



REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

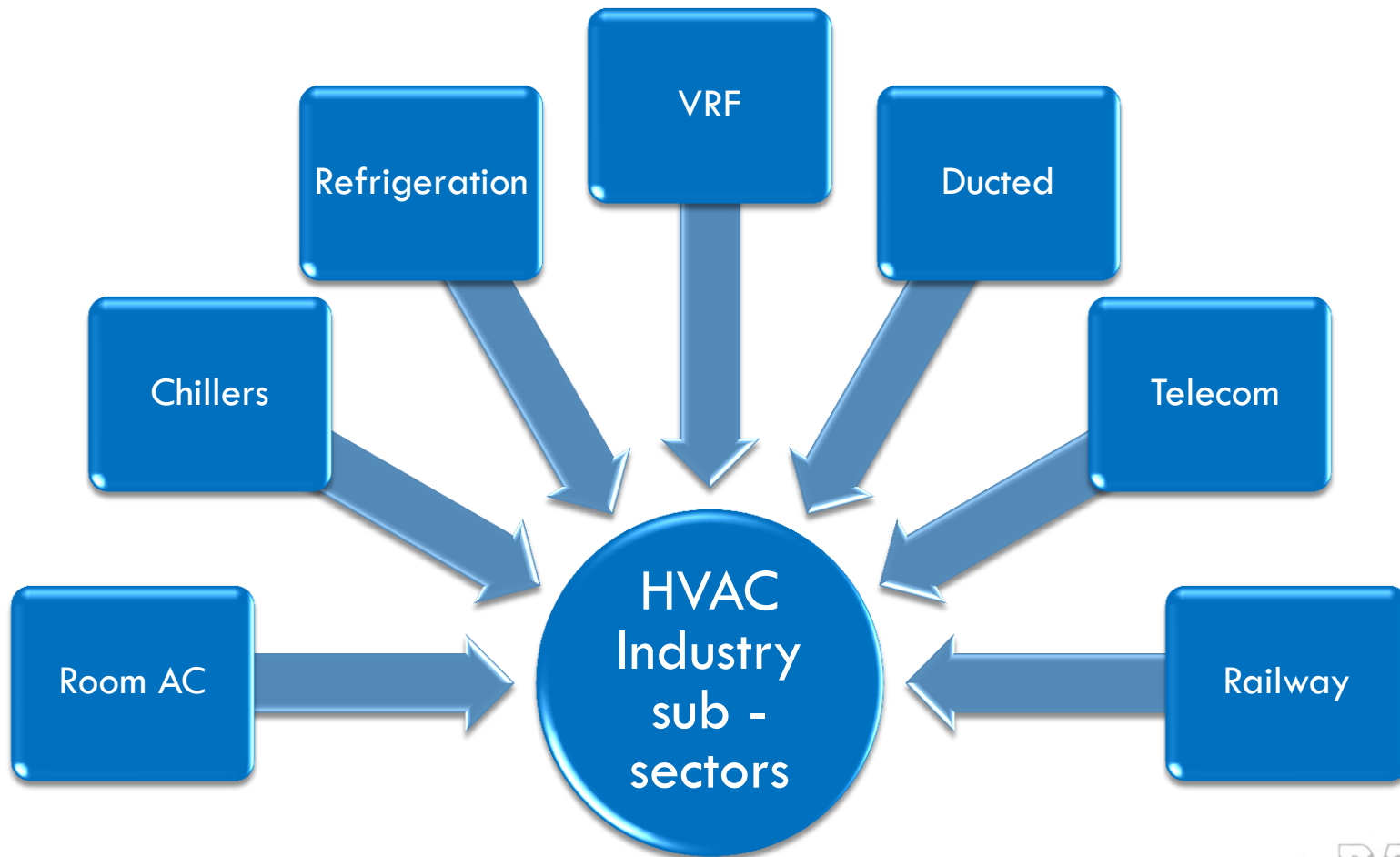
# REFRIGERANT TECHNOLOGY TRANSITION

PROGRESS & EXPECTATION OF  
INDIAN R&AC INDUSTRY

R K Mehta: Secretary RAMA

# Sub sectors

2



**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Background

3

- Indian Industry understands the importance of phasing out of HCFCs and phasing down of HFCs
- Kigali agreement has been very well designed which addresses phase-down of HFC Refrigerants and Energy efficiency together
- Industry has fully supported various initiatives taken by Indian government in energy efficiency , phase out of HCFC and to prepare for phase down of HFCs
- Industry has adopted new refrigerants wherever applicable, commercially viable, proven and safe to use.



REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Refrigerants phase-out and phase-down plan

4

- India was ahead of date in phasing out CFCs
- Indian industry has fully supported the HCFC phase-out program
  - ▣ HFC 141b taken on priority considering high ODP, implementation in progress in foam sector
  - ▣ Room ACs sector has been making all efforts to use safe low-GW refrigerants;
  - ▣ HFC 32 is gaining popularity and is approx 12 % of the total consumption in Room AC
  - ▣ HC 290 is adopted by one manufacturer however has stagnated below 1% of for last 5 years



# Continued

5

- Global manufacturers have brought in the products, manufactured in developed countries and these are with HFCs in Inverter Room AC, VRF, Chillers,& Refrigeration units
- There is demand from customers to adopt non-ODP refrigerants
- In small units such as small refrigeration equipment multinational customers are demanding Hydrocarbon refrigerant based equipment



# Sub sector wise refrigerant technologies

6

Sub sectors	HCFC	HFC	HC/ HFO	Remarks
Room AC Fix speed	R22	R32	R290	R32 is ~12 % , R290 < 1%
Room AC Inverter		R410A/ R32	R290	R32 8~10 % , R290 <1%
VRF		R410A/ R32*		No Low GWP option,
Packaged	R22	R407c, R410A, R32*		No Low GWP option
Chillers	R22	R134a, 407c, 410A,	513a, 1234ze	HFO in Centri/ Screw

\* small systems

**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Continued

7

DF		R134a	R290	R290 will emerge
Water coolers	R22	R134a	R290	R290 will emerge
Refrigeration and cold rooms	R22	R404a		No Low GWP option as of today
Visi coolers		R134a	R290	In use
Misc Refrigeration		R134a	R290	HC in small units possible

\* small systems

**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Choice of Refrigerants

8

## □ Natural :

- Ammonia : Toxic cannot be used in residential areas and for human comfort application due to safety reasons
- CO<sub>2</sub> : Limitation due to properties and cannot be adopted for Indian climatic conditions
- Hydrocarbons : Flammable and high risk of Fire Hazards





# Choice of refrigerants natural ... cont

9

Hydrocarbons ( HC ) : Flammable and high risk of Fire Hazards

- ❑ Safety has to be at the top of the product performance pyramid
- ❑ To best of our knowledge the developed countries have **not adopted HC in Room AC** including latest recommendation by SNAP programme of USA
- ❑ Quantum of charge is a serious limitation in developing high efficiency units of larger size which is a requirement of India and tropical countries
- ❑ Export and Make in India programme will be hampered as the units with HC will not be accepted in Middle East where we have export potential



# Choice of refrigerants natural-continued

10

Hydrocarbons ( HC ) : Not a choice for India due to Flammable and high risk of Fire Hazards- India perspective

- **85 % of Room AC are split type and field installed with interconnecting pipes where length is a function of location. The trend will continue and % will go up to 90% in next five years which was 75 % four years ago . The majority of units requirement is 1.5 T and above**
- Unlike other appliances an Room AC is a permanent installation and service has to be provided at site
- The dimensions of space for end application cannot be controlled
- The penetration is increasing to tier 3 and 4 cities and with huge shortage of skilled manpower for installation and servicing and quality control is challenging.



# End to End business process

11



- As we progress from R & D to end of life challenges increase in handling refrigerants

**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Full cost of conversion

12

- ❑ The Montreal Protocol has provision only for incremental cost
- ❑ With technologies becoming complex & regulatory requirements of energy efficiency, refrigerants cannot be seen in isolation
- ❑ Huge investments will have to be made across the business chain. R&D, acquiring/ developing technology, production, sales and service. IPR will be an important issue.
- ❑ Full cost of conversion is required



REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Intellectual Property rights (IPR)

13

- The approach to IPR should be holistic and it should not to move international regulations and for distortion of markets
- Patents of refrigerant molecules and application need international debate and calls for for organization of dedicated roundtable workshop
- Regulatory Protocol (s) should make provision for costs associated with acquisition of patented technologies.



# Refrigerants adopted by Europe last 15 yrs

14



Europe is already working on  
R448a, R449a, and R452a



We feel this has been done without fully considering costs involved & possible implications across the business chain, we feel we should not repeat the same

**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION

# Summary

15

- No solution for VRF and ducted
- Cost and technology availability is a concern
- Room AC is the largest sector in India and industry is already overburdened to meet stringent norms of energy efficiency, flammability is a concern, except one company with limited nos in India, no one has adopted to best of our knowledge in the world
- Impact of new refrigerants on efficiency is not fully understood



# Summary

16

- From almost one refrigerant HCFC 22, we will have multiple refrigerants for various subsectors,
- There Challenges before the manufacturers to cope up with designing of new products and simultaneously maintain the units with variety of refrigerants in field,
- Country is trying to meet this challenging situation by launching a programme for skill development and make available trained manpower which would take some time;
- The Protocol need to realize growing requirements related to flammability of refrigerants and related funding for servicing sector
- Apart from the equipment cost and its affordability the investment in R&D, product marketing and training are not fully recovered



REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION



# Thank You.

R K Mehta

Secretary

RAMA

[ravindarmehta@gmail.com](mailto:ravindarmehta@gmail.com)  
[secretary@RAMA-india.com](mailto:secretary@RAMA-india.com)

**RAMA**

REFRIGERATION AND AIRCONDITIONING  
MANUFACTURERS' ASSOCIATION