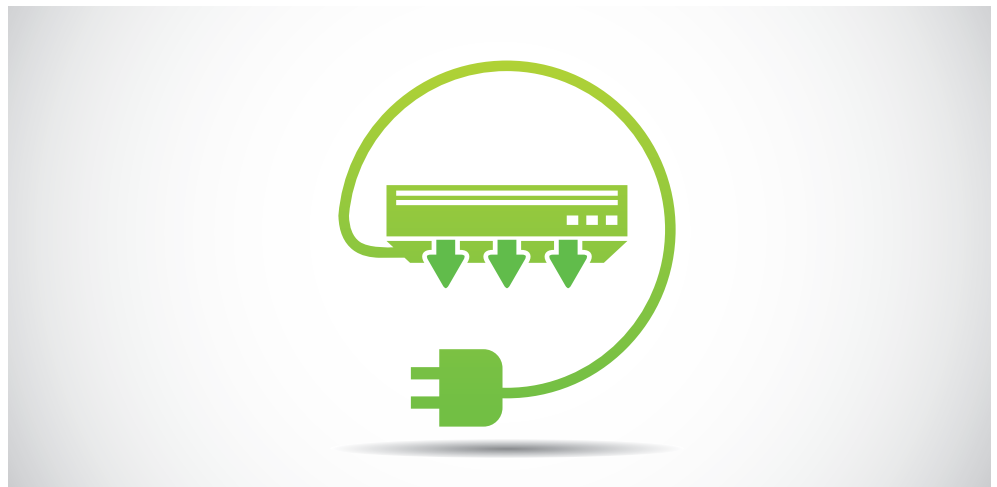
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Ministry of Environment,
Forest & Climate Change
Government of India



THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future



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Foreword

Dear Reader,

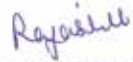
Ozone Cell, Ministry of Environment, Forest and Climate Change in collaboration with The Energy and Resources Institute (TERI) is bringing out this 2nd edition of the NewsTRAC, the quarterly newsletter with the theme "Opportunities for Refrigeration and Airconditioning (RAC) service technicians to attain the sustainable business".

As part of the implementation of the Hydrochlorofluorocarbons (HCFC) Phase out Management Plans (HPMPs), publication of NewsTRAC has been an effective medium in promoting awareness on issues of relevance to the RAC servicing sector including good servicing practices, occupational safety, social security and access to finance for the service technicians, recovery, reclaiming and recycling of refrigerants, certification system for technicians, etc.

Servicing sector will be a key thrust during implementation of HPMP Stage-III, to be commenced shortly. As part of HPMP Stage-III implementation framework, to be developed in cooperation with all the stakeholders associated with the servicing. While developing the framework, it is also equally important to get the RAC service technicians prepared for implementation of hydrofluorocarbon (HFC) phase down as per the schedule of the Kigali Amendment, considering the challenges associated with the low global warming potential refrigerants.

The NewsTRAC presents a comprehensive picture on various initiatives and relevant inputs such as certification system for RAC technicians, promoting sustainability in the RAC servicing sector, contribution of RAC sector to climate change etc. This Newsletter merits wide dissemination amongst the RAC service technicians and all the concerned stakeholders to not only promote the various initiatives taken in the servicing sector, but also serve as a medium for getting inputs for addressing the key issues in the servicing sector in the National Strategy for HFC phasedown, currently under development.

I commend the efforts of Ozone Cell, The Energy and Resources Institute (TERI), United Nations Environment Programme (UNEP), and the contributing authors for bringing out the 2nd edition of the NewsTRAC.


(Rajasree Ray)

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CERTIFICATION SYSTEM FOR REFRIGERATION AND AIR CONDITIONING (RAC) TECHNICIANS

Ms. Smita Vichare, Senior Project Advisor, GIZ-Proklima

Refrigeration and air conditioning (RAC) have increasingly become a significant component of the country's economic and social development. Due to the growing population, rapid urbanization, construction of commercial and residential buildings, the need to preserve and distribute perishable food items, increasing temperatures, heat waves due to climate change, etc. demand for RAC is rapidly increasing. The India Cooling Action Plan (ICAP) has estimated that aggregate average cooling demand would increase eight times in the next two decades. The requirement for technicians for installation and servicing in this sector is expected to grow, leading to the generation of employment opportunities in the country.

The RAC servicing sector consumes a significant quantity of refrigerants each year. The servicing sector requires over 40% of the refrigerants consumed annually in the country. It is noticed during servicing/repair of the RAC equipment and end-of-life disposal of the equipment that high quantities of refrigerants get emitted into the environment. The RAC servicing sector's significance has grown in recent years as it has become clear that most refrigerant emissions to the environment occur during RAC equipment service and end-of-life disposal.

RAC servicing sector

The RAC servicing sector in India is made up of a diverse range of establishments that provide maintenance services for all types of refrigeration and air conditioning equipment and systems. The sector is estimated to employ approx. 350,000 technicians in formal and informal enterprises/sectors. Service workshops are considered formal when they are registered with relevant government authorities (e.g., manufacturers' service centers and larger authorised service workshops). Most RAC servicing workshops in India operate in the informal sector with 1-2 technicians working in the workshop.

Refrigerant consumption in the servicing sector depends not only on the quality of the product but also on the quality of service provided during the product life cycle. Regarding service quality, there is a wide variation of failure rates depending on the knowledge and skill levels of technicians, who are primarily from the unorganized sector without formal access to technology and training.

Capacity Building / Training

Currently, various training channels offer courses for RAC technicians by the equipment manufacturing industry, industry associations, National Skill Development Corporation Electronic Sector Skill Council of India (NSSCI), Multilateral agencies like GIZ implementing the HCFC Phase-out Management Plan (HPMP) project, and the formal education through Industrial Training Institutes (ITI).

One way to ensure a high skill level in the RAC sector is to maintain a well-structured national qualification, certification, and registration (QCR) system. In the country, there are various institutes conducting training for technicians and propose for synergising the training. This will lead to the implementation of the QCR system and harmonise the QCR processes in the country.

QCR is briefly explained here in the diagram.



Why training and certification for technicians

The technicians should understand the properties of the refrigerants in the new technologies of the equipment/appliances in the market before installing and servicing them. They are flammable and/or with high pressure. To handle these refrigerants, and for good servicing practices, the technicians should undergo training. A qualified and certified technician will get good business opportunities and higher income, as qualified technicians are preferred by customers.

PROMOTING SUSTAINABILITY IN THE REFRIGERATION AND AIR-CONDITIONING SERVICING SECTOR

Prof. R S Agarwal, Advisor, Ozone Cell; **Ashish Saraswat**, Associate Fellow, TERI

Background

Refrigeration and air-conditioning (RAC) servicing sector is required to service a large variety of appliances/equipment operating over a range of temperatures/pressures and applications. The RAC servicing sector is increasingly becoming important not only because it consumes a large proportion of the total consumption of refrigerants annually, but it is also the key to efficient operation of the RAC equipment. The servicing sector accounts for more than 40 percent of annual refrigerants consumption in the country. The leakage rate of refrigerants varies from equipment to equipment as well as application to application. The variation may be ranging from 5 percent to 30 percent.

RAC sector is also a major source of greenhouse gas (GHG) emissions, it contributes to emissions in two ways: direct emissions due to the release or leakage of refrigerants; and indirect emissions of CO₂ from fossil power plants, which increase when the degradation of the performance of refrigeration systems results in higher energy consumption. It is well known that the performance of RAC equipment decreases over the period of operation due to factors that include age, defects, leakage of refrigerant and poor service practices. The efficient operation of RAC equipment and prevention of emissions of refrigerants can be ensured by deploying good service practices which includes proper installation, preventive maintenance and service of the equipment. The quality of servicing of RAC equipment, depends on the knowledge and skill levels of technicians and use of appropriate servicing tools and equipment. Proper maintenance and servicing can help to maintain performance over the working lifetime of the equipment.

The Montreal Protocol on Substances that Deplete the Ozone Layer has been proved to be a great driver for promoting non-Ozone depleting substances (ODS) and low-GWP alternatives to ODS and high-GWP chemicals and it is increasingly promoting use of good servicing practices in servicing sector. India being the Party to the Montreal Protocol has ratified all the amendments to the Montreal Protocol including the Kigali Amendment for phase-down of HFCs in September, 2021 and implementing projects/plans and servicing sector activities for phase-out/phase-down of controlled substances as per the schedule of the Montreal Protocol. The Kigali Amendment

to the Montreal Protocol was adopted by the 28th Meeting of Parties in October, 2016 for phase down of high-GWP HFCs that would move the RAC sector to use low-GWP refrigerants. It has been well recognized that the servicing sector has been playing a vital role in the phase-out/phase-down of controlled substances under the Montreal Protocol but it would be becoming increasingly challenging for the servicing personnel, especially for the technicians as most of low-GWP alternative refrigerants are expected to be flammable.

Challenges for the Servicing Sector

Historically, most of the commonly used HCFC and HFC refrigerants have been non-flammable, non-toxic and with moderate pressures. This trend is rapidly changing due to environmental considerations. The service technicians are expected to handle and service equipment with a number of refrigerants and technologies; each of the refrigerants has its own requirements as all these have different operating pressures, refrigerant charge quantities, charging procedures, lubricating oil, safety requirements etc. The simultaneous implementation of phase-out of HCFCs and phase-down of HFCs and introduction of low-GWP technologies is increasingly becoming challenging, especially for the servicing sector.

The key challenges for the service sector comprise the following:

- A large rapidly growing sector serving multiple applications and variety of equipment;
- Limited skills and knowledge of technicians in handling multiple refrigerants, especially the flammable and high-pressure refrigerants;
- Limited opportunities and capacity building of the technicians to gear up for handling and servicing of RAC appliances/equipment based on upcoming new & varieties of technologies;
- Lack of resources with the service technicians to procure tools and basic service equipment;
- Limited training infrastructure in the RAC sector at various training institutes/centres including National Skill Training Institutes (ISTIs), Institutes of Training of Trainers (ITOTs) and Industrial Technical Institutes (ITIs) in the country;
- Limited trained instructors/trainers with adequate knowledge of low-GWP refrigerants and upcoming RAC technologies;

- Lack of standard instruction/training material/modules amongst various training institutes/ organizations/ agencies;
- Lack of recognition and low remuneration of trained technicians. Need to create awareness among the customers to inculcate confidence amongst customers and job satisfaction amongst service technicians;
- Lack of awareness about the benefits including reduced electricity bill through proper installation and good servicing practices.

Sustainability of RAC Servicing Sector

It is increasingly becoming necessity to develop enabling and sustainable environment for the RAC servicing sector for seamless transitioning of the sector from current level to a level where service technicians are equipped with both the skills and tools and equipment for handling of new flammable refrigerants, service RAC appliances/equipment based on upcoming technologies and to inculcate confidence amongst customers and job satisfaction amongst service technicians.

The key to promote sustainability in the RAC servicing sector would require to make the following interventions:

- Capacity building of training infrastructure
 - » Establishment/upgradation of one (more) of the Institutes as State of Art Institute (s) in RAC service sector to facilitate training network on technological developments including periodic syllabus revisions, revision of training material and to train the faculty/ instructors of ISTIs and ITOTs;
 - » Strengthening of training infrastructure of ISTIs, ITOTs to train the trainers/ instructors of ITIs and other training institutes/centres;
 - » Strengthening of training infrastructure of Industrial Technical Institutes (ITIs) in RAC trade for providing training on latest technologies and skills to new entrant technicians in the trade;
 - » Strengthening of training infrastructure of vocational training centres/partners/industry training centres for short term/refresher training programmes providing opportunities to the existing manpower (technicians) engaged in RAC servicing sector for upgrading their knowledge and skills in the RAC trade.
- *Development of harmonized training/instruction material along with handbooks and guidebooks for all levels of training:* The curricula of various institutes imparting training at different levels to be harmonized and accordingly the training material needs to be developed for maintaining the same standard of education across the country. The training material needs to be reviewed periodically and updated.
- *Tools and equipment support for the technicians:* Recognizing tools & equipment is the key for adoption of GSPs and bring down the consumption and emissions of refrigerants. It is becoming increasingly important for upcoming technologies. There is a need for developing equipment support scheme or link with some existing scheme in consultation with industry and the stakeholders for providing minimum tool kit & equipment to the technicians.
- *Accessibility of training:* An information cum registration App based system needs to be developed for training programmes to be conducted across the country for easy accessing training by the technicians. There should be some fiscal incentive for the technicians especially from informal sector.
- *National qualification, certification and compliance for good servicing practices:* Technical behavioural challenges for establishing best practices in the servicing of RAC appliances/ equipment with low-GWP refrigerants and emerging technologies in a sustainable manner can be managed by National qualification, certification and compliance system. It would play a vital role in improving the quality of service, recognition of trained technicians and their income which important for sustainability of service sector.
- *Awareness amongst the technicians and customers:* Awareness is one of the key elements for understanding the need of adoption of GSPs, certification and for motivation to move towards the formal sector. Although, it may be challenging but very important to develop awareness programmes like developing e-training module platform catering the needs of this target group.

Awareness amongst the customer is also becoming increasingly necessary for educating them about the importance of quality of installation/servicing and its impact on the working life of equipment and electricity bill. The customer appreciation and demand for quality service needs to be enhanced. This will bring a change in customer behaviour to look for certified technicians and make due remuneration for their services. It would also motivate the technicians for learning and practicing GSPs, it would be a Win-WIN situation for all the stakeholders.

It may be necessary to initiate activities for all the above-mentioned interventions, recognizing each of the intervention has its own dynamics, requirements, timeframe and impact on the servicing sector. Taking phase-wise interventions may be helpful to ensure a servicing sector is more willing to participate in the capacity-building initiatives with larger outcomes of better customer satisfaction and productivity. The Table 1 maps the various interventions and their impacts over a short (5 years), medium (10 years) and long term (10-15 years).

Consumer Do IT Yourself

Consumer can perform these maintenance practices to their air conditioner to save money on electricity bill, to avoid frequent maintenance and to increase the life of the equipment



- Air filter of Air conditioner should be cleaned before the start of the summer season. Repeat this practice every 3-6 months.



- Schedule annual maintenance of air conditioner by qualified technicians (at least once a year)



- Check for open spaces around the window AC to keep the cool air inside

Table 1: Impact of intervention during short, medium and long term

Intervention	Short Term Impact (5 years)	Medium Term Impact (10 years)	Long Term Impact (10-15 years)
Establishment/upgrade one or more of the Institutions as State of Art Institute	Moderate	High	High
Strengthening of training infrastructure of ISTIs, ITOTs	Low	Moderate	High
Strengthening of training infrastructure of ITIs	Moderate	High	High
Strengthening of training infrastructure of vocational training centres/ partners/industry training centres	Moderate	High	High
Development of harmonized training/ instruction material	Moderate	High	High
Tools and equipment support for the technicians	High	High	High
Accessibility of training for all the technicians	High	High	High
National qualification, certification and compliance for good servicing practices	Low	Moderate	High
Awareness amongst the technicians	Moderate	High	High
Awareness amongst the customers	Low	Moderate	High
Publishing success stories of trained technicians from the field.	Moderate	High	High

BUILDING A SKILLED WORKFORCE IN AIR CONDITIONING SECTOR

Dr. Abhilasha Gaur, COO, Electronics Sector Skills Council of India

The availability of skilled and certified manpower is the need of the hour across the Electronics System Development and Maintenance (ESDM) sector and specifically the Air Conditioning and Refrigeration Industry which is expanding at a very fast pace and requires certified technicians to handle the HPMP phase out as per the Montreal Protocol. The Electronics Sector Skills Council of India (ESSCI) has aligned its skilling capability to the industry requirements and is making an all-out effort in ensuring the industry requirements for skilled and certified AC technicians with relevant technical capabilities and thus giving a boost to the growth of the sector along with creating employment opportunities for the youth of the country.

The Electronics Sector Skills Council of India (ESSCI) is a Not-for-Profit Organization, registered under the Indian Companies Act, 1956. The Council has been promoted by six Associations i.e. CEAMA, ELCINA, IESA, IPCA, MAIT & ELCOMA, with financial support from National Skill Development Corporation (NSDC).

ESSCI has a multitude of Qualification Packs for skill development in this segment and has been closely developed with the industry after assessing the intrinsic demand for trained technical manpower in the industry in near future. Some of the Qualification Packs developed by the ESSCI for the Air Conditioning and Refrigeration Industry are:

QP NAME	QP Number	NSQF level
Field Technician - AC	ELE/Q3102	4
Field Technician – Refrigerator	ELE/Q3103	4
Field Engineer –RACW	ELE/Q3105	5
Functional Tester - RAC	ELE/Q3601	4
Safety Tester - RACWO	ELE/Q3605	3
HVAC Technician	ELE/Q3112	4

The Government is keen to promote employment and the Air Conditioning Industry in India is poised to make a high growth from the current 39 million units to about 400 million units by the next decade. Accordingly, there would be a very high demand for skilled manpower for manufacturing and service and they have to also align with the constantly changing technology, given the environmental considerations.

The module developed by the Electronics Sector Skills Council of India (ESSCI) is as per the National Skill Qualification

Framework, which has been promulgated by the government of India in December 2013 and supersedes all skill and vocational-based programmes and certifications in the country and is now the ONLY certification based programme. Meaning all skill-based training and certifications in the country will be only under the NSQF.

Training Needs for the Air Conditioning technicians and Certifications

On its way forward, ESSCI, which is an apex body for skill development and certification in the electronics sector, with the support of the Ministry of Environment, Forest and Climate Change interacted with the stakeholders of the UN HCFC phase-out action plan. The Ministry of Environment Forest and Climate Change (MoEFCC) and the Ministry of Skill Development and Entrepreneurship (MSDE) have agreed to jointly undertake upskilling and certification of 100,000 refrigeration and air-conditioning (RAC) service technicians on good servicing practices and knowledge of alternative refrigerants to ozone-depleting chemicals. The project is funded under the Skill India Mission - Pradhan Mantri Kaushal Vikas Yojana (PMKVY).

The Government of India is keen on promoting employability, both wage employment and self-employment are the focus of the government, and making a high effort in this direction. While the Industry has a high recurring demand for air conditioning and given the high growth rate, there would be a high demand across the product life cycle. A large number of skilled technicians may, however, choose to go for self-employment and provide service for maintenance, installation, and repair.

The Government of India has a programme to support self-employment through the Micro Units Development and Refinance Agency Ltd. (MUDRA). The Mudra Yojana seeks to provide financial support for helping the technicians to open their businesses and allow the NSQF certificate as collateral for the loan.

The Pradhan Mantri MUDRA Yojana (PMMY) is a scheme launched by the Hon'ble Prime Minister on April 8, 2015, for providing loans up to 10 lakh to non-corporate, non-farm small/micro enterprises. These loans are classified as MUDRA loans under PMMY. These loans are given by Commercial Banks,

RRBs, Small Finance Banks, MFIs, and NBFCs. The borrower can approach any of the lending institutions mentioned above or can apply online.

Under the aegis of PMMY, MUDRA has created three products namely 'Shishu', 'Kishore', and 'Tarun' to signify the stage of growth/development and funding needs of the beneficiary micro unit/entrepreneur and also provide a reference point for the next phase of graduation/growth.

MUDRA provides refinance support to Banks / MFIs / NBFCs for lending to micro units having loan requirements up to 10 lakh. MUDRA provides refinance support to micro-business under the Scheme Pradhan Mantri MUDRA Yojana. The other products are for development support to the sector. The bouquet of offerings of MUDRA is depicted below. The offerings are being targeted across the spectrum of beneficiary segments. Mudra loan is extended for a variety of purposes

which result in income generation and employment creation. The loans are extended mainly for:

- Business loans for Vendors, Traders, Shopkeepers, and other Service Sector activities, which may include Air-conditioning Industry.
- Working capital loan through MUDRA Cards for running expenses
- Equipment Finance for Micro Units for capital equipment.

As the sector is poised to leapfrog in the future, ESSCI is committed to meeting the demand for skilled manpower in the Air conditioning and Refrigeration sector, not only in the country but across the globe.

ESSCI is leading the initiative in creating a skilled workforce in the sector and is in the service of the nation to ensure its requirements of a skilled and competent workforce.



1

Always hire qualified technician for maintenance of air conditioner (at least once a year)

AIR CONDITIONING



2

Ask technician to check evaporator and condenser coil for smooth operation of AC

3



Ask technician to check coil fin for any physical damage

4



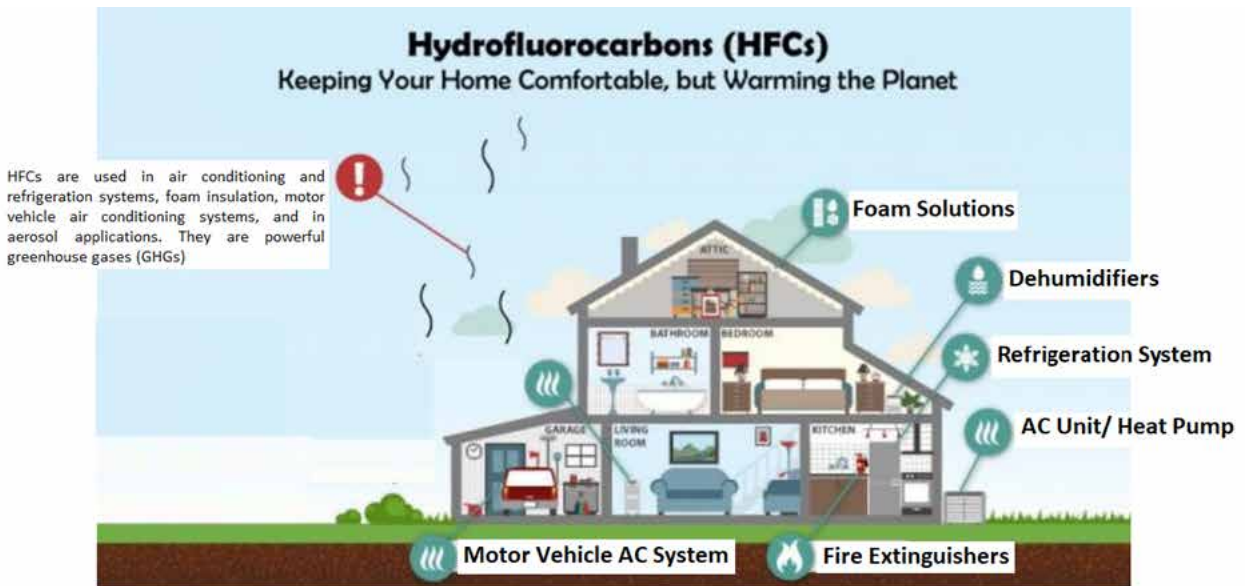
Ask technician to check for refrigerant leakage

CONTRIBUTION OF REFRIGERATION AND AIR-CONDITIONING TO GLOBAL WARMING

With the enforcement of Kigali Amendment, countries are addressing the global warming concerns associated with the refrigerants used in refrigeration & air-conditioning.

Global warming occurs when carbon dioxide (CO₂) and other air pollutants collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's

surface. Normally this radiation would escape into space, but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. Synthetic fluorinated gases (HCFCs and HFCs) are the heat-trapping pollutants and contribute to greenhouse effect.



Why should worry about RAC

- Refrigeration & Air-conditioners contribute to global warming in two ways, direct and indirect contribution
- A direct contribution is due to the direct emission of refrigerant used in RAC.
- Indirect contribution is the energy-related contribution that is represented by the emissions of greenhouse gases (mainly CO₂) that arise from the production of electricity
- Considering future climate and financial impacts of RAC sector, it is important to take measures well in advance and servicing technicians play an important role to accomplish this task with better handling of RAC equipment.



Direct Emission

Refrigerant emission due to installation/servicing +leaks +failures + end of life



Indirect Emission

Emission due to energy generated to operate air condition equipment



Mr. Vikas Kumar from Bhadurgarh has 14 years of experience working as a RAC technician and electrician.

From the field:

Mr. Vikas Kumar from Bhadurgarh has 14 years of experience working as a RAC technician and electrician.



What is the nature of your job?

Ans: I work full-time as a RAC technician and electrician. My work involves servicing home AC units and other appliances, in residential buildings



What type of refrigerant do you deal with in your job and how do you handle flammable refrigerants?

Ans: I generally deal with R-22, R-32, R-410, and R-290 refrigerants. I learned from my seniors to handle flammable refrigerants, however, I feel training is required for these refrigerants.



Are you professionally trained? What training you have undergone i.e. ITI, GIZ, ISHRAE, Skill India, etc. Have you heard about them before?

Ans: I have completed practical training from whirlpool private limited on servicing and maintenance of air conditioning also I have learned AC servicing on the job from my seniors and working for the last 14 years. I have heard and attended one GIZ training in which I learned about good servicing practices.



Would you be interested in upcoming training to remain updated with the new technologies and refrigerants?

Ans: I do feel that my current skills are adequate but I am not equipped to service new inverter ACs, so trainings focusing on that subject will be helpful for me.



What type of information do you require in the newsTRAC newsletter for the service technician, any suggestions?

Ans: I feel information focusing on the servicing of the latest technology like inverter AC and handling the flammable refrigerant on the job will be useful.



COPPER TUBE OPERATIONS

(GOOD SERVICE PRACTICES FOR ROOM AIR-CONDITIONERS)



1. Straightening

Unroll the copper tube on flat surface to get straight tubes of desired length

AVOID CONKING



2. Measuring and Marking

Measure and mark accurately with scale. Avoid wastage and extra joints

SAVE MONEY AND TIME



3. Tube Cutting

Use tube cutter with roller and blade to cut tube straight, smooth and without burr

NEVER USE HACKSAW



4. De-Burring

De-burring inner and outer burrs, help to get crack free and smooth flare surface

NEVER USE FILE



5. Tube Cleaning

Use abrasive or emery cloth for burr free & shining inner and outer surface

NEVER USE FILE



6. Tube Swaging

Use Punches & hammer or swaging tool kit for, tight fit overlapping of tubes, equivalent to the diameter of the tube.

NEVER USE NOSE-PLIER



7. Tube Flaring

Use dedicated flaring tool for crack free, smooth and even-length (straight) flare cone

NEVER USE NOSE-PLIER OR FILE



8. Tube Bending

Use lever type or spring tube benders to avoid kinks and pinch

NEVER USE HANDS



9. Flushing

Flush with Nitrogen gas for cleaning of the tubes.

ALWAYS USE 2-STAGE REGULATOR



10. Flare Tightening

Bring tubes inline. Hand tight and then with torque wrench making scissor position

NEVER USE TEFLON TAPE



11. Brazing

Use Oxy-acetylene or LPG swirl jet torch with reducing flame using more than 2% silver alloy brazing rod

INTRODUCE NITROGEN THROUGH THE TUBE AT A SLOW FLOW RATE

ALWAYS WEAR PPE



12. Pressure Testing

Hold Pressure for 15 min and check leakage with soap solution / leak detector

WIPE JOINTS AFTER LEAK CHECK



Boiling Point of water °C	Vapor pressure in microns
100	7,59,968
50	92,456
30	31,750
10	8,641
0	4,572
-10	1,722
-23.35	500

Our aim 500 microns

SAFETY ALWAYS



HCFC PHASE-OUT MANAGEMENT PLAN REFRIGERATION AND AIR-CONDITIONING (RAC) SERVICING SECTOR

A project of the Ozone Cell, Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India in co-operation with the Government of Germany represented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and United Nations Environment Programme (UNEP).



www.ozoncell.nic.in



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