The Hero's plant in Alcantarilla (Murcia) is one of the main production centers of the company

Cooling system for the production processes in the Hero Spain plant

1. The client

Hero is one of the world's leading food companies.

It offers consumers natural products, carefully selected from their origin, maintaining the highest quality and safety throughout the production process. This natural and strict way of elaborating its products has made it a reference in children's food, complying with the highest standards of quality and food safety.

2.The challenge

Hero Spain had to install in its factory in Alcantarilla (Murcia) a system to dissipate the heat of the production processes that meets the high requirements of safety, environmental sustainability, and energy efficiency required by the quality policy of the company, without detracting from a high capacity to cool very diverse manufacturing processes that reach high temperatures. .Among the important challenges to be solved were:

the scarcity and salinity of the water in the area, the high ambient temperature in summer, and the expected growth of the factory.

3.The solution

The technicians of Hero Spain,with the advice of the company Torraval, decided to replace the old cooling systems based on refrigeration equipment and non- returnable water circuits with a water cooling system using forced draught cooling towers made of glass fiber reinforced polyester (GRP) and laminar-drip fill.

Since 1974, Hero Spain has integrated 36 cooling towers of Torraval brand in its factory, which are currently at full capacity.

"Just as we are demanding in the quality of the raw materials we use for our products, we have to be demanding in the quality of the production processes"

Luis Gabarrón, Head of the Support and Control Department

4.Results

The combination of a correct choice of cooling system and the implementation of a specific maintenance plan, has contributed to meeting the company's energy efficiency and environmental management objectives. They have guaranteed maximum safety, substantially reduced purchased and

maintenance costs, and made it possible to quickly install the necessary equipment when new production processes are incorporated.

1. THE CUSTOMER

Hero: one of the world's leading food companies

The Swiss company Hero, founded in 1886, is one of the world's major food companies. It offers consumers natural products, carefully selected from their origin, maintaining the highest quality and safety throughout the production process. This natural and rigorous way of making its products has made it a benchmark in children's food, meeting the highest standards of quality and food safety.

The Hero factory in Alcantarilla: from transforming raw material into a reference production and research centre.

Hero Spain was established in Alcantarilla (Murcia) in
1922. Initially, its activity was to transform the excellent fruit and vegetables of the Murcia orchard to supply the companies of the international group. From 1930, it began to manufacture its own products, becoming in
1985 the production center of the new range of Food and Child Nutrition. In 2017 it is one of the benchmarks in research and development of children's products for the entire Group.

In the facilities of Alcantarilla, a great variety of products are elaborated. Some of them, such as baby food, require production processes at high temperatures.

Since 1974, Hero Spain has integrated 36 cooling towers of Torraval brand in its factory, which are currently at full capacity.

2. THE CHALLENGE

Dissipate excess heat from industrial processes, which is essential in production.

In the facilities of Alcantarilla, which occupy 42,000 m2, a wide variety of products are made, ranging from baby food to jams and marmalades. This makes the factory have different production processes. As in any industrial process, the choice of a suitable system to dissipate the heat produced is a key element in the success of the installation.

The constant growth of the factory and its production lines made it necessary from 1974 to implement a new system for dissipating heat to replace the old refrigeration systems, which also had low energy efficiency, high water consumption and high maintenance costs.

The new system had to meet the high demands of safety, environmental sustainability and energy efficiency required by the company's own quality policy, without detracting from a high capacity to cool manufacturing processes that reach high temperatures.

What requirements did Hero's process cooling system have to satisfy?

Energy efficiency requirements

• The system had to be energy efficient. Energy efficiency is one of the priorities of Hero Spain, which has been carrying out audits for years, even before this type of internal analysis was obligatory, as established by Directive 2012/27/EU in Article 8.

• The technology to be implemented had to take into account that some production processes at the Alcantarilla factory include heat treatments. For example, the production of baby food, which must be sterilized in autoclaves.

• The system to be installed had to cope with a high ambient temperature, which in the town of Alcantarilla reaches an average of 18º C per year and in the summer months it is well over 30º. In those months, moreover, the factory has a particularly high activity.

Environmental management issues

• The system had to be environmentally friendly, which ruled out maintenance of the existing refrigeration system, which used environmentally unsustainable refrigerant gases and emitted greenhouse gases.

• It was necessary to take into account a whole series of peculiarities both in terms of the type of water and its availability. In the Region of Murcia, where the Hero factory is located, water is a scarce resource and must therefore be used efficiently.

Economic and maintenance issues

• The system had to be versatile to be able to adapt quickly and efficiently to the growth of the company and the constant incorporation of new production lines, as each new process practically involved the installation of a new cooling tower.

• The system had to have as long a life as possible, with maintenance being both easy and efficient and at a reasonable cost. Hero also wanted to use its own means and resources for maintenance.

• It had to consider appropriate investment costs. Although this was not one of the main constraints, costs that did not add value were ruled out.

Safety issues

• The system had to provide the highest level of security. In addition to the fact that the factory is located in a residential area, it complies with current legislation on the prevention of possible microbiological risks such as legionella. In this area it had to take into account especially the high salinity of the water in the area, which could mean not only an aggression against the equipment, but also with regard to its safety, since the concentration of salts can generate corrosion and incrustations in the equipment and, consequently, favour the irrigation of microbiological contamination.

"It was necessary to take into account the high salinity of the water in the area, which could lead not only to aggression against the equipment, but also with regard to microbiological control."

"The cooling system had to be safe, environmentally friendly, energy efficient, and able to adapt to the growth of the factory"

3. THE SOLUTION

In order to adequately deal with the challenge of heat dissipation, those responsible made their decision under two lines of action: on the one hand, to apply an adequate technological solution and, on the other hand, to establish and implement a specific prevention and maintenance plan.

Technological solution: GRP (glass fiber reinforced polyester) evaporative cooling towers.

Those responsible for Hero, with the advice of Torraval's technicians, decided to install an evaporative cooling tower system with the following characteristics:

- Material of the towers: GRP (glass fiber reinforced polyester)
- Type of tower: Forced draft.
- Filling: laminated or dripping.

Why were evaporative cooling towers chosen?

The reasons for choosing cooling towers instead of other technologies such as refrigeration or air condensation systems are several and have to do with issues such as greater energy efficiency, lower cost of acquisition, easier maintenance and lower environmental impact and cost of purchase.

Discarding the use of systems with refrigeration circuits due to their high-energy cost and the use of fluorinated gases (incompatible with the company's values), and air condensation systems due to their high-energy cost, it was decided to implement Torraval's evaporative cooling tower system, which dissipates a greater amount of heat using less electrical energy.

Why were GRP towers used?

One of the most important questions a user has to consider when deciding on a solution is the material the tower is made of. All materials have pros and cons that must be evaluated according to specific needs. In this case, Hero decides on GRP towers whose main advantages, apart from a much lower acquisition cost than stainless steel cooling towers, are the safety they offer and the possibility of easier maintenance.

In the words of Luis Gabarrón, head of the Industrial Support and Control Department at Hero Spain, the polyester towers are "*stable, resistant, clean, avoid the adhesion of organic matter, creating biofilm, are lightweight, easier to maintain and in short, more economical and efficient than metal towers".*

Even when located in hard-to-reach places, forced-draft cooling towers are easy to maintain. This not only reduces costs, but also ensures that maintenance is carried out properly.

The water used by Hero in the cooling circuit is subjected to a process of desalination and adjustment of different physical parameters to avoid incrustations and possible microbiological problems such as the formation of biofilm.

"The great advantage of cooling towers is that with low energy consumption, large amounts of heat can be dissipated."

"The biocides, used by imperative of the current legislation, are highly aggressive with the metallic towers, while they are not with the PRFV"."

Hero's technicians decided to customize the cooling towers and paint the interior background in a suitable color, making it easier to see the water left on the base. In this way, possible soiling can be detected. The upper part is painted white to check for the adhesion of incrustations.

"We treat the water before introducing it into the circuit, so that its useful life is as long as possible, it does not affect the installation in a negative way and there is no problem of corrosion or of microbiological nature".

"Torraval polyester towers are stable, resistant, clean and easy to maintain. In addition, they are the most economical and efficienton the market."

Why forced draft cooling towers?

Once the cooling tower solution was chosen, a decision had to be made on the type of tower to be used. The alternatives were either forced or induced shooting towers. The first ones have the fan at the bottom, unlike the second ones. Hero and Torraval decide on forced draught towers, among other reasons because of their ease of maintenance.

Why did people choose to have the laminate or drip filler?

Filling is a fundamental element in the operation of a cooling tower. In this case, Hero and Torraval choose both laminar fill in some cases and drip fill in others. The drip filler is especially effective in cooling water with solid particles. Circulating water with a concentration of solids can clog up a common laminar filling.

Management solution: Own prevention and maintenance system

In parallel with the installation of the towers, Hero's managers established a specific prevention and maintenance plan for the equipment, which is carried out with the company's own resources and which guarantees both the maximum useful life of the equipment and its safety. This plan includes, among others, the following activities:

- Pre-treatment of water used in cooling circuits. The water is subjected to a process of desalination and adjustment of physical parameters. As Luis Gabarrón points out, *"it is of little use to put a good equipment if the fluid used is not treated in a proper way".*
- Daily analytical monitoring plan that detects any possible deviation of parameters
- Monthly intervention in the tower and, if necessary, use of biocides for prevention. In this sense, it must be said that the biocides used by imperative of the current legislation, are highly aggressive with the metal towers, while they are not with the GRP ones.
- Maintenance operations and continuous improvement in line with the actions established in Royal Decree 865/2003.
- Adaptation and some customization of the cooling towers.

4. RESULTS

The main results of the application of Torraval's system at the Hero factory have been:

- Compliance with energy efficiency targets.
- Compliance with environmental management objectives.
- Guarantee of maximum security.
- Reduced acquisition and maintenance costs compared to other solutions.
- Maximum versatility. The system has been able to adapt to the factory's production growth.

Meeting energy efficiency targets

The choice of cooling tower technology has been one of the elements that have contributed to achieving a constant reduction in the consumption of electrical energy required in manufacturing processes in recent years, as can be seen in Hero's latest sustainability report.

As Hero's team points out, *"compared to some air condensation systems we are using in other areas, the electricity consumption is half as high".*

Meeting environmental sustainability targets

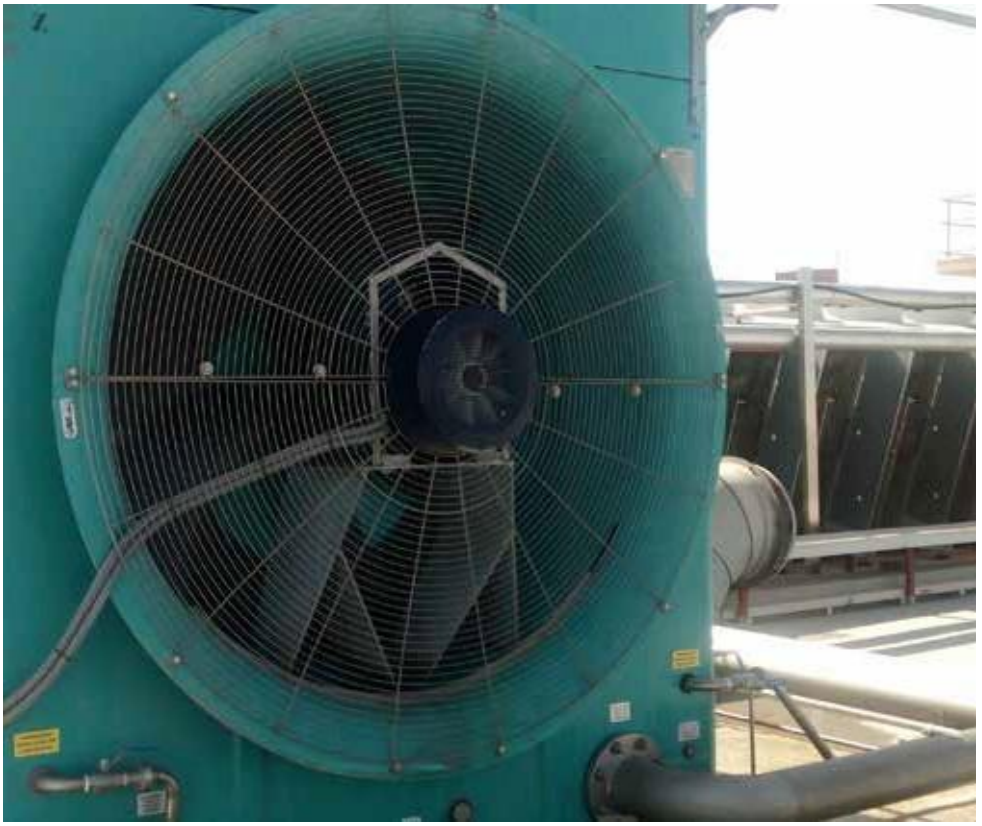
One of the main results of the installation of evaporative cooling towers is their decisive contribution to the reduction of greenhouse gas emissions and CO 2 emissions.

Also, the system has made the use of water more efficient, making its permanence in the circuit as long as possible, avoiding substitutions. Its consumption has been reduced in recent years, reaching a decrease of 0.4 m3 per ton of manufactured product.

The installation of evaporative cooling towers has contributed to a constant reduction in the volume of electrical energy consumed in Hero's manufacturing processes, CO2 emissions and water consumption in recent years.

“The cooling towers have been one of the elements that have contributed to achieving a constant reduction in the consumption of electrical energy required in the manufacturing processes of Hero”.

“Compared to some condensing air systems we are using in other areas, the electricity consumption is half that".



“We are not in favour of replacing equipment. A change is always more complex than maintenance because of the associated installation and movement costs involved. All the components of the Torraval Towers can be replaced or repaired: "the engine, the filling, the walls, etc. A Torraval tower can last a lifetime".

Cooling towers are an inseparable part of production processes, because almost all of them need to dissipate heat. Generally, the installation of a cooling tower is linked to each new production line. Companies like Hero, which are constantly growing, need a system that provides maximum versatility.

Maximum security

The use of cooling towers, combined with the maintenance plan has achieved one hundred percent safety. Two key elements of this achievement have been the use of treated water and the choice of GRP towers. By avoiding the formation of incrustations, possible risks of microbiological contamination are also avoided.

Cost reduction: acquisition and duration of equipment

In addition to the lower cost of acquisition of the cooling towers, Hero has managed to extend the life of the equipment to the maximum thanks to its maintenance plan. The company is not in favour of replacing the equipment, but of repairing it or adapting it, if necessary. Luis Gabarrón believes that *"a change is always more complex than maintenance because of the associated installation costs involved.*

All the components of the Torraval towers can be replaced or repaired: such as the motor, the filling, the walls, etc. A Torraval tower can last a lifetime, if a proper maintenance plan is applied".

Versatility: the system has proven to be fully adaptable to factory growth

Choosing cooling tower technology has allowed Hero to quickly adapt to its growth needsThanks to the ease of installation, the company has been able to quickly and easily incorporate cooling towers into its new production processes. Since 1974, 36 cooling towers have been installed, which are currently at full capacity. That is why the first tower that was installed and the last one have in common that they meet very strict standards: *"The objective is to maintain the tower with a working and efficient performance, conditioning it to the new technologies. Although, obviously, there are components that have been replaced, the performance of all of them is maintained as it was on the first day".*

Summary table of Hero and Torraval's decision to choose the cooling system for the production processes at the Hero factory in Alcantarilla (Murcia)

Necessary variables to meet	Elements to take into account	Solution	Main results of the application of the Torraval system
Energy efficiency issues • Achieving maximum energy efficiency.	• High temperature production processes. • Constant incorporation of new processes productivos. • High ambient temperature.	• Evaporative cooling system versus air-condensed refrigeration systems.	• Maximum energy efficiency than any other system: reduction of electricity consumption (50 % less than air-cooled systems) • Cost reduction per ton produced.
Environmental issues • Achieve maximum respect for the environment.	• Low water consumption. • Decrease the emission of CO . 2 • Eliminate risk of F-Gas emissions.	• Evaporative cooling system vs. the air-condensed refrigeration systems that are so consuming.	• Reduction of greenhouse gas emissions • Maximum use of water (adequate consumption of water resources).
Economic and maintenance issues • Adequate investment costs. • Versatility to adapt to the growth of the factory. • Easy maintenance with own resources.	• Adequate initial investment cost. • Cost of maintenance (Own resources and external resources) • Duration of the equipment: obtain the longest possible life.	• Evaporative cooling system. • Forced-draft towers. • Hero's own specific maintenance plan.	• Substantially lower initial investment than with other stainless steel equipment. • Possibility of carrying out maintenance with our own resources: cost reduction and greater guarantees. • Longer equipment life. All installed equipment is in perfect working order (some for more than 40 years). • Easy installation of new towers for new production processes.
Safety issues • Highest level of security.	• Factory located in urban area. • Avoid scaling and other microbiological problems. • Legal obligation to use aggressive biocides with the metal.	• Hero's own specific maintenance plan. • GRP equipment.	• No incidents related to microbiological problems in 40 years. • Adaptability to current regulations.

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