



# Training and Safety in AC Manufacturing & Servicing Sector

*Iqbal P. Sheikh*

*IN Consult, Pakistan*



## Success Stories Pakistan Natural Substance

- **100% production in PU block slab shifted to hydrocarbon (HC).**
- **Almost all industrial refrigeration, cold storage, cargo ships and food industries are on “Ammonia”.**
- **51% of R141b replaced with Cyclopentane in manufacturing of insulating PU rigid foam in refrigeration sector. Remaining 49% is planned to be phased out using either Cyclopentane or water based technologies.**
- **One new line has been added on R290 to replace R134a in PEL by Agramkow. 5,000 units of bottle cooler have been sold.**
- **One new line for domestic refrigerators has been added on R600a by Electrolux. 15,000 units sold.**



# HCFC 22 Phase out Issues & Approach

<b>Product Category</b>	<b>Production</b>	<b>Servicing</b>
<b>Window-mounted AC</b>	<b>40,000</b>	<b>1,520,000</b>
<b>Split Residential and Commercial AC</b>	<b>320,000</b>	<b>15,200,000</b>
<b>Ducted Split Residential AC</b>	<b>28,000</b>	<b>1,520,000</b>
<b>Ducted Commercial Split &amp; Packaged AC</b>	<b>12,000</b>	<b>760,000</b>
<b>Total Population</b>	<b>400,000</b>	<b>19,000,000</b>
<b>HCFC 22 consumption 2012 ODPT</b>	<b>32</b>	<b>92</b>

- **Issue:**  
R22 phase out in Production and Servicing of AC to meet targets
- **Production approach:**
  - 1: Phase out R22 to HFCs and then to HC
  - 2: Phase out R22 directly to HC
- **Servicing Sector approach:**  
Retrofit, drop in, recovery & reuse



# HCFC's Projections after 141b Phase out & Targets



Assuming 141b phase out in two stages in 2013 and 2017



## Concerns

- When the proven certified technology accepted internationally in manufacturing of **RAC** based on HC technology is made available that shall be environmentally safe, financially viable, energy efficient, meeting health and safety (flammability) requirement.

*“In case it is not available soon, we need to adopt approach-1 that is through adoption of HFCs”.*

- What solutions are available to phase out R22 in AC servicing sector which is around 19 million and may increase to 21 million in 2017.

*“We look desperately if the solutions are available through drop in or retrofit”*

- If we don't get timely solutions, we have to adopt HFCs options that may not be environment friendly.



## Approach-2 Key Factors for Technology Selection

- Financial Aspects
- Technology Availability
- Third Party Certification
- **Training and Certification**
- **Safety**

Although the first three factors have number of barriers in most developed and developing countries yet it is presumed that these barriers may be removed and certified acceptable technologies will be available. **Question is when?**

These technologies will not sustain until and unless, the last two factors are properly taken care of other wise, **the process may be reversed.**

## Barriers to adoption of HC technologies in RAC

- Lack of general technical information about natural refrigerants.
- Lack of design guidelines and instructions for carrying out service, transport, installation, repair and disposal of equipment.
- Non-availability of Guidelines and instructions in national language
- Non-availability of Trained instructors
- Non-availability of adequate training material, hands on equipment and lack of coordination of concerned stakeholders.
- Non-existence of certification schemes

**Unless these barriers are removed, the adoption of HC technology in RAC is difficult.**

## How to overcome these barriers?

- **Well organized awareness program for dissemination of knowledge on natural refrigerant**
- **Form a technical working group to formulate guidelines/ instructions and their harmonization preferably at regional level**
- **Guidelines and instructions should be in national language due to the low educational background of the trainees.**
- **Comprehensive Training of Trainers (TOT) program to be formulated taking advantage of nations who have already developed similar program and is in practice.**
- **Ensure availability of curriculum, training material and equipment in the training institutes. This may be integrated into existing formal training programs or new training modules**





# Training and Certification

## How to overcome these barriers?

- **E-learning is not available and is recommended for broader application. Role of public bodies, private training providers, components & system suppliers, manufacturer, associations and end user organizations to be identified and integrated in the training program for its acceptance by all stakeholders.**
- **The accreditation body in the country should look into the certification of such training programs. This shall be required to coordinate with international accreditation bodies to ensure regular quality updates of training programs.**

# Training and Certification

## Present Status & Future Needs

### Training facilities & Workshops

- Over 1,500 T&VIs enrolling over 300,000 trainees all over country in public & private sector. Most of them offer 1-3 years certificate/ diploma in AC. Curriculums don't cover HC technologies. No certification system exists .
- Over 10,000 workshops in formal and informal sector employing 30-50 thousand employees.

### What is required?

- Total revamping of curricula, introduction of certification system, provision of tools & equipment in workshops for HC technologies

### What has been done?

- Pakistan in association with UNEP organized training of two master trainers in Bangkok, 29 master trainers in Pakistan, over 120 technicians & 35 custom officers. **However, this does not have impact of adoption of HC technology.**

# Safety & Technology Standards

## Barriers to adoption of HC technologies in RAC:

- **ASHRE 34, ISO 817 and EN 378 classify R290 as A3 i.e. toxic and highly flammable. According to BRA guideline, the use of flammable refrigerant shall be in new especially designed system. The existing systems using non-flammable refrigerant must not be retrofitted with flammable refrigerant.**
- **IEC standard 60335-2-24 & 60335-2-89 restricts the charge size to 150 grams of flammable refrigerant. Standards do not establish safety guidelines for units with charge size in excess of 150 grams currently required in RAC.**
- **Transport & handling of flammable cylinders and equipment**



# Safety & Technology Standards

## How to overcome these barriers?

- **Adequate international guidelines should be available to the developing countries so that the national guidelines are tailored accordingly. These should include guidelines for the production area, repair workshops and for end users.**
- **End users must be made aware that systems are charged with flammable refrigerant. Where applicable, information about the minimum room size where the equipment can be located in, and potentially flammable zone extent around the equipment shall be highlighted.**



 **ATMO**  
**sphere**  
technology summit  
**natural solutions**  
3 - 4 June 2013 in Vienna

---

Thank you very much for your attention

## **HFC's APPLICATION AND NATURAL REFRIGERANT**

- **HFC 134a is commonly used as cooling agent in refrigeration and air conditioners in vehicle**
- **Currently, 1.5 million domestic refrigerators and 400,000 commercial refrigerators are either produced or imported using 134a as refrigerant.**
- **Almost 200,000 air conditioned vehicles are produced or imported using 134a as cooling agent.**
- **Major players in refrigerators manufacturing are seriously considering shifting to natural refrigerant provided the unit is cost effective, offer energy saving and adequate trained maintenance network.**
- **No serious effort has been observed in the domestic market for the phase out of HFC 134a in air conditioners in vehicles**
- **Disincentive approach is discouraging manufacturers to shift to low climate impact technologies unless otherwise offer energy savings**