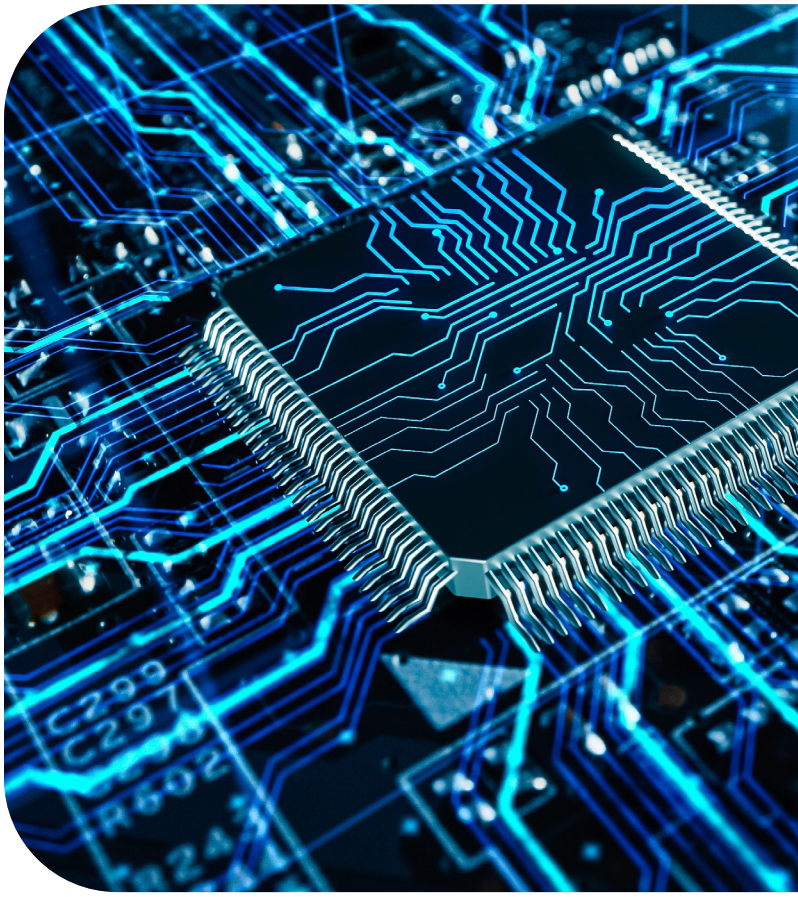
CASE STORY

110 consecutive days of free-cooling and 2.13 million CNY saved every year

Hefei, China



In a strategic move towards energy efficiency, a prominent Chinese semiconductor enterprise undertook an ambitious energy retrofit at their plant in Hefei. Guided by Alfa Laval's expertise, the factory integrated its cooling and heating systems, which previously operated in isolation.

The main challenge was to meet the factory's outlet water temperature requirements, that allow only a 1-degree difference for the LMTD. However, Alfa Laval's plate heat exchangers proved their capacity for heat recovery under special conditions. As a result, this industry-leading semiconductor enterprise now achieves remarkable energy savings in their processes on a yearly basis.

Customizable retrofit solutions

In a world where energy demands increase at the same pace as the pressure to reach net zero, energy efficiency will play a key role in making the task more manageable. In fact, optimizing energy efficiency in heat exchange processes alone can lead to visible energy-saving opportunities and quantifiable economic benefits for everyone. So, the first step is to identify key energy-saving opportunities that are hidden within existing systems.

Take this major semiconductor enterprise in Hefei, China as an example. As a leading enterprise in the Chinese display industry, they understood the important role they could play to support a green economy and decided to perform an energy retrofit for existing production lines.

Semiconductor plants have often used cooling towers as a form of free cooling and to save energy in their processes. But to reach the full potential that cooling towers provide, a well-designed system that is customized to fit the factory's actual conditions is essential.

This factory in Hefei has a variety of systems that were installed for different functions. For example, one requires a heating unit to warm the water, while the other needs a cooling unit to cool it. Normally, these two systems operate independently. But with the support of Alfa Laval technical personnel, they found a way to make this far more cost and energy efficient for their processes. By integrating the two systems and balancing their requirements with complementary cooling or heating over specific time intervals, the semiconductor plant would no longer need to run the main units.

Finding the balance between heat transfer efficiency and economic benefits

The biggest challenge for this project was to meet the factory's strict requirement for the outlet water temperature, which only allows for a 1-degree difference for the approach temperature. Thankfully, Alfa Laval plate heat exchangers can perform efficient heat recovery, even in environments with small temperature differences, to facilitate better energy exchange between each system.

110 days of free-cooling in factory chiller operation

The factory installed two 8,000 kW Alfa Laval plate heat exchanger units with a flow rate of 1,000 m³/h.

Heat saved
(19°C-9°C) * 1,000 * 4.2 / 3.6 = 11,666 kW which is equivalent to the heat produced by one heat-recovery cooling chiller, based on the COP (coefficient of performance) of 7.5.

Hourly electricity consumption:
(11,666 kW / 7.5) *1 hour = 1,555 kWh

Projected operation for 110 days per year.

2.13 million CNY in electricity savings every year

After a period of stable operation, all systems indicators were measured and met the design requirements. Based on the estimated electricity consumption, their annual electricity cost savings are calculated to be:

Heat recovery rated power * operating time
* electricity price
= 1,555 kWh * (24 * 110) * CNY 0.52 per kWh
≈ CNY 2.13 million.

Energy savings
11,666 kW/year

Cost savings
2.13 million CNY/year

Uptime
110 days/year

Energy Hunter & collaboration

This collaboration is a reflection, not just of the innovation taking place at both companies, but also of the huge benefits that come with promoting a low carbon economy. As the leading "Energy hunter" on the market, Alfa Laval will continue to explore energy saving opportunities in various industries, revitalizing the importance of energy efficiency and providing high-quality solutions.

AHRI certified plate heat exchangers

The plate heat exchanger operation in a free-cooling application is designed with a very close approach temperature to maximise the cooling effect of the cooling tower. With approach temperatures as low as 1°C, performance is guaranteed with AHRI Performance Certification. In this case, when the cooling tower water is at 10°C, the system is assured to receive cold water at 11°C.

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Liquid to Liquid Heat Exchangers
AHRI Standard 400

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Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com

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