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Phase-out of HCFC Refrigerants

THE DEADLINE to the start of the HCFC phase-out in South Africa began on 1 January 2013 with a required reduction of 10% by end 2015. National legislation will then control the limited importation of HCFCs, with the importation rate decreasing each year until 2030. The resultant reduction of R22 stock will force companies to use only recycled HCFCs or change their air conditioning/refrigeration/heat pump systems altogether.

As production of HCFC gases decreases, they will become more difficult to obtain. Prices will therefore escalate as was experienced in the United Kingdom, where in the beginning of 2012 the price of R22 doubled and the trend of increases over and above this continues.

The European Commission is currently in the process of publishing their proposals to make changes to the EU F-Gas Regulation to further reduce fluorinated gas emissions over the next 20 years. The proposal specifies that any refrigerant with a Global Warming Potential (GWP) above 2 500 cannot be used for the servicing of refrigeration systems after 2020.

R404A is the most widely used HFC for refrigeration applications in Europe and is, along with R507, under threat under the new F-Gas proposals. Not only does R404A have a very high GWP, but it does not deliver the best energy efficiency, especially when used in medium temperature applications.

It is therefore imperative that the South African refrigeration market begins focusing on not just the recovery of R22 but also looks at alternative refrigerants with lower GWP. The advantage for countries such as South Africa, being a developing country, is the fact that research, development, testing and approval of HCFC replacement refrigerants has already been carried out over past years by developed countries. This enables us to move ahead with our phasing-out programme, converting at an earlier stage, with tried and tested products.

Being aware of the phase-out, A-Gas recently introduced Honeywell's Genetron® Performax™ LT to the South African market as an alternative to R22, R404A and R507. The product has been tested and approved by a large number of global retail supermarkets and compressor manufacturers as the refrigerant of choice for HCFC refrigerant replacement.

Performax LT has zero Ozone Depletion Potential (ODP), a lower GWP than R404A and R507, and has an A1 safety classification. The product is also non-toxic and non-flammable.

Performax LT provides the closest match to R22 in low and medium temperature refrigeration applications and has been proven in Europe, America and the UK to offer high energy efficiency as well as providing the potential for higher profitability to the end user.

In South Africa we now have the opportunity to experience a smoother and more rapid transition from HCFC to HFC refrigerants by converting to environmentally friendlier products, such as Performax LT, which has been successfully in use globally for a period of time.

Schedule for Developing Country Phase-Out of HCFCs

Schedule	Year
Baseline	Average of 2009 and 2010
Freeze	2013
10% Reduction (90% of baseline)	2015
35% Reduction (65% of baseline)	2020
67.5% Reduction (32.5% of baseline)	2025
Total Phase-Out	2030
2.5% of baseline averaged over 10 years (2030 - 2040) allowed, if necessary, for servicing of refrigeration and air conditioning equipment until 2040	2030 - 2040

Global Warming Potential (GWP) of Common Refrigerants

Refrigerant	GWP
R507	3 985
R404A	3 922
R407A	2 107
R410A	2 088
Performax LT	1 825
R22	1 810
R407C	1 774

Refrigerant	GWP
R134a	1 430
HFO1234yf	5
R600a	4
R290	3.3
R744 (CO_2)	1
R717 (Ammonia)	0

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Honeywell Performax LT Test Results*

Supermarket Application
Comparison of three Different Refrigerants in a Typical Supermarket
Low and High Temperature Applications

	High Temperature			Low Temperature		
Refrigerant	R404A	R407A	Performax	R404A	R407A	Performax
Refrigerant Charge	250	250	250	150	150	150
Refrigerant GWP	3922	2107	1824	3922	2107	1824
Annual Leakage Rate	15%	15%	15%	15%	15%	15%
System Operational Lifetime (years)	15	15	15	15	15	15
Recovery Efficiency	95%	95%	95%	95%	95%	95%
Average Relative CoP	100%	105%	115%	100%	105%	115%
Annual Compressor Energy Consumption (kWh)	170000	161905	147826	123000	117143	106957
CO_2 Emission Factor (kg CO_2/kWh)	0.54	0.54	0.54	0.54	0.54	0.54
Electricity Price (€/kWh)	0.1	0.1	0.1	0.1	0.1	0.1
Total Equivalent Warming Impact (TEWI)						
Direct	2255150	1211525	1048800	1372700	737450	638400
Indirect	1377000	1311429	1197391	996300	948857	866348
Total	3632150	2522954	2246191	2369000	1686307	1504748
TEWI (Tonne CO_2)	3632	2523	2246	2369	1686	1505
Yearly Operating Cost	17 000	16 190	14 783	12 300	11 714	10 696

Data and Criteria*

Annual Leak Rate[2]	15%
System Operational Lifetime (years)	15
Recovery Efficiency	95%
Electricity Price (€/kWh)[3]	0.14
CO_2 Emission Factor (kg CO_2/kWh)[4]	0.54522%

ASDA Savings*

Direct Emissions: tons CO_{2eq}	1.930	Lifetime
Indirect Emissions: tons CO_{2eq}	264	Lifetime
Total Reduction Emissions: tons CO_{2eq}	2.194	Lifetime

[1] Performax vs R404A: CoP for MT from ASDA field test; CoP for LT from Honeywell Research Lab bench test

R407A cannot be used for LT applications

[2] 15% leak rate is the industry average. ASDA's current leak rate is 2%.

[3] Source: http//www.energysavingtrust.org.uk

Technical Case Study Performax – ASDA Hunts Cross*

	Medium Temperature			Low Temperature		Total System		
Refrigerant	R404A	R407A	Performax	R404A	Performax	R404A	R407A	Performax
Refrigerant Charge	250	250	250	150	150	400	400	400
Average Relative CoP[1]	100%	105%	115%	100%	109%	100%	99%	112%
TEWI (Tonne CO_2) Direct	2.255	1.212	1.049	1.353	629	3.608	2.565	1.678
TEWI (Tonne CO_2) Indirect	1.390	1.324	1.209	1.006	875	2.396	2.330	2.084
TEWI (Tonne CO_2) Total	3.645	2.536	2.258	2.359	1.504	6.004	4.895	3.762
Savings CO_{2eq}		30%	38%		36%		18%	37%
Yearly Operating Cost from Compressor (€)	23.800	22.667	20.696	17.220	14.974	41.020	39.887	35.670
Savings Compressor Energy Cost vs R404A		95%	87%		87%		97%	87%

[4] Units kg CO_{2eq} per unit, source Carbon Trust, conversion factor 2010

*Notice. All data has been sourced from Honeywell Fluorine Products Europe B.V.

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