

*R22 phase out time*

MARICHEM MARIGASES WORLDWIDE SERVICES

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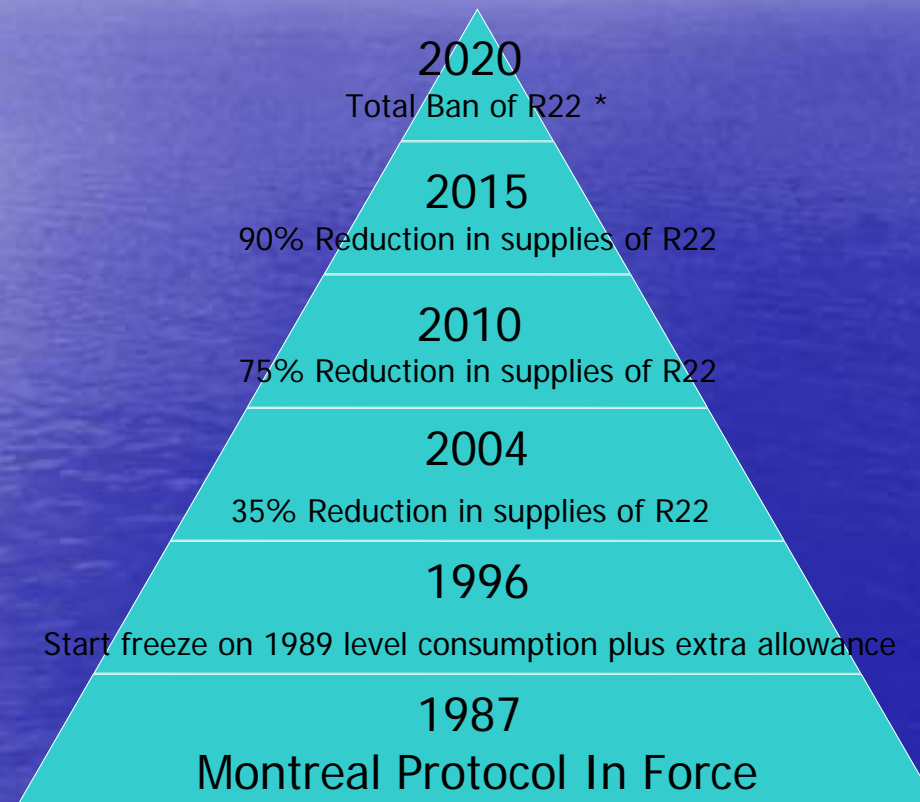
- Montreal protocol (R22 phase out)
- Potential Solutions
- Choosing the proper Refrigerant
- Retrofit Services

# Montreal Protocol (1987)

in force with different phase-out timetable for:

- Developed Countries  
(Non-Article 5 countries)
- Developing Countries  
(Article 5 countries)

# R22 phase out timetable for Developed Countries



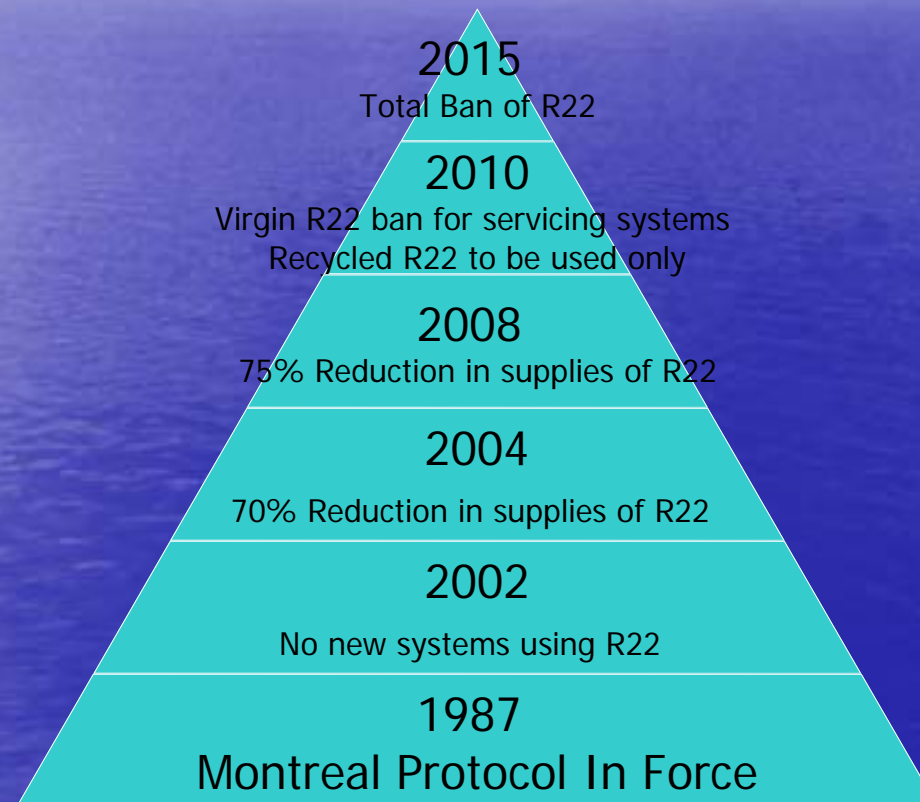
\* Upto 0.5% of base level consumption can be used till 2030 to service existing equipment – subject to review in 2015

# R22 phase out timetable for Developing Countries



\* Upto 2.5% of base level consumption can be used till 2040 to service existing equipment – subject to review in 2025

# R22 phase out timetable for European Community countries (accelerated plan as per EC 2037-2000 regulation)



# Article 5 parties

## Developing countries (147 in total)

- Algeria, Argentina, Bahamas, Bahrain, Bangladesh, Brazil, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Dominican republic, Ecuador, Egypt, India, Indonesia, Jamaica, Jordan, S. Korea, Kuwait, Lebanon, Malaysia, Mexico, Morocco, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Qatar, Saudi Arabia, Singapore, South Africa, Sri Lanka, Syria, Thailand, Trinidad & Tobago, Turkey, UAE, Uruguay, Venezuela, Vietnam
- All African countries and other countries ww as well

# Supplies at the EC ports

- Vessels registered under 3<sup>rd</sup> country flag, can be supplied at EC ports with virgin R22 from 01.01.2010 - subject to special export procedures. EC committee remains to clarify technical details for this.
- Vessels under EC country flag, can be supplied only with recycled/reclaimed R22 at EC ports.



# Potential Solutions

1. Keep the existing system with R22
2. Drop-in, replacement of R22 only with alternative HFC  
R417a, R422d etc
3. Replacement of R22 refrigerant with HFC refrigerant  
R407c, R404a, R502 etc
4. Replacement of R22 system with new HFC system  
R407c, R404a, R507 etc
5. Change over to a "natural" refrigerant  
Ammonia, CO2

# 1. Keep the existing R22 system

- No short term costs
- Unknown yet price after 2009 in EC
- Unknown yet availability in EC
- Ozone depleting substance

## 2. Drop-in Replacement Solution

(R417a, R422d)

- Low change-over cost, minor system intervention
- Reduced availability WW
- High price of refrigerant
- Global Warming Potential material

### 3. Replacement of R22 with HFC refrigerant (R407c, R404a, R507)

- Medium change-over cost, system needs modifications
- Widely available refrigerants WW
- Reasonable price of refrigerant
- Global Warming Potential material

## 4. Replacement of R22 with New HFC system (R407c, R404a, R507)

- Higher change-over cost, investment cost
- Widely available refrigerants WW
- Reasonable price of refrigerant
- Global Warming Potential material

## 5. Change over to “natural” refrigerant system

Ammonia, CO<sub>2</sub>

- Highest change-over cost, investment cost
- Low maintenance cost
- No ODS – GWP impact

# RETROFIT SERVICES

offered by Marichem Marigases Worldwide Services

- MARICHEM MARIGASES WORLDWIDE SERVICES, is offering retrofit services at main ports all over the world.
- Contact your local sales agent or the European Administration office for more details