SUCESS STORIES

REDUCTION OF ENERGY COST

2022

INTRODUCTION

Today's rapid technological advancement facilitates access to Business Intelligence tools, which enables industrial refrigeration to be recognised as a key element for Industry 4.0., food safety and energy efficiency. This transforms the individual management of traditional industrial assets into an intelligent system capable of performing actions in an agile and efficient way.

Food safety is also vital, as it is directly related to health. It is essential to convey confidence to customers, so risk levels must be minimised (or eliminated) by resorting to preventive measures. To this end, food quality must be preserved throughout the entire product's value chain, from the producer to the consumer.

PURPOSE OF THE REPORT

The food industry's production processes demand maximum efficiency and minimum energy and maintenance costs.

Refrigeration 4.0, therefore, implies that maintenance become automated, going from 100% on-site actions to 70% automatized actions.

This document is an example of the energy costs report that can be generated after the execution of the feasibility study at the customer's facilities.

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COFRICO

Facility 1

The first facility consists of several areas, but we will focus on a machine room equipped with two 300kWf screw compressors whose refrigerant is ammonia (NH3) and that initially supplied 2 negative cold rooms (-20°C) with a volume of 16 000 m3.

The following information has been taken into account to generate this report:

- Each compressor's consumption
- The plant's consumption
- Electricity tariff

Once the system has been monitored by means of this feasibility study, we obtained the energy consumption distribution of the studied areas.

By using Gradhoc, we were able to visualise this information and to quantify the exact consumption of each compressor.

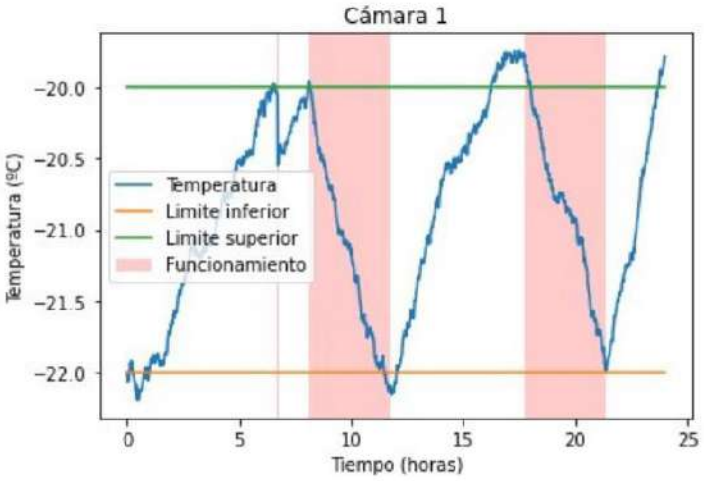
C6	**20.697** kWh
C7	**21.963** kWh

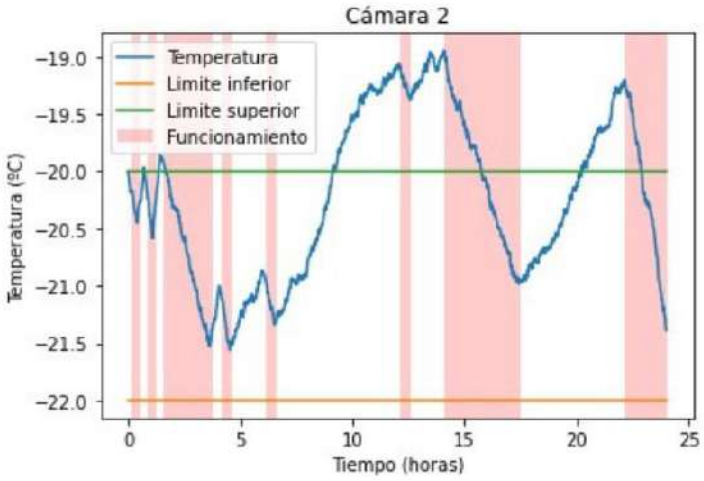
C6	**2.069,7** €
C7	**2.196,3** €

We noticed that the compressors stopped and started continuously. This, from an energy perspective, is completely counterproductive because compressors increase their energy efficiency when they are working at full capacity. Therefore, we tried to minimise the number of startups and shutdowns of the equipment.

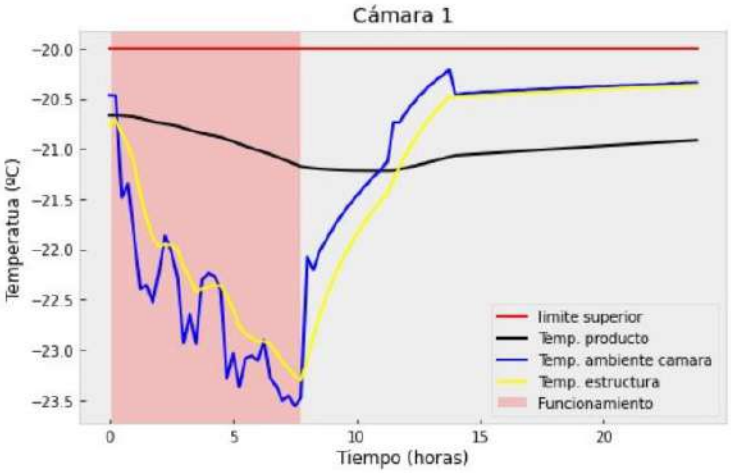
In addition, we carried out a simulation of the rooms' temperature behaviour, in which we represented its current behaviour and we predicted how it would change once the proposed adjustment was made. The graphs used to carry out the aforementioned study are shown below.

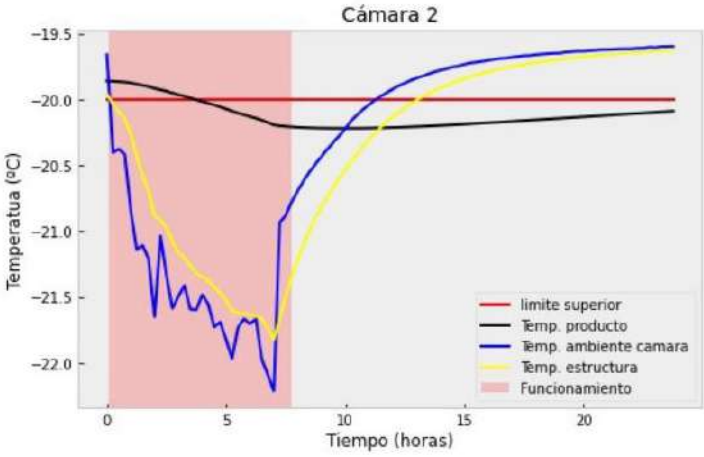
➢ Pre-adjustment simulation





➢ Simulation of the expected performance after the adjustment





Facility 1

After presenting the report, we suggested to the customer that the facility be reprogrammed to eliminate the intermittent startups and stops in order to achieve a more regular consumption distribution, as well as to optimise the installation's operating hours, thus capitalizing on the customer's contracted power.

Taking into account all this, the customer decided to carry out this project, achieving the following consumption profiles:

We managed to supply both rooms with only one of the two compressors, while achieving an effective electricity consumption of approximately 17 000 kWh, which implied a 40% reduction on energy expenditure.

C6	**3** kWh
C7	**25.476** kWh

C6	**0,25** €
C7	**1.333,44** €

In financial terms, the improvement was even greater, since the fact of adjusting the cold room's functioning to the electricity tariff diminished electricity costs by 2 900 euros, which translated into a 68% reduction on costs per month.

As a result, the facility's payback period was less than one year. In addition, with the power that was available after switching off one of the two compressors, the customer has taken advantage of this equipment to increase its production capacity and reduce the cost per kg produced.

Facility 2

The second system is a 16 450 m3 industrial logistics centre consisting of several areas, which were supplied according to different regimes depending on which of them needed cooling. To do so, the client resorted to a 350kWf positive refrigeration plant that used transcritical CO2 as a refrigerant.

In this case, the client asked us to carry out this study to verify whether it was possible to increase the plant's operating capacity by 24% (4 000 m3) with the same installed cooling capacity as before.

This report took into account the following information:

- Suction pressure and temperature
- Discharge pressure and temperature
- Oil pressure and temperature of each compressor
- Ambient temperature
- Each room's temperature

Based on all this, we presented a report in which we demonstrated that, by regulating the evaporation processes and by adjusting cooling and defrosting times, the system would be able to supply all the cold rooms after the increase in production capacity. As shown below, these measures increased the installation's production capacity and improved its energy efficiency:

➢ Evaporation

Evaporation temperature has been increased 4 ºC in spite of maintaining the cold rooms' operating condition. This implies an energy saving of 12%, as reducing the evaporation temperature 1 degree equals an energy saving of 3%.

❑ Before the adjustment

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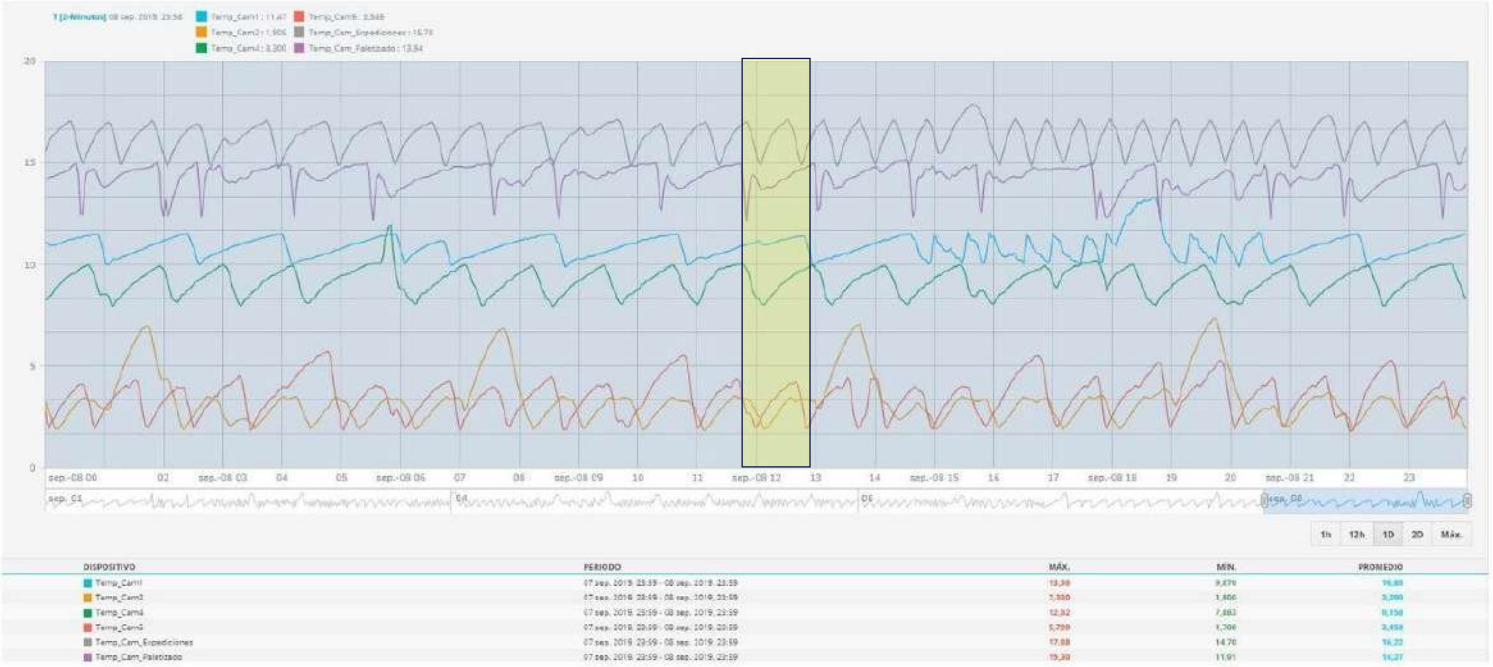
❑ After the adjustment

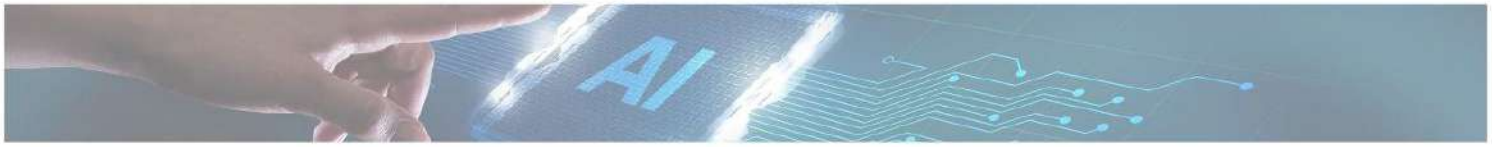
➢ Cooling time

The interval during which the cold rooms are being supplied with cold is reduced.

❑ Before the adjustment



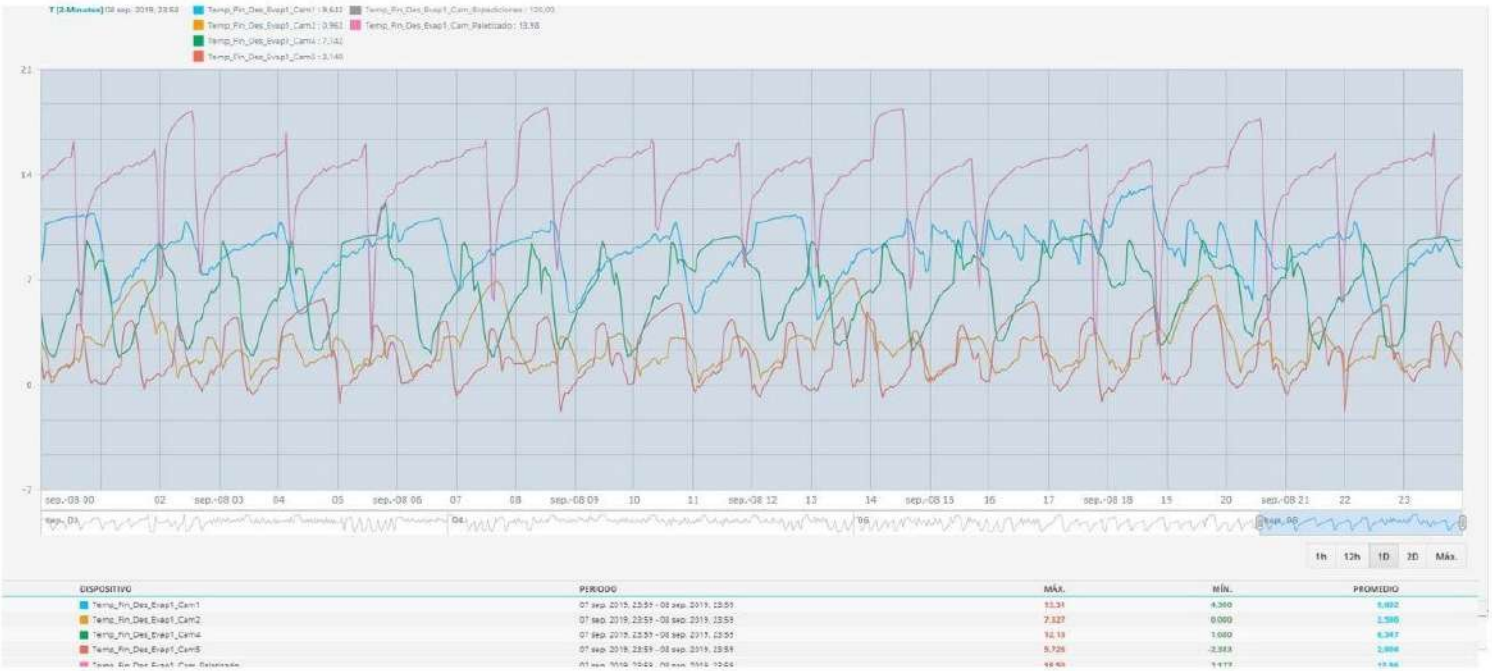
❑ After the adjustment



➢ Defrosting time

By increasing the intervals between defrostings and their duration.

❑ Before the adjustment



Facility 2

❑ After the adjustment

Thanks to this report and the analytical capabilities offered by Gradhoc, the client was able to:

- **Increase its production capacity by 24% without having to expand**
- **Reduce costs per kg processed**
- **Improve the system's energy efficiency**

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