

Simply Gordoniz Bilbao (Spain) CO2 transcritical booster

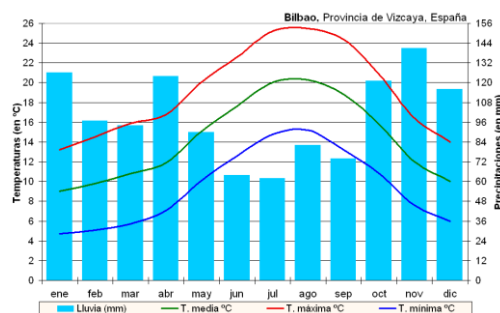
Gabriel Romero Asensio
Technical Director



16-17 March 2015 in Brussels



Simply Gordoniz (Bilbao)



Climograma di Bilbao
(Observatorio del Aeropuerto de Bilbao)

Location:

Bilbao (Spain)
 Average T^amax: 26,0 °C
 Average T^amin: 4,0 °C
 Level: 19 m over sea level

Supermarket:

Sales area: 700 m²
 Positive cooling capacity: 113,70kW
 Negative cooling capacity: 23,48kW



Ley 16/2013, 29th October – F-Gas Tax

REFRIGERANTE	FAMILY	GWP	TAX(€/Kg)
R22	HCFC	1700	34
R134A	HFC	1300	26
R404A	HFC	3800	76
R407A	HFC	2000	40
R407C	HFC	1700	34
R407F	HFC	1824	36
R410A	HFC	1890	38
R290 (propano)	HC	3	0
R1270 (propileno)	HC	0	0
R717 (amonaco)	Natural	0	0
R744 (CO2)	Natural	1	0
R1234yf	HFO	6	0

It is a tax on gas kg refilled at a installation.

Any refrigerant used in cooling systems is a Greenhouse Gas whose impact is measured by the 100-GWP (Global Warming Potential) representing its contribution to the greenhouse effect on Earth in a period of 100 years.

The potential value of gas warming refers to the CO2.

Analyzed the existing gases into our installations, there is a potential risk of k € 3,210 F-Gas Tax.

GAS	Suma de Kg Gas Instalación	Suma de Tasa Potencial
R-404A	41.591	3.160.901
R-407 F	600	21.600
Total general	42.191	3.182.501

REGLAMENTO (UE) N° 517/2014

Prohibitions timetable

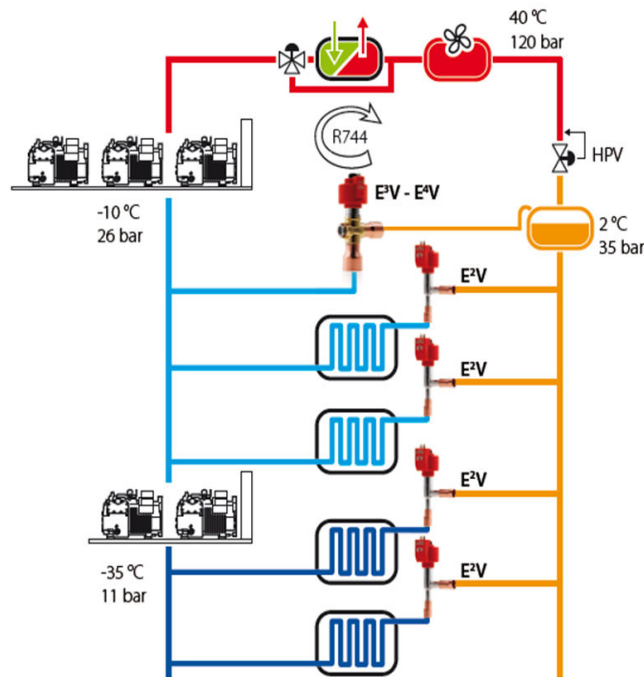
Productos y equipos	Fecha de la prohibición	
Equipo de protección contra incendios que contienen HFC-23	1 de enero 2016	
Frigoríficos y congeladores domésticos que contienen HFC con un PCA igual o superior a 150	1 de enero 2015	
Frigoríficos y congeladores para uso comercial (sistemas cerrados herméticamente)	que contienen HFC con un PCA igual o superior a 2500 que contienen HFC con un PCA igual o superior a 150	1 de enero 2020 1 de enero 2022
Aparatos fijos de refrigeración que contengan HFC, o cuyo funcionamiento dependa de ellos, con un PCA igual o superior a 2.500, excepto los aparatos diseñados para aplicaciones destinadas a refrigerar productos a temperaturas inferiores a -50°C	1 de enero 2020	
Centrales frigoríficas multicompresor compactas, para refrigeración comercial, con una capacidad igual o superior a 40 kW, que contengan gases fluorados de efecto invernadero, o cuyo funcionamiento dependa de ellos, con un PCA igual o superior a 150, excepto en los circuitos refrigerantes primarios de los sistemas en cascada, en que pueden emplearse gases fluorados de efecto invernadero con un PCA inferior a 1500	1 de enero 2022	
Sistemas de aire acondicionado móviles para habitación (sistemas sellados herméticamente que el usuario final puede cambiar de una habitación a otra) que contienen HFC con un PCA igual o superior a 150	1 de enero 2020	
Sistemas de aire acondicionado partidos de pequeño tamaño con una sola unidad interior que contengan menos de 3 kg de gases fluorados de efecto invernadero o cuyo funcionamiento dependa de ellos, con un PCA igual o superior a 750	1 de enero 2025	
Espumas que contengan HFC con un PCA igual o superior a 150, excepto cuando se exija el cumplimiento de normas nacionales de seguridad	Poliestireno extruido Otras espumas	1 de enero 2020 1 de enero 2023
Aerosoles técnicos que contengan HFC con un PCA igual o superior a 150, excepto cuando se exija el cumplimiento de las normas nacionales de seguridad o cuando se utilicen para aplicaciones médicas	1 de enero 2018	

Our installations are affected by this prohibition.

We decided we had to explore new solutions for future developments.

Transcritical CO2 booster system

We decided to perform an installation of a transcritical CO2 booster system, and also integrate into the same installation the services of refrigeration and air conditioning.



Benefits:

- Solution completely "green".
- Greater efficiency for media ambient temperatures.
- Technology in continuous improvement.
- Heat recovery possibilities.

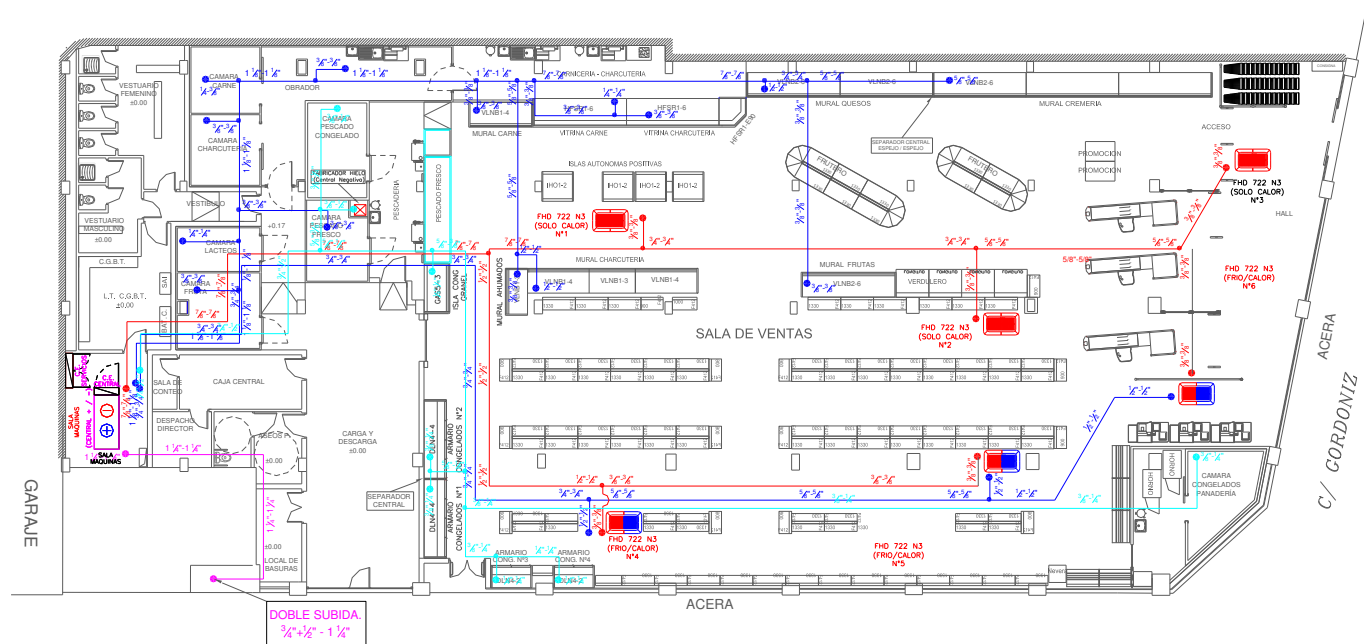
Disadvantages

- High working pressure.
- Need high level of knowledge.
- Are necessary additional safety devices in case of failure of supply voltage.

Equipment

- EPTA ECO₂-Small power rack
- Professional Training performed at Epta Uk

Air conditioning system



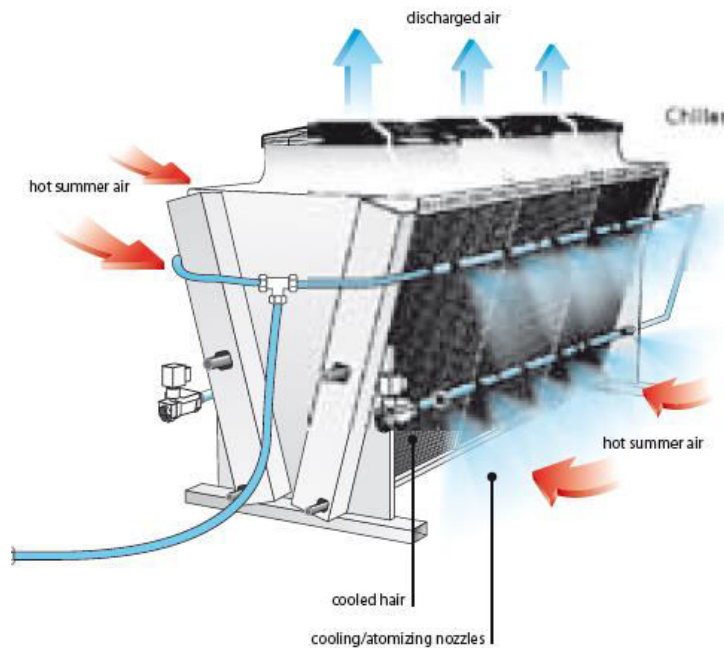
The air conditioning is integrated by direct expansion system of CO2.

In winter, the discharge of CO2 is routed to the interior air treatment devices located into the supermarket, generating enough heat to maintain a comfortable temperature.

We profit the waste heat from the refrigeration cooling plants.



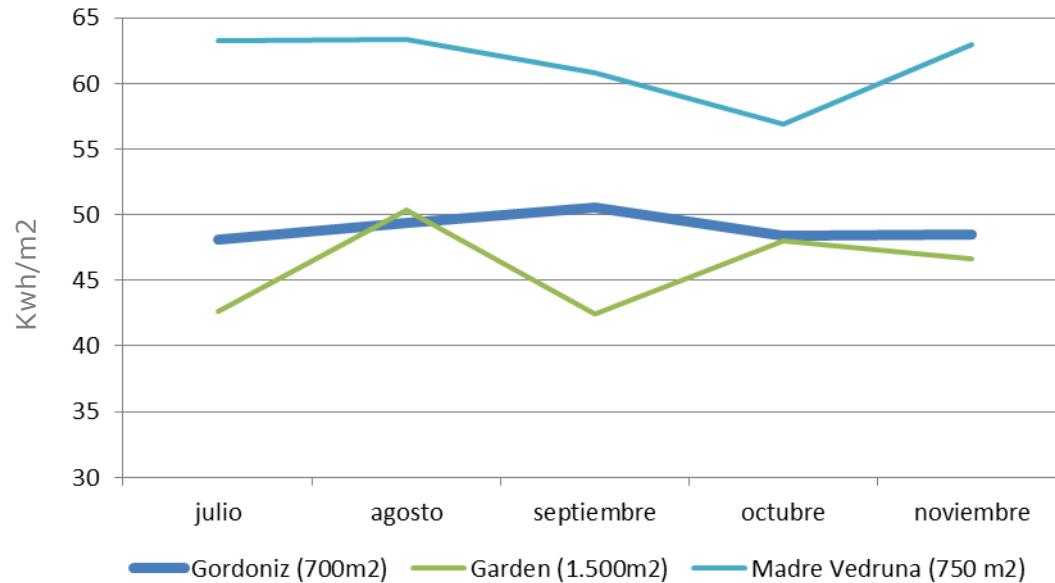
Adiabatic cooling system



Adiabatic cooling system allows to reduce the operating temperature of the gascooler by cooling down the ambient air. Improves overall system efficiency.

Consequently, the system operating pressures are reduced thanks to the cooling air, in the test operation we could find that the pressure was reduced from 107 bar to 70 bar, and therefore reducing electricity usage of the system.

Energy performance



If we analyze the energy system performance during the months of operation, especially in the warmer months and we compare supermarkets with similar characteristics, we can see that has a similar or even better performance.

We have concluded that CO2 transcritical system is a viable option in temperate climates and we are exploring the possibility of introducing it in warmer climates.