



Business Case for  
Natural Refrigerants

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11-12/04/2018 – Beijing



## **New Huayi NUS compressor series**

One step forward in energy consumption for R290  
LMBP in light commercial refrigeration



**jiaxipera**

**cubigel**<sup>®</sup>  
compressors

## HUAYI COMPRESSOR CO. LTD

The largest hermetic reciprocating compressors manufacturer in the world.

The company is held by Sichuan Changhong Electric Co. Ltd and operates in the household and light commercial refrigeration sectors with its three trademarks:

- Huayi
- Jiaxipera
- Cubigel Compressors

Produced in the 7 facilities of the group worldwide.



Annual sales of **45 Million** compressors



Capacity of **46,5 Million** compressors



**7,200** employees



7 factories worldwide  
**772.000 m<sup>2</sup>**

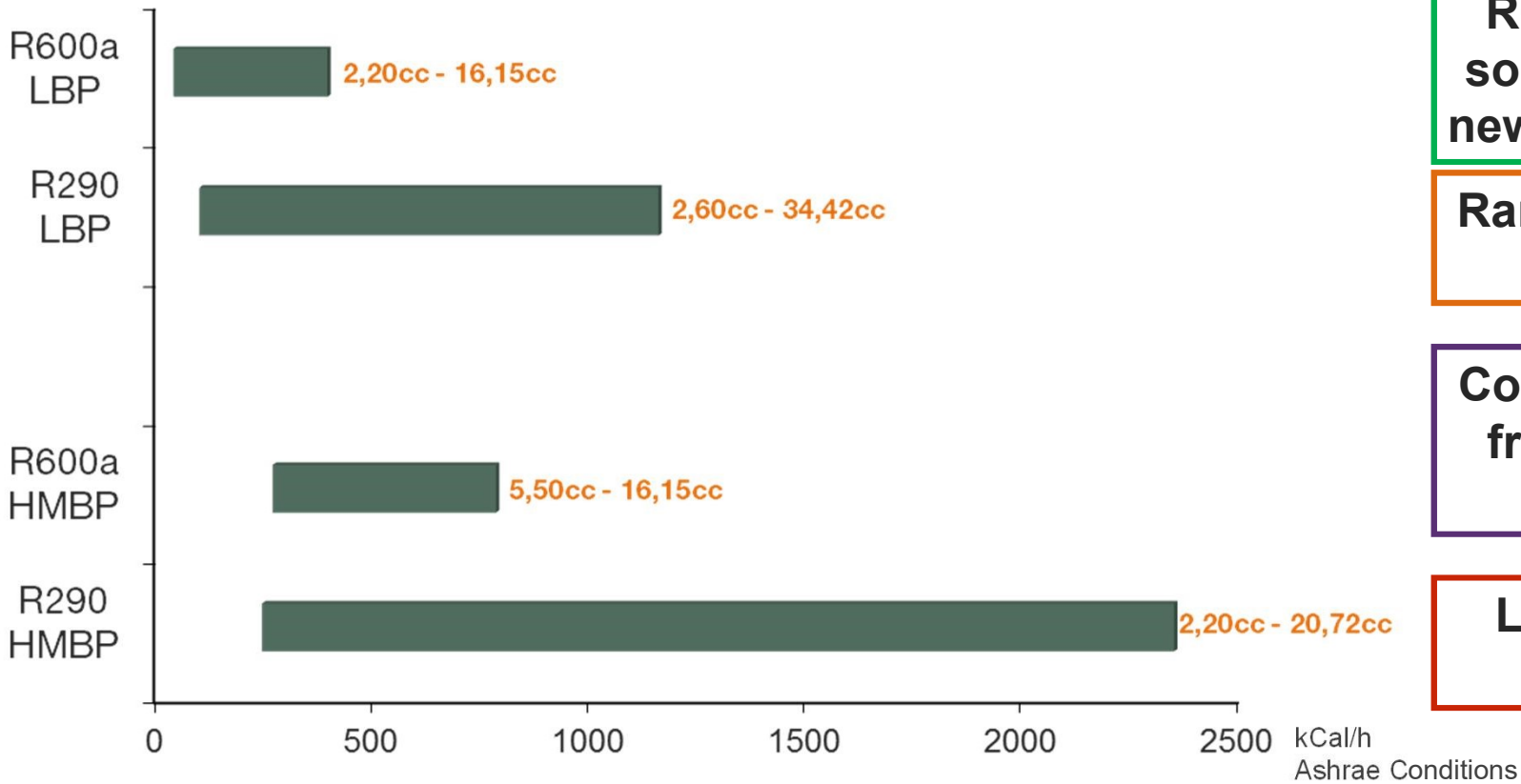


More than  
**400 R&D Engineers**



R&D investments  
**> 3% net sales**

## OVERVIEW OF NATURAL REFRIGERANT-BASED SOLUTIONS



**R600a and R290 solutions (90 % of new developments)**

**Ranges from 2,2cc to 38cc**

**Cooling capacities from 30 to 2.550 kCal/h**

**LBP and HMBP applications**



## CASE STUDY

### OBJECTIVE

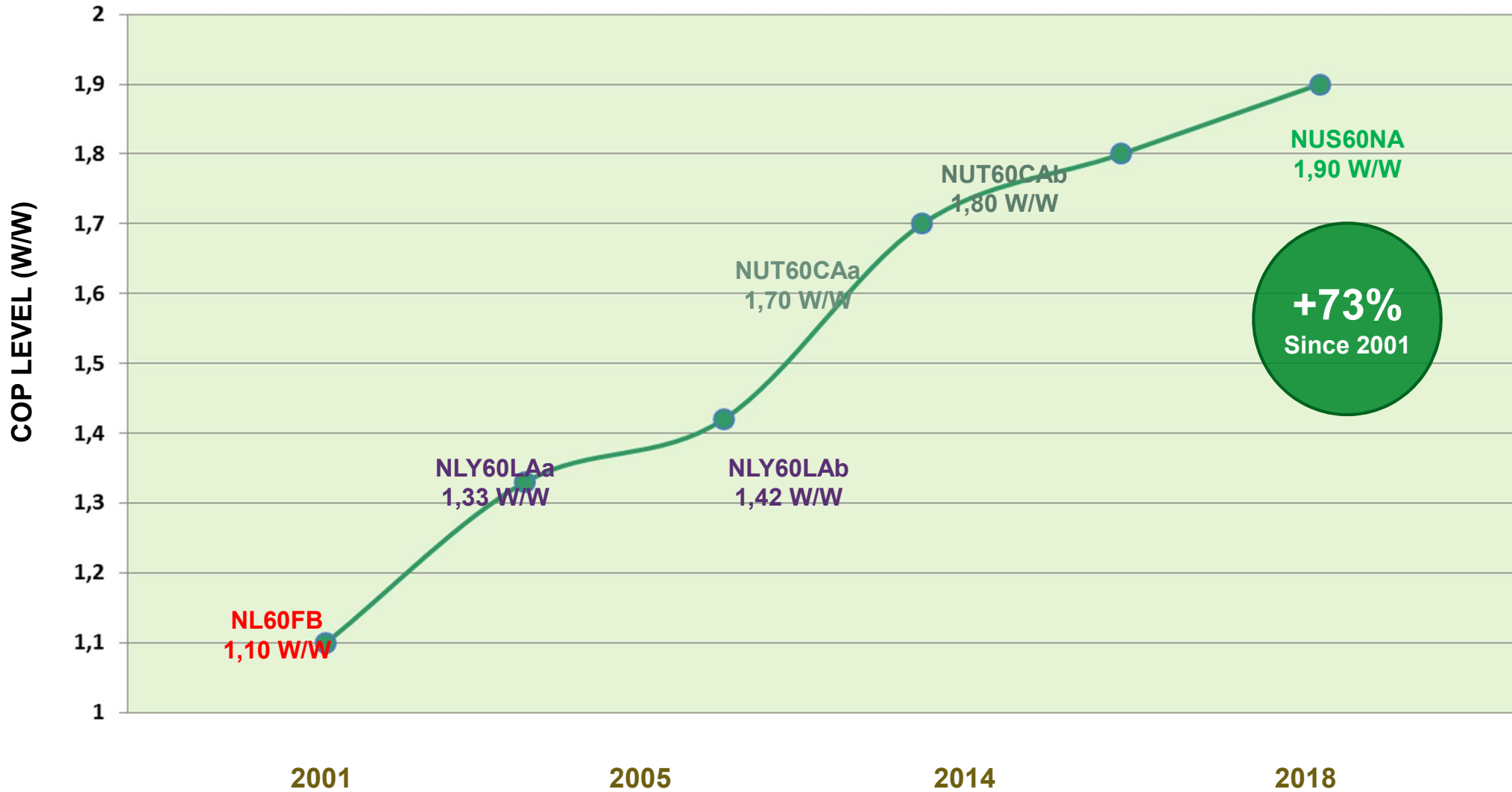
In 2014 Huayi launched to the market the most efficient range of R290 LBP compressors for light commercial freezers: The New U range. Now, 4 years later Huayi has improved the NUT range and nowadays **the new NUS range** represents again an efficiency imprudent that is translated into a lower cabinet energy consumption.

We want to share our real experience testing an existing freezer LBP where we can see the complete system energy saving just due to the use of the **new NUS range R290 LMBP** as alternative to the previous existing NUT range R290 LBP.



## The New NUS Range

**COMPRESSOR COP EVOLUTION: THE NEW NUS SERIES**



## THE COMPRESSOR

REFRIGERANT	MODEL	APPLICATION	DISPLACEMENT (cc)	CAPACITY (W)	COP (W/W)
R290	NUT60CAb	LBP	6,00	302	<b>1,80</b>
R290	NUS60NAb	LMBP	6,00	295	<b>1,90</b>



*ASHRAE32 Conditions*

## TESTS PERFORMED IN Huayi Barcelona

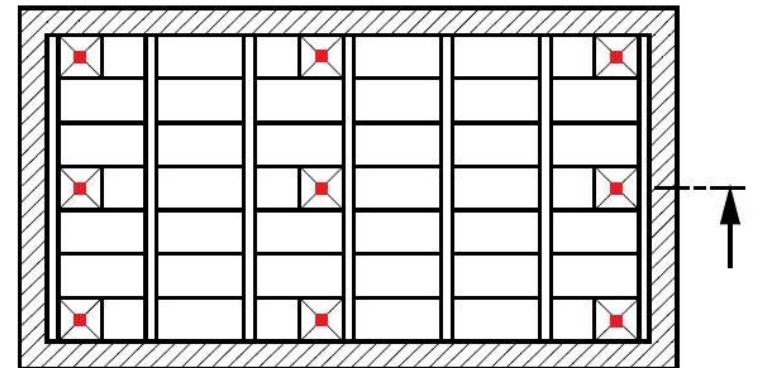
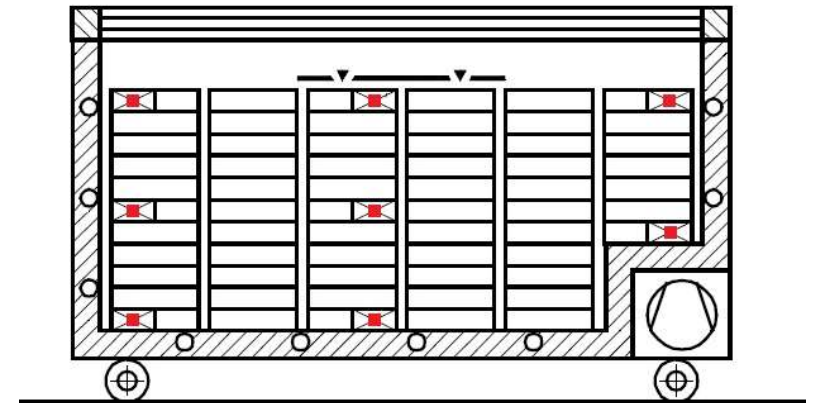
COMPRESSOR MODEL	TEST	CONDITION	REFRIGERANT CHARGE	CAPILLARY TUBE
NUT60CAb	Pull-Down	35°C / 75% HR	70 gr	0,8mm x 2,90 m
	Energy consumption	30°C / 55% HR	70 gr	0,8mm x 2,90 m
NUS60NAb	Pull-Down	35°C / 75% HR	70 gr	0,8mm x 2,90 m
	Energy consumption	30°C / 55% HR	70 gr	0,8mm x 2,90 m

*Tests performed according to EN16901*

## THE APPLIANCE

### APPLICATION CHARACTERISTICS AND TEST CONDITIONS

Type of cabinet	Ice-Cream Freezer
Refrigerant	R290
Internal net volume	300 Liters
Voltage	220-240V 50Hz
Ambient temperature / RH	30°C / 55%
Average internal temperature	-18°C
Cabinet load	Fully loaded (see scheme)





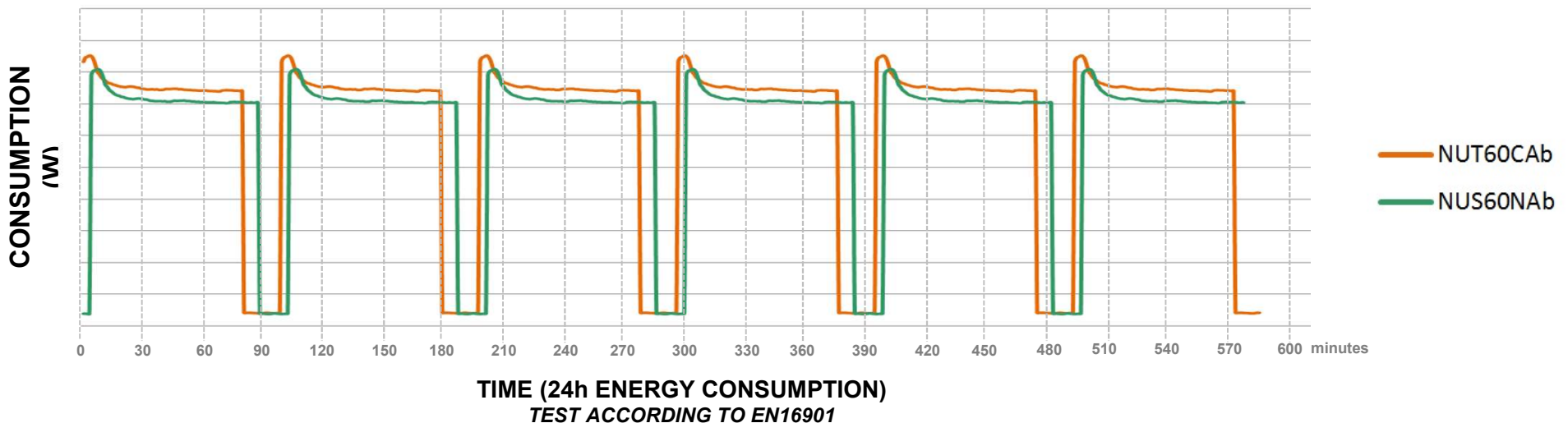
## TEST RESULTS

PULL DOWN TEST (35°C / 75% HR)	NUT60CAb	NUS60NAb
Pull Down time (hottest package at -20°C)	97 minutes	<b>92 minutes</b>

ENERGY CONSUMPTION TEST (30°C / 55% HR)	NUT60CAb	NUS60NAb
Evaporating temperature (°C)	-34,22	-34,39
Condensing temperature (°C)	42,05	42,02
Average package temperature (°C)	-18,49	-18,26
Duty cycle (%)	81,2%	84,5%
Energy consumption (kW/24h)	2,839	2,696
Energy consumption difference vs cabinet with std compressor	-	<b>-5,04%</b>



Low energy  
consumption



## TEST RESULTS

Accumulated in 10 years		
Data	NUT60CAb	NUS60NAb
Total energy consumption (kWh)	10362	9840
Total energy consumption savings vs std (kWh)	-	522
Total energy cost savings (*)	-	51,15 €
Savings per day vs std (euro)	-	0,03 €
CO2 emissions (kg CO2) (***)	4663	4428
CO2 emissions reduction vs std (kg CO2) (***)	-	<b>235</b>

(\*) 0,098 €/kWh average energy cost in Europe

(\*\*\*) Supposing 0,45kg CO2 emissions for each kWh



Sustainable Cooling



## R290 ADVANTAGES VS OTHER REFRIGERANTS FOR LIGHT COMMERCIAL REFRIGERATION

- For light commercial R290 is one of the best environment friendly alternatives (**excellent GWP**).
- For light commercial R290 is the most efficient solution (**excellent COP**)
- R290 already EPA SNAP approved: (**Global refrigerant solution**).
- R290 applied in the most efficient appliances produced in Europe from last years with very positive results with million units running. (**Already very well proved**)
- R290 systems do not requires significant changes vs current HFC's alternatives and vs other ecological alternatives (CO<sub>2</sub>) (**Reasonable working pressures**).
- R290 is already common use solution by the most important Chinese OEM for light commercial refrigeration. (**Rapid growth in Chinese market**)
- Weak point of R290 is the limitation of 150 g charge per circuit due to flammability. (**Light commercial new maximum charge restriction for R290 coming soon**) .



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**Thank you very much!**

