



©iStockphoto

Promoting low-GWP refrigerants in high-ambient-temperature countries



Objectives

The project's objectives were to facilitate technology transfer and the exchange of experiences regarding low-GWP alternatives for the AC sectors in high ambient-temperature (HAT) countries; to promote better decision making by these countries to move towards such alternatives; and to encourage the development of local and regional standards to ease the transition toward such alternatives and improve energy efficiency.

Description

Six regional original equipment manufacturers built 14 prototypes operating with five refrigerant alternatives and shipped nine other units based on HCFC-22 or HFC refrigerants for comparison purposes. Prototypes using R-290, HFC-32, R-444B (L-20), R-447A (L-41), and R-454C (DR-3) were tested at 35, 46, and 50°C ambient temperatures. The prototypes using R 290, R-444B, and R-454C were compared with HCFC-22, while those using HFC 32 and R-447A were compared with R-410A. The project also assessed technology-transfer barriers, energy-efficiency implications, the cost of alternatives, and the availability of district cooling opportunities to reduce dependency on high-GWP alternatives and technologies.

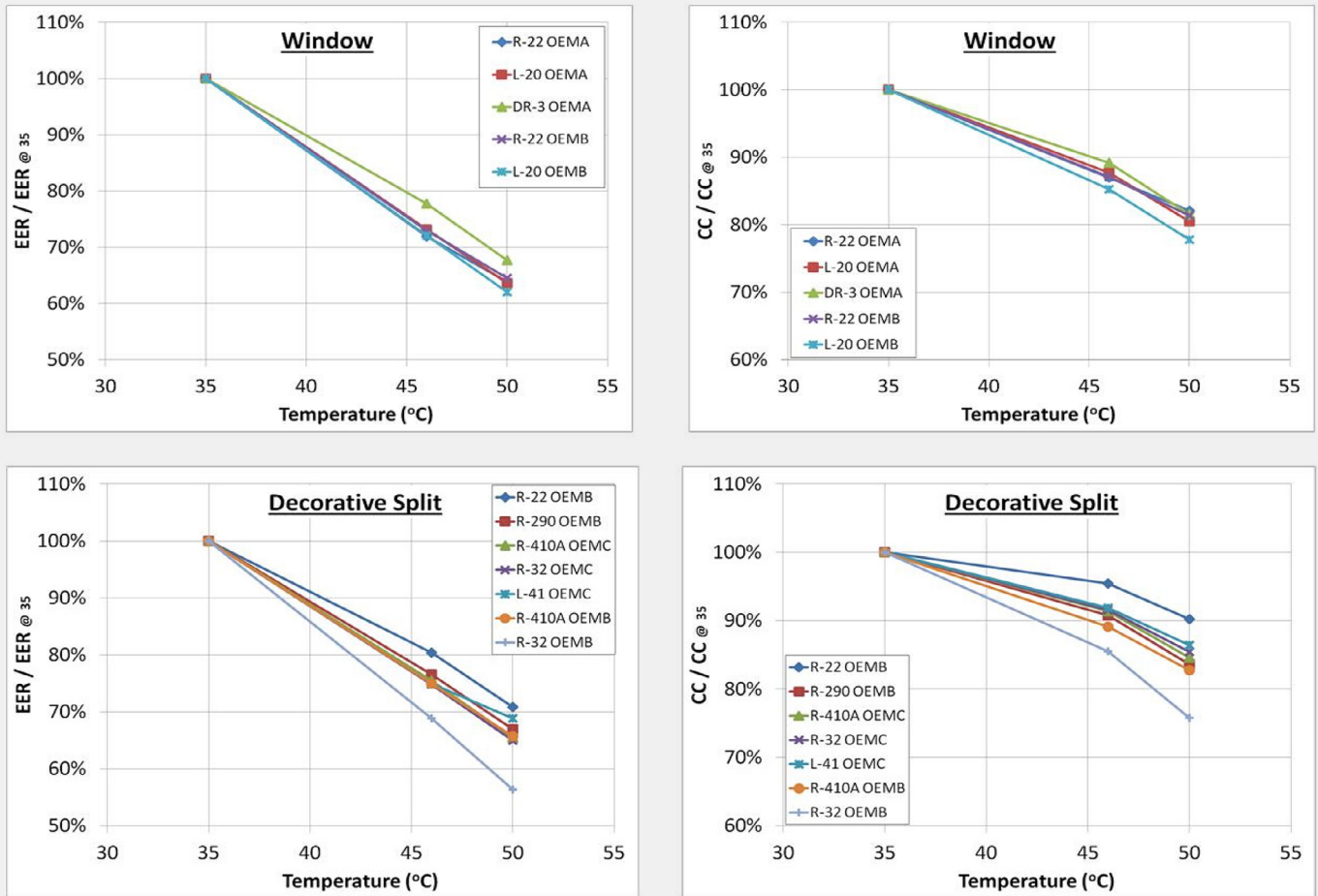
Results

- ▶ The results from the packaged air-conditioning units tested were better than those for smaller units.
- ▶ The larger-capacity units used more advanced components (e.g., electronic expansion valve instead of capillary tube) and a greater range of condenser size, allowing for better optimization.
- ▶ Safety and standard-related considerations limited the more widespread use of flammable refrigerants in larger size units.
- ▶ Units operating with R-410A were found to be more technologically advanced than those using HCFC-22.

Promoting low-global-warming-potential refrigerants for air-conditioning sectors in high-ambient-temperature (HAT) countries in West Asia* (PRAHA-I)

Country	Regional
Agency	UNEP/UNIDO
Sector	Refrigeration and air conditioning (RAC)
Sub-sector/application	AC
Enterprise/systems house	n/a
Baseline technology	HCFC-22 and R-410A
Alternative technology	HFC-32, R-290, HFO blends
Global Warming Potential (GWP) of the alternative technology	R-290: negligible. HFC-32: 675. R-444B: 331. R-447A: 583. R-454C: 148
Potential safety issues	Flammability of R-290, HFC-32, R-444B, R-447A, and R-454C
Ozone Depleting Substances (ODS) phase-out in mt	0
ODS phase-out in Ozone De-pleting Potential (ODP) tonnes	0

Figure 1: Percentage degradation of efficiency and cooling capacity associated with increasing ambient temperature from 35°C to 50°C for the window and decorative split units.



Conclusion

There are potential alternative refrigerants that have close to or better performance than baseline refrigerants. Research and development must be bolstered in HAT countries to build local industry's capacity to redesign and optimize products using low-GWP alternatives. Economic and technology-transfer barriers will continue to be relevant until global markets stabilize around a limited number of alternative

refrigerants. Risk assessments of alternative refrigerants must be tailored to the needs of Article 5 countries, and HAT countries in particular. There is a lack of institutional programmes in HAT countries aimed at addressing alternative technologies and reducing dependence on high-GWP alternatives. The process of improving energy-efficiency standards for air-conditioning applications in countries

with high ambient temperatures is progressing faster than the assessment of alternative refrigerants. The results of PRAHA-I have led the Executive Committee to approve decision 76/28, a request to develop comprehensive risk-assessment models and to build the local design capacity based on the air-conditioning prototypes developed by the project. ■

Additional details on this project are available in the link below:

<http://www.multilateralfund.org/76/English/1/7610.pdf>

Paragraphs 37 42 and Annex IV



Multilateral Fund
for the
Implementation of
the Montreal Protocol