

BEST PRACTICES – REFRIGERATION SYSTEM FACTSHEET



Refrigeration system improvement

Spanish company dedicated to the elaboration of different high-quality meat products, decides to conduct a study to evaluate their facilities and detect possible inefficiencies in them. The is focused in the cured ham production, which must be elaborated under very specific temperature conditions to achieve the best quality and fulfil the food regulation requirements.

After an energy efficiency study, it was decided to change an old refrigeration system running on R22 by a modern centralized ammonia (NH₃) aimed at producing significant **energy savings**, as well as a reduction of the emissions. Other benefits include the better control of the refrigeration system, which improves the processes and product quality and a reduction in the operating and maintenance costs, with a reduced pay-back period.

Description

For many years the industrial refrigeration system has used traditional R22 and its substituting refrigeration gases, with high power but also high GWP.

The study considered the option to transform this system by a new centralised ammonia system (NH₃, R717) which brings a set of benefits as improved efficiency, easier maintenance, emissions reduction, better control, etc.

By substituting the old performance cooling plant by a new NH₃ system it was also possible to use part of the heat produced in the factory processes, thus improving the overall heating and cooling performance.

The heat recovery system is integrated in the overall system, thus providing an integrated performance of great interest for any factory demanding cold and heat.

'Double saving'

Spain
Meat industry

Investment
300,000 €

Savings
55,000 €/year
350,000 kWh/year

Main NEBs (Other Benefits)

**Reducing greenhouse
gas emissions**
Increased equipment life
**Product quality
improvement**

What is the improvement focus?

The NH₃ refrigeration plant is located in the technical room and, by using a compression-evaporation centralised system, achieves a refrigerant load reduction in the system.

The key of this improvement lies in greater efficiency from the new chiller plant to the existing refrigerated plant. Initially there was a plant constituted by a set of individual compressors with an average EER of 1.30 that have been upgraded to a centralised and controlled system with EER 3.5.

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Benefits

A new system with technical, control and heat recovery improvements is available after this renovation.

The most important ones for the industry are present directly in the electricity bills since there is a significant energy efficiency increase

of the entire cooling and heating system, from a plant <1,5 EER plant to an installation with a value next to 3.5, considering the heat recovery.

Reducing the greenhouse emission is another major benefit of this improvement due to operation with low GWP refrigerant, as well as

supporting the company strategic aims in its environmental policy.

Other important benefits are the increased lifespan, lower maintenance requirements of the new equipment and improved control system.

Calculations

The calculations show a quick idea of the costs and returns of this practice, as well as the economic impact after the implementation of the new equipment. In order to be clear, the initial situation is directly compared with the final situation and a table of differences is shown broken down into the different key points of savings, using an average price of electricity and emissions taking into account their expected evolution.

	Initial situation	Final situation
Productive capacity [t/year]	900	900
Annual energy consumption [kWh/year]	1,402,285	1,029,277
Annual energy cooling consumption [kWh/year]	981,600	608,592
Annual economic energy expenditure [€/year]	184,285	135,265

Total investment (€)	300,000
Energy savings [kWh/year]	373,008
Average electricity price [€/kWh]	0,13142
Average emission price [€/tCO ₂]	36
Emission reduction [tCO ₂ /year]	150
Energy economic saving (€)	49,020
Emission economic saving (€)	5,400
Total economic savings (€)	54,420
Return period (years)	5.5

About ICCEE

The project ICCEE, www.iccee.eu, funded by the EU programme Horizon 2020, aims at improving energy efficiency in the cold chain of the food & beverage sector and making it easier for the sector to undertake energy efficiency measures across the entire supply chain and accelerate the implementation of energy audit results. ICCEE follows a holistic approach that moves from a single company perspective to the assessment of the entire cold supply chain. Existing financing schemes for SMEs will be assessed: the optimal ones will support the implementation of energy efficiency measures. ICCEE objectives build on 2 pillars:



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