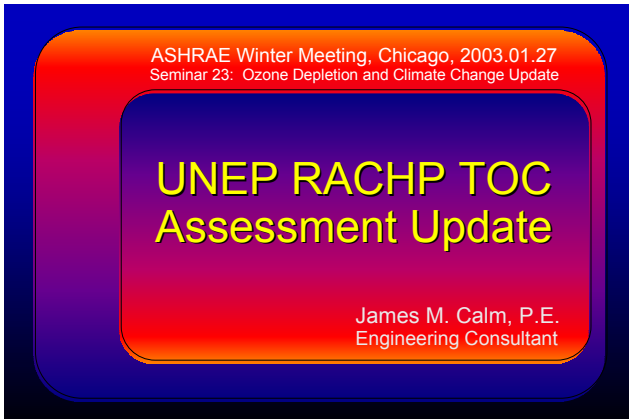


UNEP RACHP TOC Assessment Update

James M. Calm, Engineering Consultant, USA

ASHRAE Winter Meeting, Chicago, 2003.01.27



PRESENTATION CAVEAT

This presentation represents the perspective of the author and has not been reviewed or approved by ASHRAE, the UNEP RACHP TOC, or any other entity. It addresses an assessment still in progress, and not yet published, of a transition that is underway; as such it summarizes a transient vignette that is expected to change in time. This overview covers key points and should not be taken as either definitive or complete.

UNEP RACHP TOC 2002 UPDATE



United Nations Environment Programme (UNEP) Refrigeration, Air-Conditioning, and Heat Pump (RACHP) Technical Options Committee (TOC)

UNEP TECHNICAL OPTIONS COMMITTEES



Technology and Economic Assessment Panel (TEAP) for the Montreal Protocol on Substances that Deplete the Ozone Layer has six TOCs (and three task forces):

- Aerosols, Sterilants, Miscellaneous Uses, and Carbon Tetrachloride
- Flexible and Rigid Foams
- Halons
- Methyl Bromide
- Refrigeration, Air Conditioning, and Heat Pumps
- Solvents, Coatings, and Adhesives

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prior assessments

- 1991
- 1994
- 1998

TOC MEMBERSHIP

38 members from 18 countries

USA (9)	India (2)	Poland	Uganda
Germany (5)	Japan (2)	Russia	UK
Netherlands (3)	Hungary	Slovakia	Vietnam
France (3)	Kenya	Thailand	
Brazil (2)	Norway	Tunisia	

21 consulting members

5 organization / association members

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TOC MEMBERSHIP

38 members representing

- manufacturers (16) 8 from Japan and USA
- academia (8) } 8 from Europe
- research (5)
- government (4)
- engineering / use (1)
- other (4)

UNEP RACHP TOC 2002 UPDATE

- introduction to the Montreal Protocol process
- refrigerants (includes heat transfer fluids used as "secondary refrigerants")
- domestic refrigeration
- commercial refrigeration
- industrial refrigeration, cold storage, and food processing
- transport refrigeration
- air conditioning and heat pumps (refrigerant-to-air)
- chillers and heat pump water heaters
- vehicle air conditioning
- refrigerant conservation

ASSESSMENT CONCLUSIONS

- industry has made tremendous progress in complying with the Montreal Protocol through phasing out CFCs and, in several applications, HCFCs as well
- the mobile air conditioning and the domestic refrigeration industries have shifted rapidly from CFC-12 to non-ozone-depleting substance (non-ODS) refrigerants
- other applications, such as chillers and commercial refrigeration, have shifted from CFCs to HCFCs and HFCs or other fluids
- phaseouts, along with considerations to reduce global warming, spurred unprecedented transitions
- differences in timing and in choosing options between countries have been influenced by regional and national regulations

ASSESSMENT CONCLUSIONS

the primary solutions for new equipment by application are:

- *domestic refrigeration:* HFC-134a and isobutane (HC-600a)
- *commercial refrigeration:* HCFC-22 and mainly R-404A in supermarkets, HCs in some self-contained units and a few indirect systems, and to a small extent carbon dioxide (R-744)
- *industrial refrigeration:* widely ammonia (R-717), also HCFCs and HFCs, and to a lesser extent carbon dioxide (for low temperatures) and hydrocarbons
- *transport refrigeration:* HFCs for the majority of applications

continued ...

ASSESSMENT CONCLUSIONS

the primary solutions *continued ...*

- *air conditioning equipment:* HCFC-22 (~90%) with HFCs, HFC blends, and to a lesser extent HCs in the remainder
- *chillers:* HCFCs (primarily HCFC-22 in small and HCFC-123 in centrifugal chillers), HFCs (primarily HFC-134a and, in smaller equipment, also blends), and much less commonly ammonia (R-717) and HCs
- *heat pump water heaters:* HCFC-22, HFC-134a, propane (HC-290), R-410A, and to some extent carbon dioxide
- *mobile air conditioning:* HFC-134a for virtually the entire population

ASSESSMENT CONCLUSIONS IN ARTICLE 5(1) COUNTRIES

- the same solutions are also being applied in Article 5(1) countries
- conversion is less or not complete in several sectors, but is steadily increasing
- some new equipment still being manufactured with CFCs, especially in commercial and transport refrigeration

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INSTALLED EQUIPMENT

- a significant amount still uses CFCs and HCFCs
- service demand for CFCs and HCFCs remains high
- refrigerant demand for service needs is best minimized by preventive service, containment, retrofit, recovery and recycling
- recovery at decommissioning (not only for refrigerators) is important
- need training of installers and service technicians as well as certification and regulations

CURRENT DEVELOPMENTS

- concentrate on HFCs and non-FC options with emphasis on increasing efficiency and reducing emissions of high-GWP refrigerants
- containment to reduce climate impacts and improve safety
- R&D is ongoing to enhance current options and to investigate long-term, *in-kind* and *not-in-kind* solutions to lower environmental impacts and improve safety

2002 RACHP TOC REPORT

drafting and peer review completed

now in publication

most chapters address:

- applications (including market characterization)
- current status and trends
- refrigerant options for new equipment
- new technologies
- retrofit options for existing equipment
- situation in and special needs of developing countries
- references

RACHP TOC FUTURE

nothing firm (no activity planned for the next year)

joint task group on HFC/PFC emissions

2006 assessment? (probable)

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