



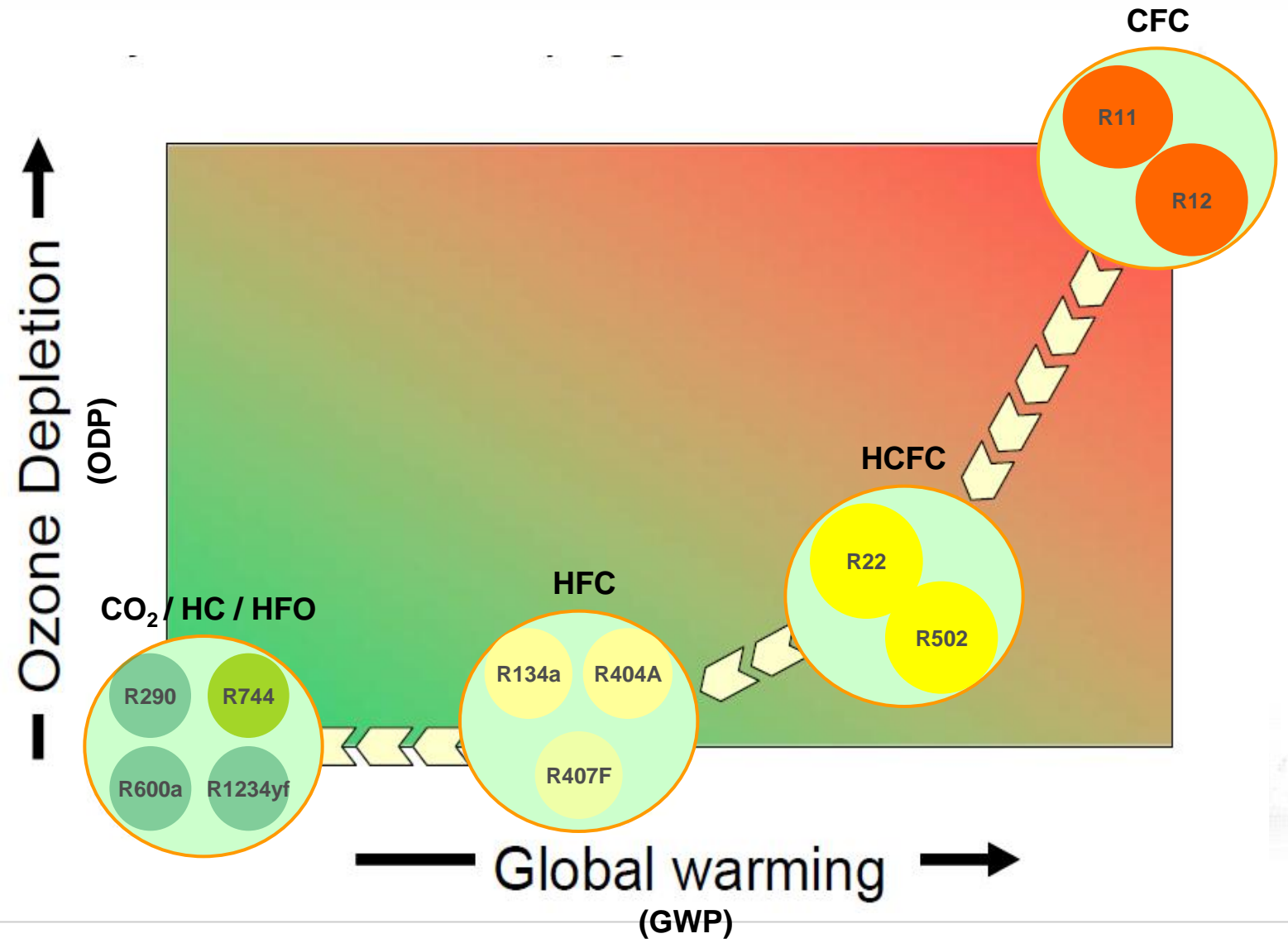
“Low energy consumption when using R290 as an alternative to R404A in light commercial refrigeration in America”

HUAYI COMPRESSOR BARCELONA, S.L.

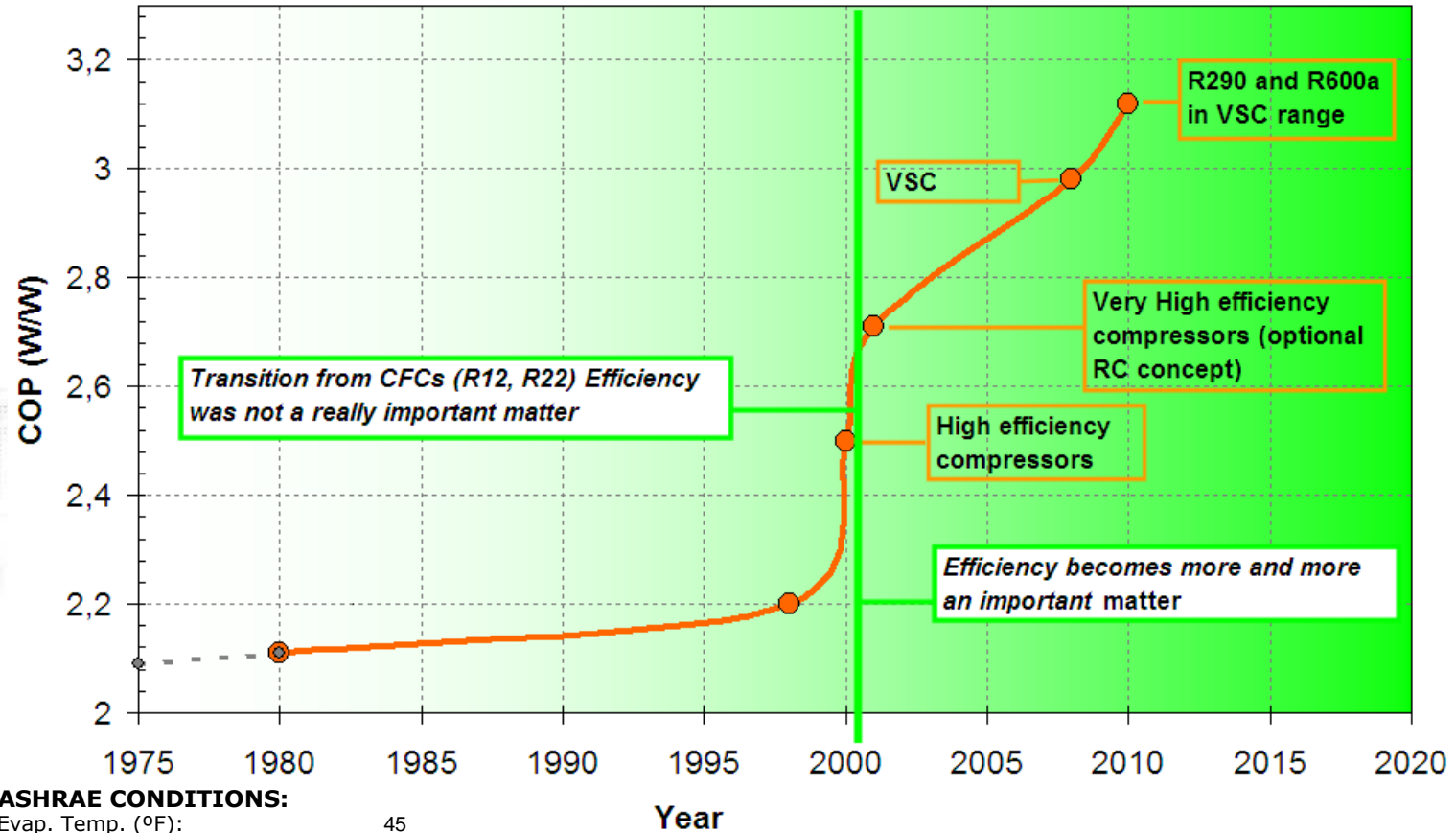
HUAYI COMPRESSORS GROUP contributes to a more sustainable world with more than **50 years experience** in designing, manufacturing and selling hermetic compressors and condensing units for the light commercial refrigeration market, operating under the **Cubigel Compressors®** brand worldwide



- **The Green Cooling Range includes:**
 - Natural Gas Refrigerants
 - High Efficiency Compressors + Variable Speed Compressors
- **The advanced design of the Green Cooling Ranges allows:**
 - Efficiency improvement (up to 50% compared to standard versions).
 - Consequently, lower CO₂ emissions to the atmosphere.
 - Use of natural refrigerants as R290 with no direct effect on global warming.
 - Additional EER improvement because of moving from HFCs to HCs.



EFFICIENCY EVOLUTION FOR LIGHT COMMERCIAL REFRIGERATION



ASHRAE CONDITIONS:

Evap. Temp. (°F):	45
Cond. Temp. (°F):	131
Liquid Temp. (°F):	115
Suction Temp. (°F):	95
Ambient Temp. (°F):	95

"RC": Running capacitor

Characteristic	R134a	R404A/R507	R744	R290	R1234yf	R407F
Group Name	HFC	HFC	CO ₂	HC	HFO	HFC
GWP	1300	3260	1	3	4	1824
ODP	0	0	0	0	0	0
Inherent EER	Medium	Medium	Low	High	Medium	Medium
T (14,5 PSI) °F	-26,1	-51,7	-110,2	-43,78	-29	-48,9
T (362,6 PSI) °F	77	129,2	10,4	154,4	79	136,4
P (-31°F) PSI	9,72	24,08	174,77	19,73	11,46	24,66
P (14°F) PSI	29,01	62,80	384,35	49,60	31,91	63,82
P (113°F) PSI	168,24	296,60	1070,81	222,05	167,37	310,38
P (140°F) PSI	243,81	416,26	1070,81	307,19	238,15	427,86
Critical Point	101°C 40,67 Bar	161,6°F 541,13 PSI	87,8°F 1070,81 PSI	206,6°F 614,38 PSI	201,2°F 490 PSI	180,68°F 689,51 PSI
Flammable (*)	No	No	No	Yes	Yes	No
Oil Type	POE	POE	MINERAL	MINERAL/ POE	POE	POE
Status	Current Use	Current Use	Current Use	Current Use	ud	ud

(*) If Flammable, there is charge limitation till 150 g per single circuit.

Characteristic	R134a	R404A/R507	R744	R290	R1234yf	R407F
GWP	4	2	10	8	7	3
ODP	10	10	10	10	10	10
Inherent COP	6	4	6	7	5	4
Cooling capacity / Size	5	9	1	8	5	9
Pressure level	5	2	0	4	5	2
Requires redesign	7	6	0	6	7	6
Flammability	10	10	10	0	2	10

Importance
20%
10%
20%
20%
10%
10%
10%

RANKING	62	58	54	66	58	60
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R290 THE BETTER CHOICE FOR LIGHT COMMERCIAL REFRIGERATION

R290 HMBP 60 Hz

Natural Refrigerant

Model	Displacement cu.in	Power hp	Application	Cpr cooling	Voltage Frequency	Motor	Refrigeration Capacity °F Condensing Temperature = 131°F		
							ASHRAE		
							Evaporating Temperature = 45°F		
							Btu/h	EER (Btu/Wh)	COP (W/W)
NLY45RRa	0,278	1/6	HMBP	F	115-127V 60Hz ~1	CSIR	2463	8,64	2,53
NLY45RRb	0,278	1/6	HMBP	F	115-127V 60Hz ~1	CSR	2463	9,39	2,75
NLY60RRa	0,365	1/5	HMBP	F	115-127V 60Hz ~1	CSIR	3344	8,81	2,58
NLY60RRb	0,365	1/5	HMBP	F	115-127V 60Hz ~1	CSR	3344	9,53	2,79
NL60TR	0,365	1/4	HMBP	F	115-127V 60Hz ~1	CSIR	2925	7,65	2,24
NLY80RRa	0,494	1/4	HMBP	F	115-127V 60Hz ~1	CSIR	4435	8,88	2,60
NLY80RRb	0,494	1/4	HMBP	F	115-127V 60Hz ~1	CSR	4435	9,56	2,80
NLY90RRa	0,555	1/3	HMBP	F	115-127V 60Hz ~1	CSIR	5016	8,74	2,56
NLY90RRb	0,555	1/3	HMBP	F	115-127V 60Hz ~1	CSR	5016	9,43	2,76

ASHRAE CONDITIONS:

Evap. Temp. (°F):	45
Cond. Temp. (°F):	131
Liquid Temp. (°F):	115
Suction Temp. (°F):	95
Ambient Temp. (°F):	95

R290 LBP 60 Hz

Natural Refrigerant

Model	Displacement cu.in	Power hp	Application	Cpr cooling	Voltage Frequency	Motor	Refrigeration Capacity °F Condensing Temperature = 131°F		
							ASHRAE		
							Evaporating Temperature = -10°F		
							Btu/h	EER (Btu/Wh)	COP (W/W)
NLY45LRa	0,278	1/6	LBP	F	115-127V 60Hz ~1	CSIR	818	4,61	1,35
NLY45LRb	0,278	1/6	LBP	F	115-127V 60Hz ~1	CSR	818	4,92	1,44
NL45FR	0,278	1/6	LBP	F	115-127V 60Hz ~1	CSIR	751	3,76	1,10
NLY60LRa	0,365	1/5	LBP	F	115-127V 60Hz ~1	CSIR	1186	4,85	1,42
NLY60LRb	0,365	1/5	LBP	F	115-127V 60Hz ~1	CSR	1186	5,22	1,53
NL60FR	0,365	1/5	LBP	F	115-127V 60Hz ~1	CSIR	929	3,89	1,14
NLY80LRa	0,494	1/4	LBP	F	115-127V 60Hz ~1	CSIR	1474	4,68	1,37
NLY80LRb	0,494	1/4	LBP	F	115-127V 60Hz ~1	CSR	1474	4,99	1,46
NLY90LRa	0,555	1/3	LBP	F	115-127V 60Hz ~1	CSIR	1648	4,64	1,36
NLY90LRb	0,555	1/3	LBP	F	115-127V 60Hz ~1	CSR	1648	4,92	1,44
NPY12LRa	0,738	3/8	LBP	F	115-127V 60Hz ~1	CSIR	2158	4,61	1,35
NPY12LRb	0,738	3/8	LBP	F	115-127V 60Hz ~1	CSR	2158	4,92	1,44

ASHRAE CONDITIONS:

Evap. Temp. (°F):	-10
Cond. Temp. (°F):	131
Liquid Temp. (°F):	90
Suction Temp. (°F):	90
Ambient Temp. (°F):	90

Application Characteristics and Test Conditions

Internal net volume (l)	340
Power supply (V/Hz)	115/60
Cabinet load	Empty
Ambient temp. / RH (°F/%)	77 / 50
Average internal temperature (°F)	-0,4
Ambient temp / RH in pull down (°F/%)	95 / 50



COMPRESSORS DATA	MP12FR	NPY12LRa	NPY12LRb	NPT12FSC
Compressor type	R404A Std Effic.	R290 High Effic.	R290 Very HighEffic.	R290 VSC
Cooling Capacity (BTU/h)	2083	2158	2158	2312
EER	3,93	4,61	4,92	5,36
EER increase vs Std. Effic. (%)		17%	25%	36%

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DATA	MP12FR	NPY12LRa	NPY12LRb	NPT12FSC
Compressor type	R404A Std Effic.	R290 High Effic.	R290 Very High Effic.	R290 VSC
Evaporating temperature (°F)	-25,78	-25,24	-24,88	-24,7
Condensing temperature (°F)	121,1	119,84	119,12	113,18
Duty cycle (% of running time)	51	52	52	73
Energy consumption (kWh/24h)	5,22	4,49	4,05	3,31
Energy consumption difference vs cabinet with MP12FR (%)	-	-14%	-22%	-37%

Acumulated data in 5 years	MP12FR	NPY12LRa	NPY12LRb	NPT12FSC
Total energy consumption (kWh)	9523	8192	7391	6039
Total energy consumption savings vs MP12FR (kWh)	-	1331	2132	3484
Total energy cost savings (US\$) (*)	-	174	279	456
CO ₂ emissions (kg CO ₂) (**)	4285	3687	3326	2717
CO ₂ emissions reduction vs std (kg CO ₂) (**)	-	-599	-960	-1568

(*) 0,131 \$/kWh average energy cost in USA

(**) Supposing 0,45kg CO₂ emissions for each kWh of produced energy

R290 advantages vs other alternative gas refrigerants for light commercial Refrigeration in USA:



- R290 one of the best environment friendly alternatives (excellent GWP)
- R290 EPA SNAP approved
- R290 applied in the most efficient appliances produced in Europe from last years with very positive results in million units running
- R290 systems do not requires significant changes vs current HFC's and vs other ecological alternatives (CO₂) (Reasonable working pressures)
- R290 allows the use of lower displacement compressors vs R134a and R1234yf to get equivalent cooling capacity
- Weak point of R290 is the limitation of 150 g charge per circuit (which cover most of light commercial appliances charge). Restriction under discussion to extend the maximum charge but estimated to middle term.



Thank you!