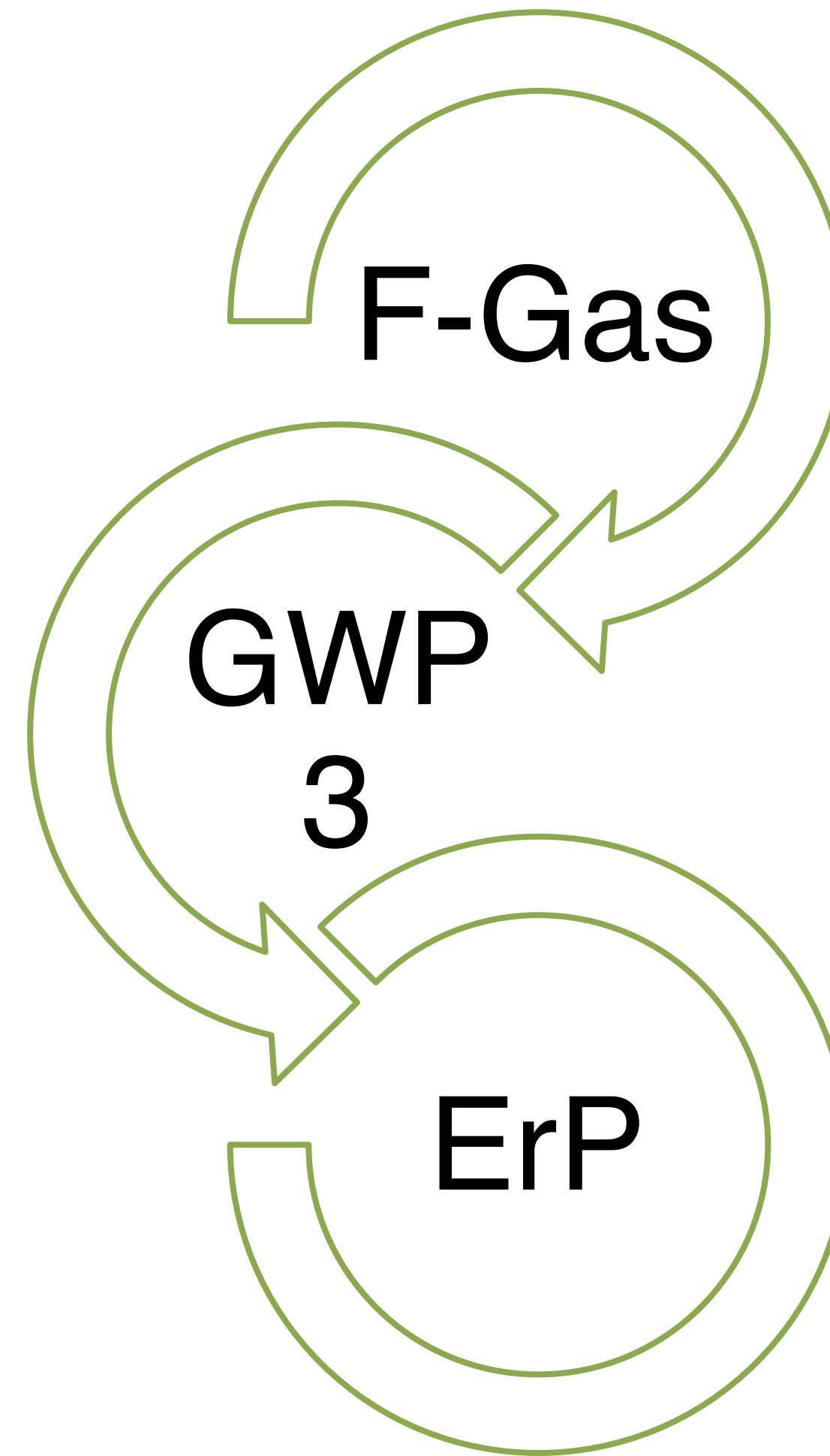




Use of a Hydro-Carbon refrigerant in a convenience store

Presentation of a Reach In application running with less than 150gr of Propane

Why to develop a Reach In running with Propane?



Mandatory Steps

Fulfill the End users chain requirements :

GWP < 5

Hydrocarbon charge < 150gr to be able to locate the Reach In everywhere.

Reach In efficiency should equal or be above the ones of the current models.

Systems able to run in 43°C ambient temperatures.

Enlarge the application possibilities with 150gr of R290.

Barriers and Solutions

Regulatory requirements

- Electrical changes
- Refrigerating Re design

Flammability level

- Lower the HC concentration rate in case of abnormal running conditions.
- Electrical components protection

Cost

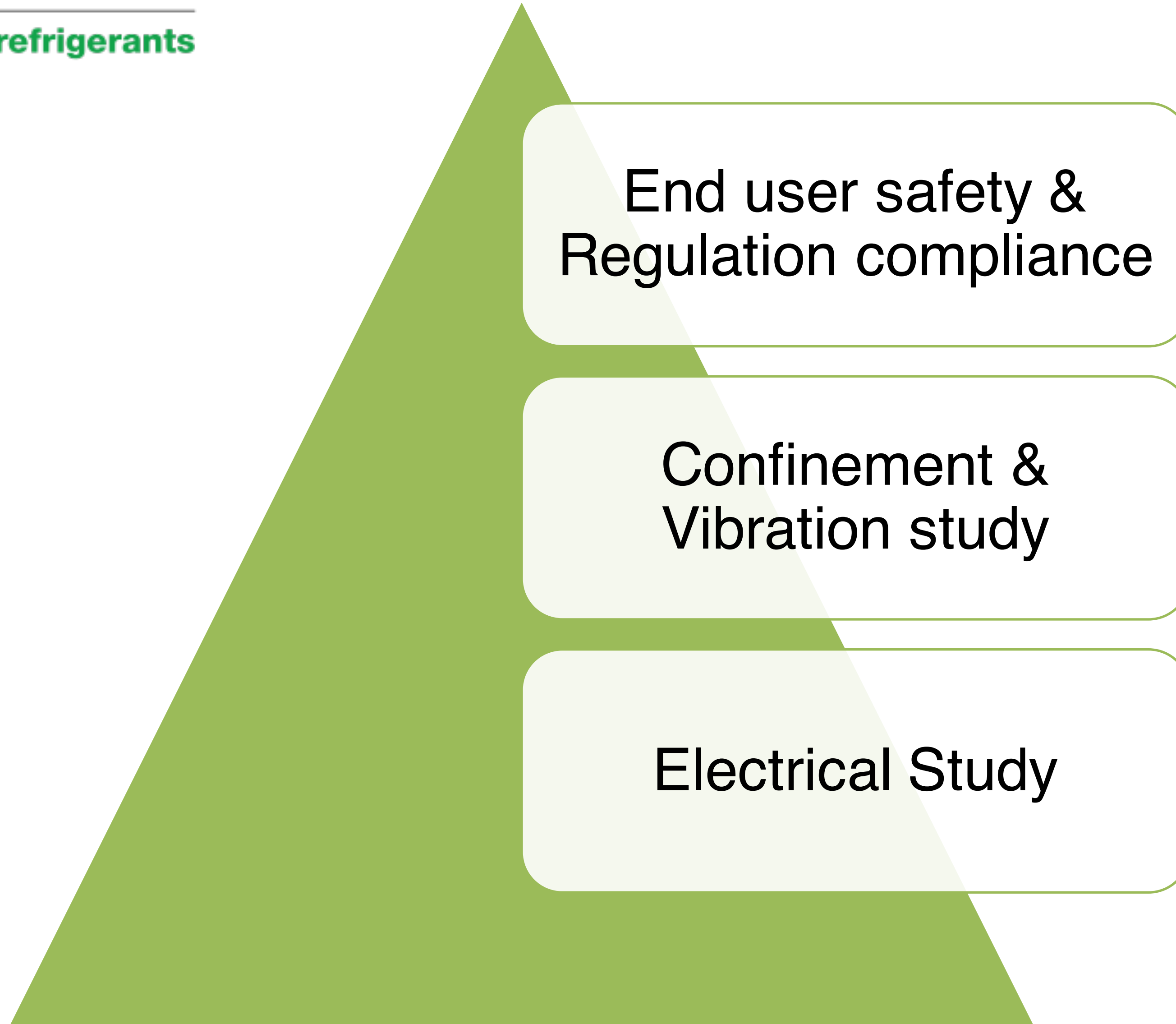
- Component optimization accordingly to the refrigerant properties
- Life cycle impact

Application Specifications

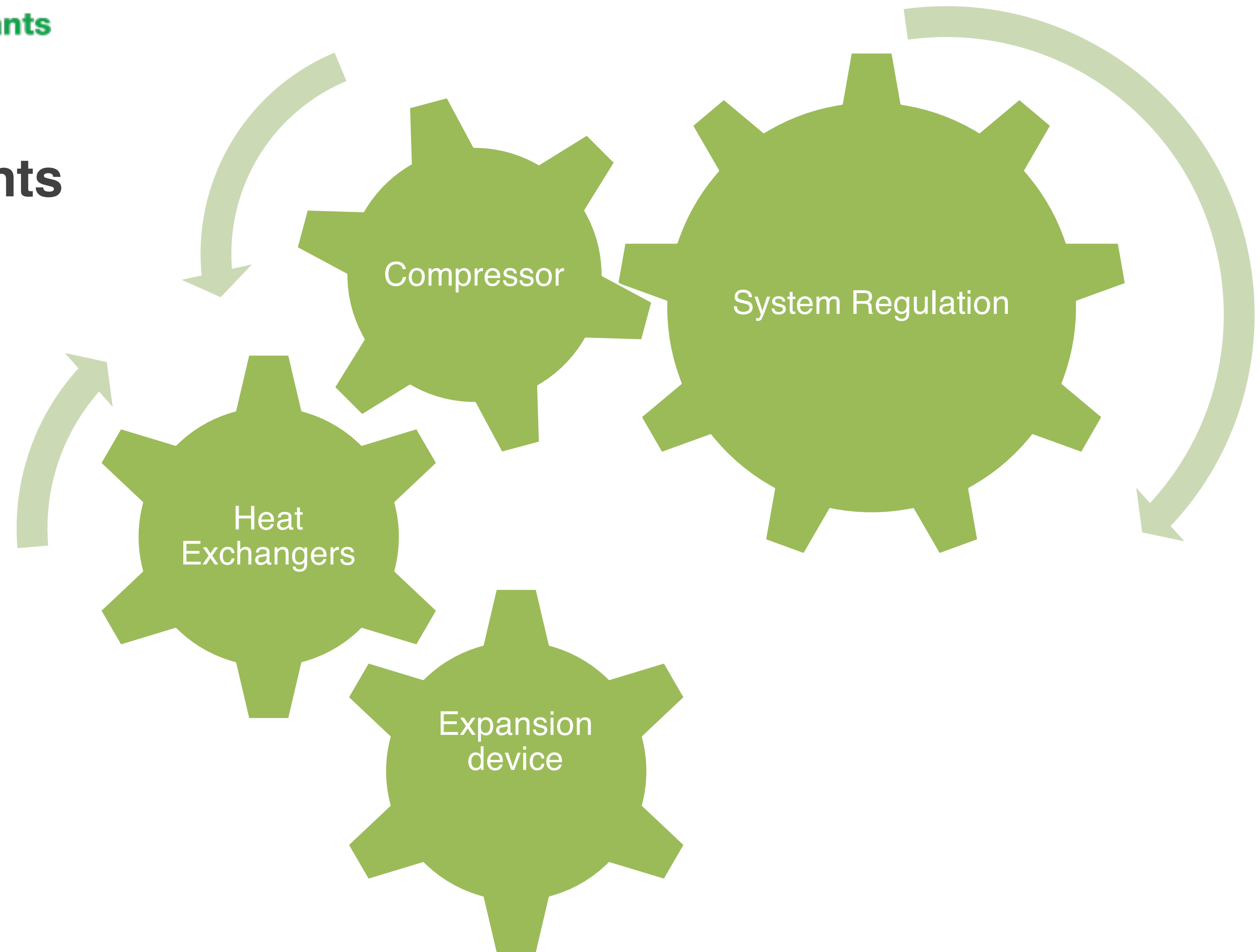
- Inner volume = 600 Liters
- Ambient Class 4
- Complies to standard pr EN 16825



Safety



Refrigerating components Regulation



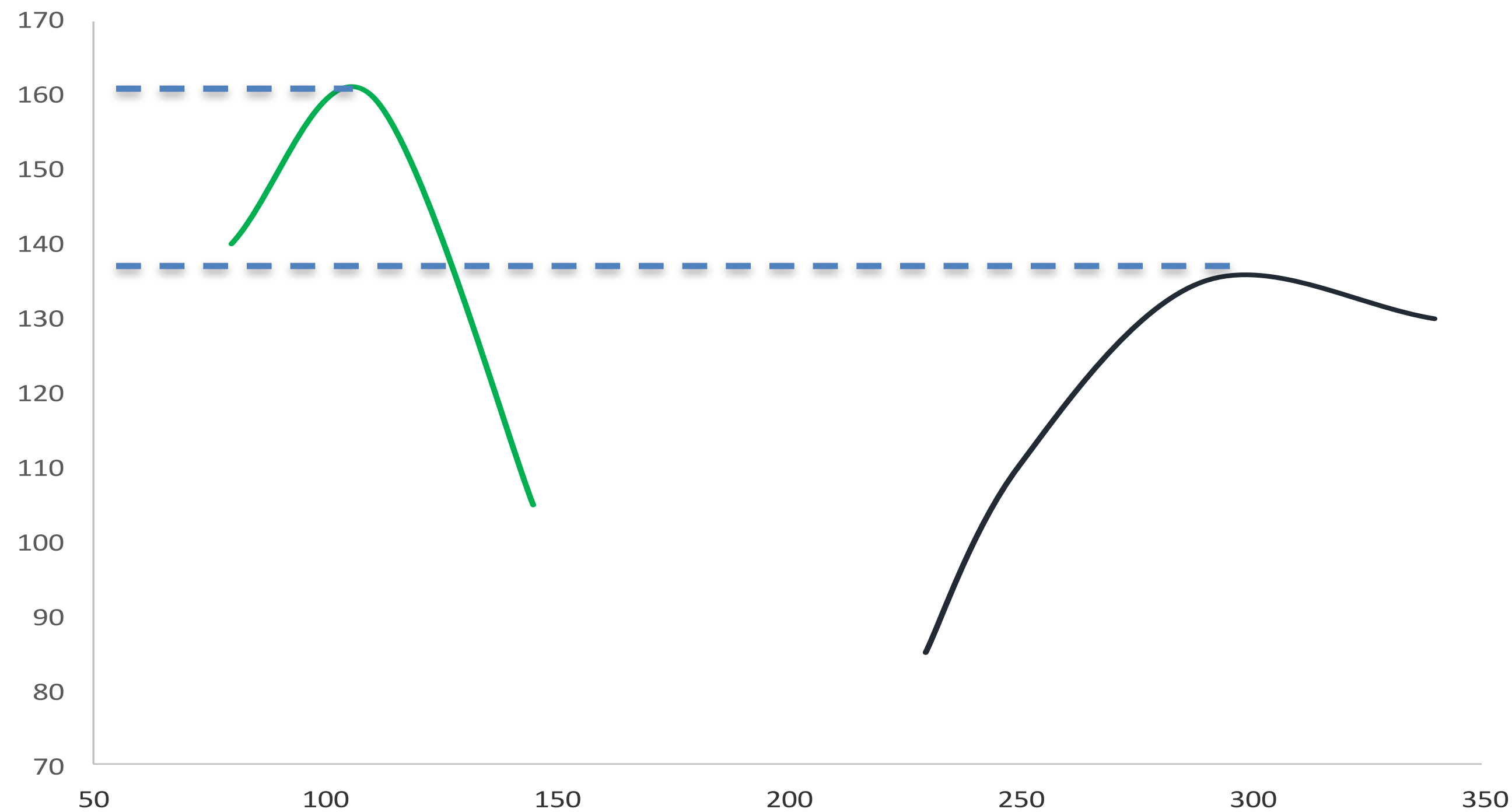
Laboratory measurement carried out with R290 as Drop In. Cabinet LJ1

Refrigerant		R404A	R290
Closed door*		reference	2.78
MEPS Door Opening 30° C Ambient	%	reference	5.98

* Energy consumption measured without door opening
Ambient 32°C

Capacity Comparison – Laboratory Refrigerant charge optimization

Net Cooling capacity
Watt

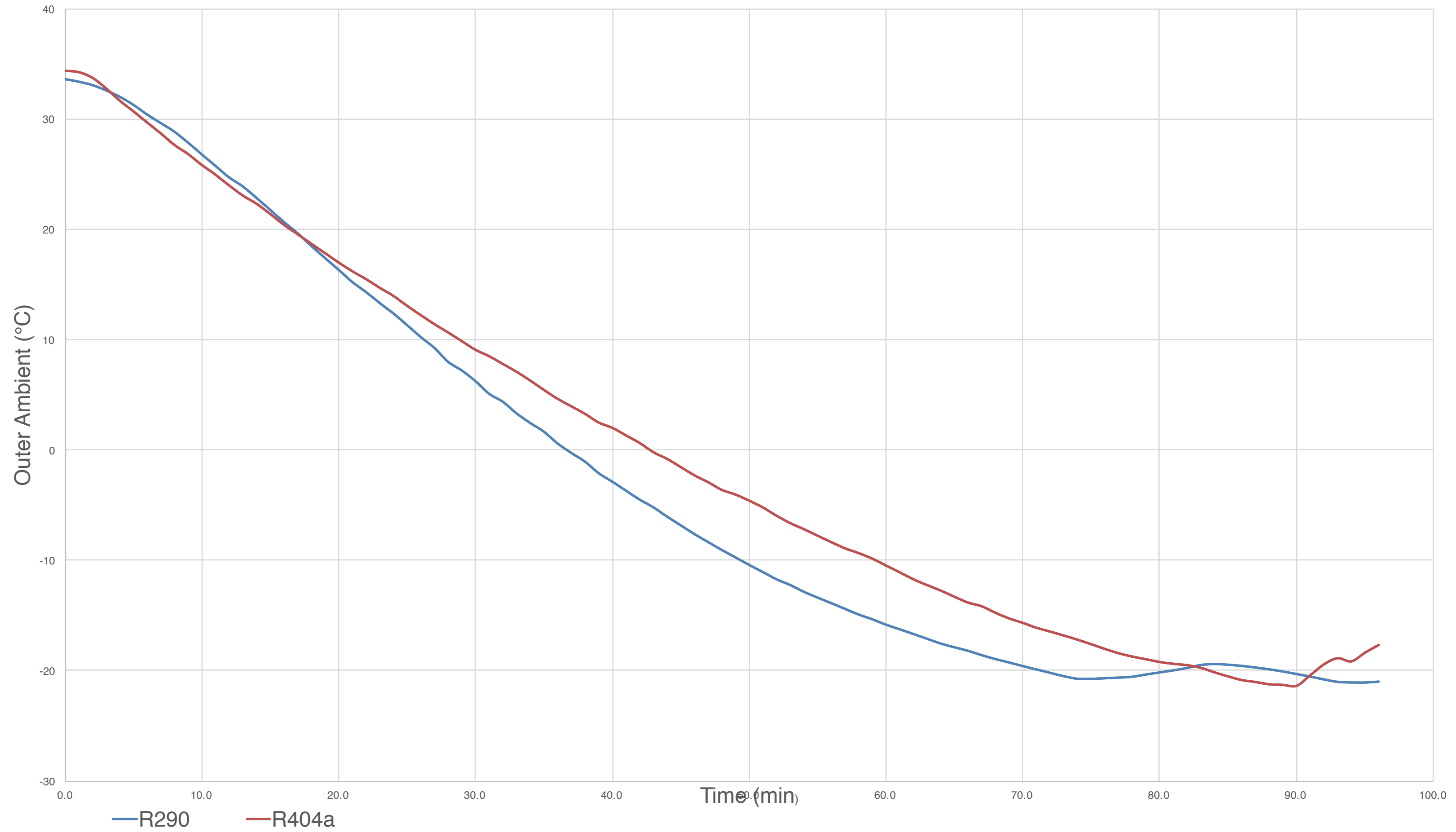


Refrigerant		HFC (R404A)	HC (R290)
Optimum Refrigerant charge	gr	275	113
Net Cooling capacity (*)	Watt s	303	342

(*) Testing room temperature = 32° C
 Refrigerated volume temperature = -18° C

Pull down

Average Inner cabinet Temperature



Laboratory measurements.

Condensing unit Efficiency with an optimized components, regulation & refrigerating circuit.



Compressor		CAE 2420Z	AE 2420U
Refrigerant		R404A	R290
Running ratio	%	61,5	51 ,2
Condensing unit consumption	Wh/24h	5620	4517
Energy gain	%	reference	19,6

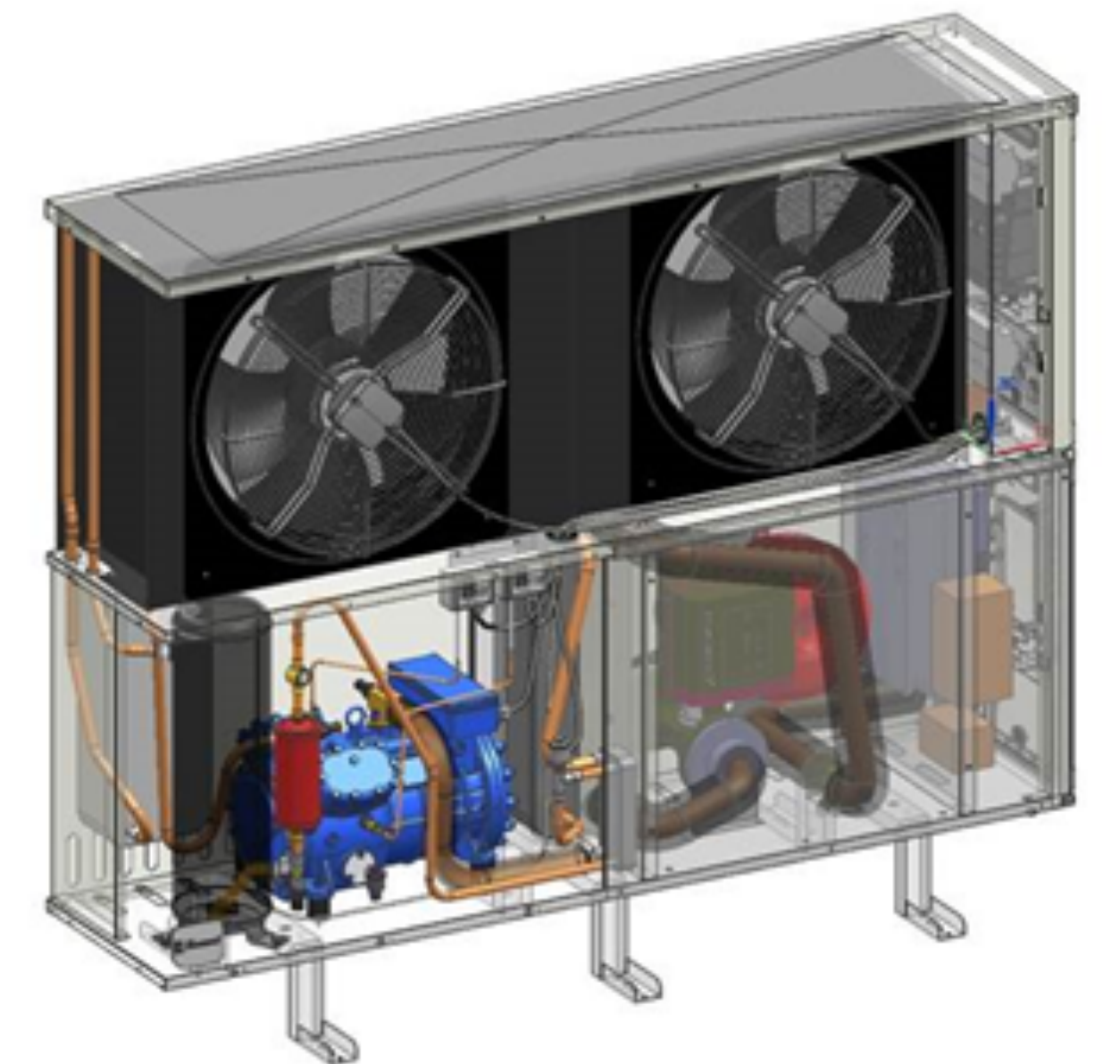
Energy consumption measured without door opening
Cut out thermostat = -19°C

Cost Analysis

- Basis is the same average Market sales cost
- Electricity cost saving on the end user side
- Less Heat rejection

Tecumseh Action Plan

HC Compressors & Condensing Units			Systems & μ Chiller
Piston	TA - TC	TA available – TC on progress	Development on progress
		Compressor range available Full CU range completion on going	
		LBP range available MHP & HP compressors & CU on progress	
	AK ²	on progress	
Rotary	RGA - HGA	MHP & HP compressors available	



Lessons learnt

- What will you do differently in the future?

More focus on technical cooperation with OEMs to enlarge their applications field possibilities.

- What can you apply to the next projects?
- Safety criteria is a driver. Design of the hermetically Sealed Commercial Refrigerated System, should make their location possible almost everywhere.



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19 & 20 April, 2016 – Barcelona

Thank you very much!