

Substantial renovation transforms office building into a CO₂-saving powerhouse

When buildings age, the question almost always arises: 'demolish or renovate'?

Rethinking demolition – most existing buildings lack in energy efficiency. When properties are uneconomical and harmful to the climate, they are often demolished. However, modernization is fundamentally possible for these buildings, and often significantly more environmentally friendly. By using existing structures and materials, renovation conserves resources instead of destroying or disposing of them. When the European Patent Office in Vienna looked at redeveloping their aged building, they decided to strip the office building down to the shell and completely renovate it. This decision was made with a clear focus on ecological sustainability and CO₂ neutrality – as the renovated building would also be equipped with advanced technology for energy efficiency.



Cutting-edge heat pumps and natural refrigerant

The overall modernization concept of the European Patent Office includes a heat pump system with 20 probes drilled 200 meters deep into the ground beneath the second basement of the building. In winter, the system extracts heat from the ground, heating the building much more efficiently than air heat pumps and with significantly lower CO₂ emissions compared to conventional gas heating. In summer, the heat pump's process is reversed to cool the building. The driving force behind this system is two custom-made heat pumps from industrial sustainability frontrunners Equans Kältetechnik GmbH.

At the express request of the client, the heat pumps were to operate with a natural refrigerant. Due to its outstanding thermodynamic properties, ammonia was chosen, which has so far been primarily known as a classic industrial refrigerant and is rarely found in smaller capacity applications.

"NH₃ has neither ozone depletion potential nor greenhouse potential and is also unbeatable in terms of efficiency," explains Equans's project manager Jan-Hagen Kremser. "Our solution for the European Patent Office consists of two custom-made Equans smartPACK-L7 compact units, each with two compressors. Even in the lower performance range, the Equans smartPACK-L7 shows outstanding efficiency when using ammonia."

Customized solution for energy efficiency

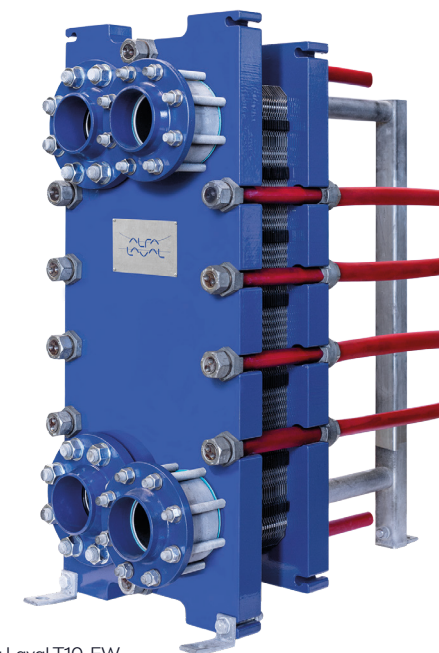
Two Alfa Laval plate heat exchangers of type T10-EW were integrated into the system as evaporators and condensers. These semi-welded heat exchangers are particularly safe, reliable, and energy efficient. They deliver consistently high thermal performance even in the most demanding applications and impress with their high fatigue resistance. Thanks to their design, they are ideal for ammonia applications and withstand high pressures and temperatures.

The condenser has a capacity of 292 kW and heats water from 38 to 47°C, at a condensation temperature of 50°C. The evaporator has a capacity of about 252 kW and cools the frost-proof ethylene glycol brine from 16 to 7°C at an evaporation temperature of 4°C.



An additional desuperheater of type Alfa Nova is used in both heat pumps. This fusion-bonded plate heat exchanger delivers about 38 kW of power and uses the 116°C hot discharge gas to heat water from 55 to 60°C, making it usable as domestic hot water. Like the T10-EW plate heat exchangers, the Alfa Nova is also made entirely of stainless steel and designed for contact with ammonia. Special seals from Alfa Laval ensure that the occupational exposure limit (OEL) for ammonia is not exceeded during operation with the two heat pumps.

"Our custom-made solution helps make the natural refrigerant ammonia attractive for smaller capacity ranges as well," says Equans Managing Director Philipp Baumgartner. "Until now, NH₃ has been used almost exclusively in industry. Now, other sectors can also benefit from it – as in this case, the real estate sector."



Alfa Laval T10-EW

About Equans Kältetechnik GmbH

Equans Kältetechnik is a leading company in the fields of industrial, climate, and commercial refrigeration as well as heat pump technology in Austria, Germany, and Switzerland. Whether it is small commercial refrigeration units or complex industrial systems, Equans develops customized, economical, and energy-efficient solutions for all requirements with a focus on natural refrigerants. Thanks to its extensive technical know-how, the company is always a reliable partner for cooling and heating.

About the European Patent Office (EPO)

The European Patent Office (EPO) was founded in 1977 and is responsible for examining patent applications and granting European patents. It employs around 6,300 staff at its headquarters in Munich and its offices in The Hague, Berlin, and Vienna.

Carbon neutrality over the entire lifecycle

Renovation work began in November 2022 and was completed by the end of 2024. By deciding to retain the original concrete structure of the four-story building, approximately half of the carbon dioxide is saved compared to a total demolition and complete reconstruction. Additionally, the building is equipped with state-of-the-art technology, including its own green electricity supply, which generates more energy than the building needs for its basic functions of heating, cooling, ventilation, lighting, and hot water. This way, the building can fully compensate for the CO₂ emissions generated during the renovation over its lifetime.

The energy concept of the European Patent Office in Vienna comprises not only the sophisticated heat pump system but also a photovoltaic system on the roof and facades. Additional environmentally friendly measures, such as the use of a wooden facade, rainwater tanks, and many plants, make the building even more sustainable and contribute to saving water and energy.

Contact Alfa Laval

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