Oilon Industrial Heat Pumps

Boosting the energy transition

www.oilon.com

OILON GROUP

Oilon is a family-owned, global energy and environmental technology company, founded in 1961. Oilon specializes in environmental technology with a special emphasis on research and development. The focus areas of the research and development are on improving energy efficiency, decreasing emission levels, and developing new solutions using renewable energy sources.

The focus technologies are:

- industrial heat pumps and chillers
- ground source heat pumps
- burners and combustion systems for liquid and gaseous fuels in the capacity range of 10 kW – 90 MW

The service activities are in an important role throughout the product life cycle.

Oilon solutions and systems are used for heating and cooling large buildings and facilities, and for heating private houses. Key industrial customers include power plants, pulp and paper mills, process industry, waste incineration plants, marine operators, and districts heating plants.

Oilon with its turnover of 85 million euros has 400 employees. Oilon has operations in Finland, USA and China, and sales offices in Brazil and Germany, and in addition, more than 70 resellers worldwide.

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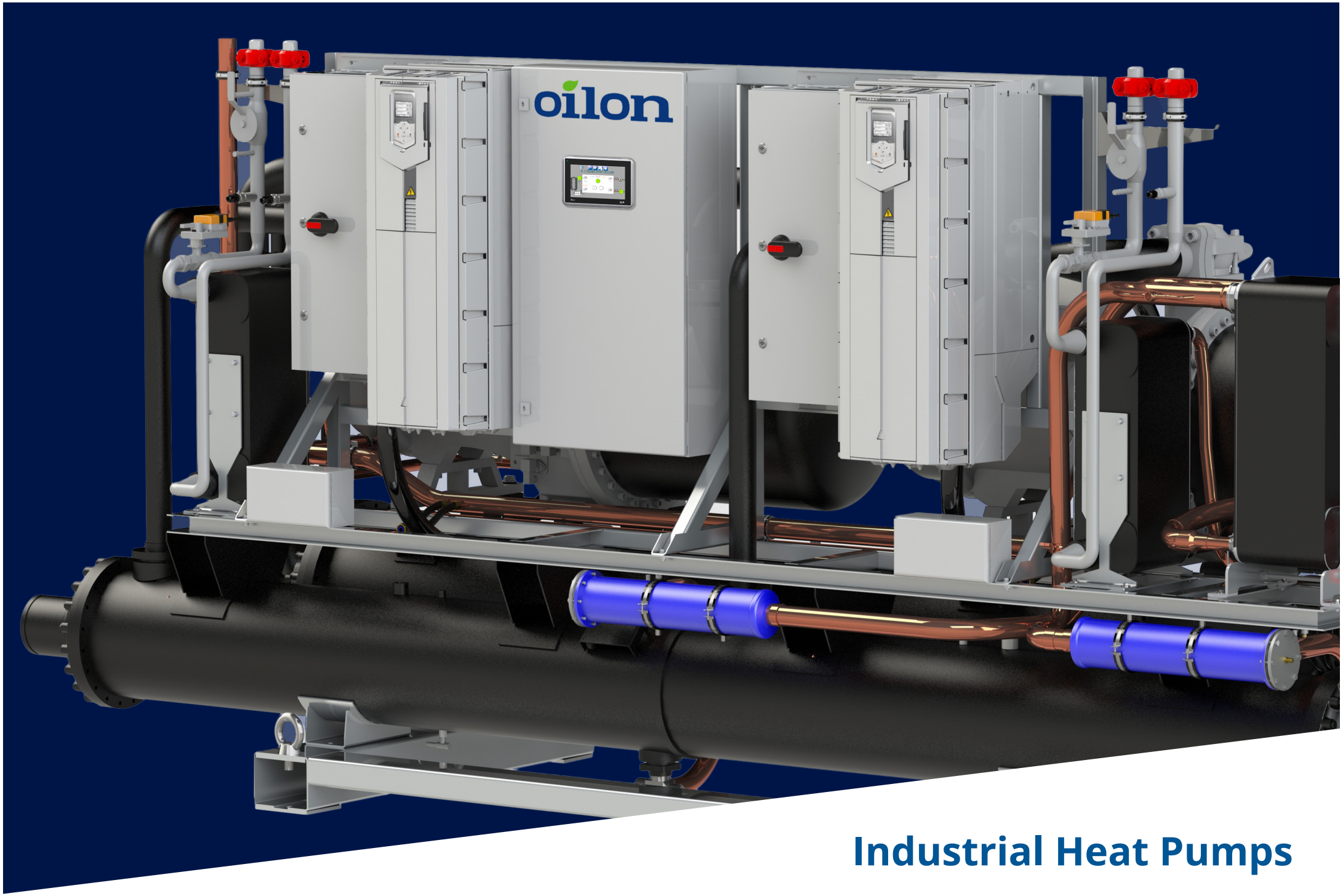


Industrial Heat Pumps

Boosting the energy transition

To combat climate change, we need new ways of producing energy. Oilon's energy-efficient industrial heat pumps are a tangible solution for reducing emissions. Besides traditional HFC refrigerants, we offer HFO refrigerants with an extremely low or near-zero global warming potential (GWP).

Our heat pumps are a flexible solution that can be used for different heating and cooling applications in industrial operations and large properties as well as for district heating and cooling.

COMBINED HEATING AND COOLING – TAPPING INTO INDUSTRIAL WASTE STREAMS

Modern heat pumps allow companies to use heat sources which would be otherwise difficult or impossible to use. For example, low-temperature waste heat from industrial processes can be used as a source of energy for district heating.

The best coefficient of performance can be achieved with combined heating and cooling (CHC). In CHC solutions, a heat pump cools down one part of a process and uses the extracted energy to heat up another part of the process, reducing the need for traditional forms of heating. This arrangement can be used to create a fully carbon-neutral heating and cooling solution.

EXCELLENT CONNECTIVITY

Oilon ChillHeat units can be combined into different systems. By connecting heat pumps together, the system's capacity can be increased, the system's flow temperature increased, or both. The selection process is supported by Oilon Selection Tool, which provides indispensable help with system sizing.

REMOTE ACCESS TO ACCURATE INFORMATION ABOUT SYSTEM OPERATION

Oilon ChillHeat heat pumps can be connected to the Oilon Global Monitor cloud service, a remote solution for monitoring system operation. Engineers can diagnose potential problems remotely, which means that there is no need to fly out a technician to another part of the world. Customers, in turn, can view extensive system data through a web browser.

Fortum to select Oilon as the heat pump supplier for heat recovery from a major data center complex

In the future, Oilon heat pumps will recover waste heat from a large data center complex and convert it into emission-free district heating for a city and two other communities in the Helsinki metropolitan area. This will be the largest system for recycling waste heat from data centers in the world and the largest delivery contract in Oilon's history.

Microsoft is building a data center complex in the Helsinki metropolitan area. Fortum, Finland's leading energy company, will recover the waste heat from the the complex and reuse it for district heating. This will be the largest project for recycling waste heat from data centers in the world.

Oilon will supply Fortum with the industrial heat pumps required by the heat recovery system's two heat pump plants. For Oilon, this is the largest delivery in the company's history.

"The delivery is valued at approximately EUR 15 million. This project is a true testament to our ability to provide large-scale solutions and support our customers in the green transition," says Oilon's CEO **Tero Tulokas**.

Fortum is a forerunner in reducing CO2 emissions from energy production and aims at reaching carbon neutrality by 2030. The company continuously seeks out and implements the best and most cost-effective ways to break free from using fossil fuels for heating production. In this, heat pumps have a vital role to play.

"In the future, district heating networks will increasingly serve as a platform for recycling energy, allowing stakeholders to utilize different heat sources and energy streams. Heat pumps make this all possible. In this project, for example, cooling the data centers will inevitably generate waste heat, and this technology will allow us to recycle that heat," says **Thomas Ekholm**, head of energy solutions, Fortum Finland.

Record-breaking coefficient of performance from energy recycling

Fortum's two heat pump plants will be equipped with a combined heating and cooling solution, CHC for short. The heat pumps will provide cooling to the data centers, recover the waste heat generated, and transfer the recovered energy into the local district heating network. In other words, the plants produce heating and cooling at the same time.

"By recycling energy streams effectively, we can achieve outstanding coefficient of performance values. The total COP of the system is 6.6, which means that for each unit of electricity, the heat pump generates 6.6 times as much energy for heating and cooling," says **Jussi Alpua**, Oilon's sales manager responsible for industrial heat pumps.

Oilon will deliver several S series heat pumps for both heat pump plants. Each unit weighs as much as 10 cars, or around 15,000 kg. Each plant has an output temperature of 85 °C. Together, the two plants will produce nearly 40 MW of district heating.

The first heat pump plant is currently being built in Kirkkonummi, and the first heat pumps will be delivered to the site in early 2025. The Espoo project will follow a half year later.

At full capacity, the waste heat recovery system will produce enough emission-free district heating for 100,000 customers. This accounts for 40 per cent of the 250,000 district heating customers in Espoo, Kauniainen, and Kirkkonummi. For Fortum, this means a permanent CO emission reduction of up to 400,000 tonnes per year. Furthermore, the two heat pump plants will correspond to more than 1% of the emission reduction required for achieving Finland's carbon neutrality target.

Internationally significant project

Finland's ambitious carbon neutrality target sets Finland at the forefront of EU countries. As Finland's leading energy company, Fortum is now providing a persuasive practical example of how the target can be reached – in a project utilizing Oilon technology, no less.

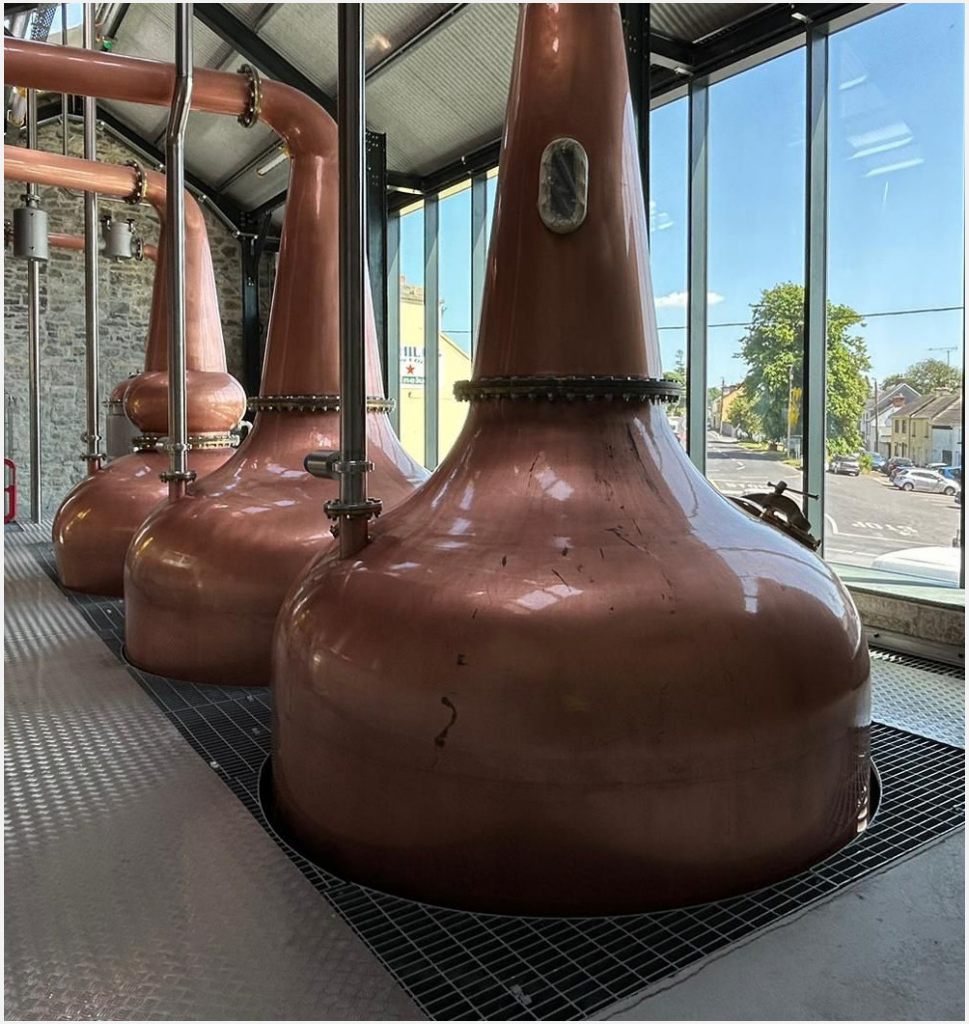
Traditionally, heat pumps have been seen primarily as a means of making heat generation more efficient in industrial applications and energy production. In recent years, the trend has started to shift towards using heat pumps also as a primary method of energy production on a wider, industrial scale.

"From a technological standpoint, the big thing is that we've created a powerful overall solution by utilizing a combination of several heat pumps. This provides an extremely wide operating range, allowing the system to respond to process requirements, especially the varying need for heating and cooling, in a flexible and accurate way. By connecting some of the heat pumps in series, we can utilize staged heating and cooling production. This provides an excellent coefficient of performance across the entire capacity range," says **Martti Kukkola**, Oilon's chief business officer for industrial heat pumps and chillers.

According to Kukkola, this project is a great example of combining two trends: electrification of energy production and recycling energy by utilizing waste heat. The project is extremely interesting not only from a national standpoint but also at the international level.

"Large global companies are keeping an close eye on what we do to achieve carbon neutrality in energy production here in the northernmost reaches of Europe. This reference case will open many doors for Oilon in the international market, providing access to increasingly large projects. In the future, heat pumps will play a bigger role not only in the global marketplace but also in Oilon's business," Kukkola says.

The world's first carbon neutrally produced whiskeys are distilled using Oilon heat pumps



The unique zero-emission distillation process of the Irish Ahascragh Distillery has been implemented with a comprehensive system design applied from the process industry: at the core are Oilon's high temperature heat pumps, with which all the waste heat is put to use.

In the village of Ahascragh, about a two-hour drive from Dublin, there lies an over 200-year-old brick mill where grain was ground into flour from the early 1800s until the 1950s. Now, this magnificent historic building has been given a new life as the world's first carbon neutral whiskey distillery, which opened its doors in the summer of 2023.

'Distilling whiskey is very energy intensive: Each bottle of traditionally distilled whiskey produces 3-4 kilograms of carbon dioxide emissions. Now, we are proud to be able to offer consumers a whiskey alternative whose production has not harmed the environment,' **Gareth McAllister**, the owner of Ahascragh Distillery, says.

Unlike other distilleries in Ireland, heat is provided to the distillery through heat pumps which means that there will be no flue related emissions, or impacts on the local environment.

Almost 120-degree water for the process with the help of pumps

Ireland produces plenty of green electricity: In 2022, 34 percent of the country's electricity production (about 13.2 TWh) was wind power. Instead, thermal energy in the island state is still largely produced with fossil fuels. Even thermal energy used in whiskey distillation has traditionally been produced with natural gas.

'In Ahascragh, the heat needed for the process is produced by high temperature heat pumps instead of natural gas. The pumps are powered by wind-generated electricity. In this way, we have been able to get rid of fossil fuels and the process has become zero-emission,' McAllister explains.

Oilon has delivered two P450 series heat pumps and one smaller P150 heat pump to the distillery. P450 series pumps are capable of producing temperatures of up to 120 degrees, in Ahascragh the design temperature is 115 degrees. The pumps also use the latest refrigerant technology: they have a very low GWP value (Global Warming Potential).

Oilon's experience in process industry heat pump solutions was utilized in the project. The Irish company Astatine which specializes in carbon-neutral turnkey solutions was responsible for the overall design of the system.

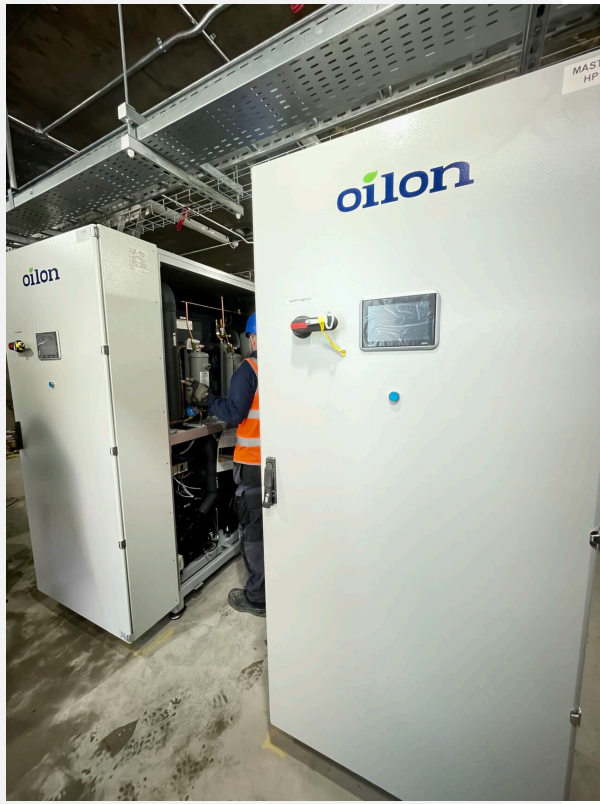
Waste heat recovery and circulation, COP up

Two parallel processes work in the distillery: the actual distillation process where alcohol is alternately steamed and condensed in a closed circuit, and the automatic cleaning process of the equipment, which requires a significant amount of warm water.

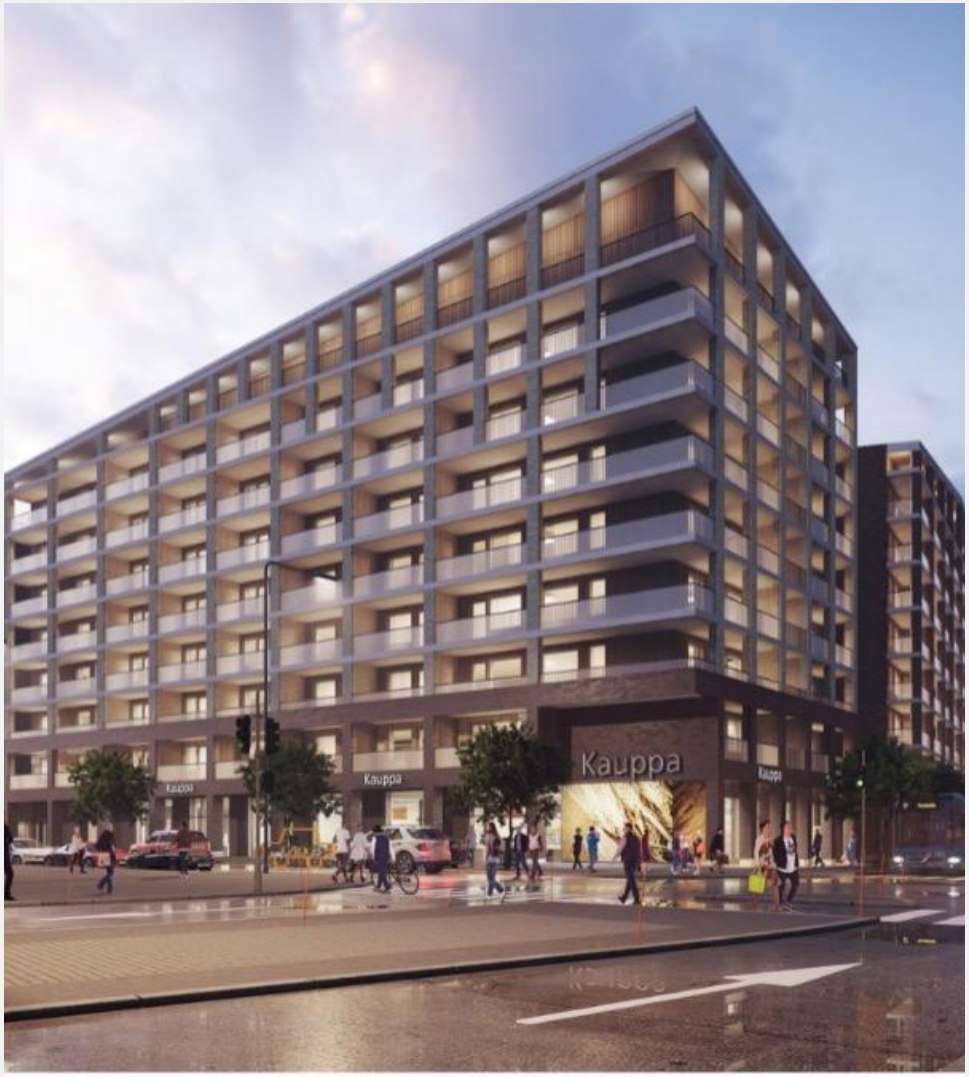
'The total COP has been raised to an exceptionally high level by applying the operating methods of the process industry: heat pump technology is combined with process know-how, i.e., all generated waste heat is recovered with the pumps and utilized at another point in the process,' Astatine's manager **Tom Marren** says.

The heat pump design, heat recovery and thermal storage means that the energy inputs to the distillery are a third than that of traditional technology.

At the high temperatures of the P450 pumps, the distillation process itself is running. In this process the alcohol alternately vaporizes and condenses in a closed circuit. The pumps are equipped with separate heat exchangers which also produce lower temperature water for the washing process. The smaller P150 pump produces domestic hot water which can be used for additional cooling of the distillation process if necessary. 'Comprehensive system planning and combination of processes was crucial in terms of COP and, of course, reducing emissions. The total COP of the process is an astounding 6.5. In other words, for every kWh of electricity used by the heat pump, it generates 6.5 kWh of energy for use in the process. This level of energy efficiency is exceptional and it can only be reached by utilising the energy flows in the process optimally," says Sales and Marketing Director **Sami Pekkola** from Oilon.



Oilon’s heat pump expertise recognized as best in class in Europe



Energy technology company Oilon and Helen, One of Finland’s largest energy groups, have received the esteemed Heat Pump Award in the DecarBuilding series for their jointly-developed heat pump solution. Granted by the European Heat Pump Association (EHPA) since 2011, the award serves to recognize the most innovative and energy-efficient heat pump projects in the continent. The award ceremony took place in Brussels in October 2022.

The award-winning project involved a heating and cooling solution for a new apartment building. Completed in 2021, the system utilizes the building’s waste heat in various ways. The building, which is located in Helsinki’s Postipuisto district, has a total of 113 apartments as well as a grocery store.

The beating heart of the system is a high-capacity heat pump. Besides ground source heating, the unit can utilize waste heat from the building’s waste water and apartment cooling as well as the grocery store’s refrigeration equipment. The recycled energy is used for heating the building, producing domestic hot water, and, in the summer months, for apartment cooling. District heating is used for backup in case there is a fault and to provide supplementary heating during the coldest days of winter. On days when the building generates more heating than it consumes, the surplus heat can be sold as district heating and channeled into Helen’s district heating network.

Recycling makes sense even in energy production

Developed jointly by Oilon and Helen based on the principles of circular economy, the new hybrid solution sets a new standard for the energy efficiency and environmental impact of new buildings. The solution is the result of long-term product development between the partners, with a unified focus on heat pump technology and waste heat recovery. The most innovative aspect of the system is that different heat sources can be utilized in different combinations at different times of the year, resulting in optimal performance and minimizing the building's carbon footprint. This is made possible by an Oilon ChillHeat heat pump, which can adjust its output intelligently from very low levels to maximum capacity within a wide range of temperatures.

The adoption of bidirectional energy production and consumption is part of the trend that drives building heating and cooling towards improved sustainability. Oilon's heat pumps play a key part in this development: they allow companies and property owners to utilize renewable energy sources and waste heat. Additionally, they are an excellent fit for smart networks and electricity-based energy production.

Excellent experiences from the first year of operation

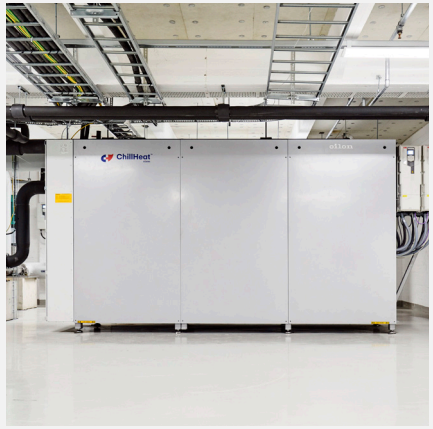
Antti Leskinen, who serves as the project lead for Helen, describes the Postipuisto pilot project as a wonderful and interesting yet challenging undertaking. The success of the project is based on careful planning. The companies have a long history of shared innovation in waste heat recovery, which served as solid groundwork. In Helsinki, for example, Helen extracts heat from waste water at the Katri Vala heat pump plant, the largest of its kind in the world.

"There were no major issues with the Postipuisto system in its first year of operation. We kept a close eye on energy streams and system operation and fine-tuned the system along the way, exactly as planned," Leskinen says.

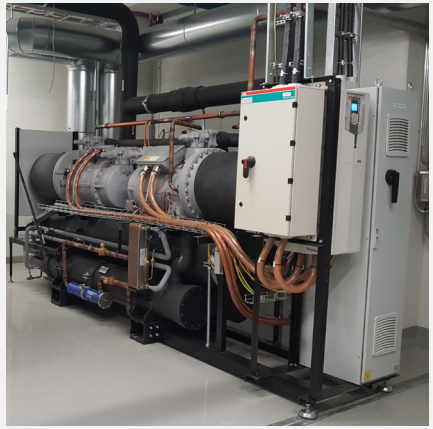
Two energy sources rose above the others: condensation heat from the grocery store and ground source heating. Additionally, the system recovered considerable amounts of energy from wastewater and apartment cooling. In summer, the heat pump transfers surplus heat to boreholes for storage. In the coldest days of 2022, district heating was used to even out peaks in power consumption. Versatile, flexible, and responsive energy use creates new opportunities for housing construction in the future.

"For Helen, Oilon is a long-standing and reliable heat pump partner. They have deep understanding of the field, which is evident in the quality of their products and,

	Capacity	Heat source	Heat sink	COP
Heating mode	115kW (heating)	3/0 °C (ground)	30/55 °C (building)	3.2 (heating)
Cooling mode	100kW (cooling)	12/7 °C (cooling)	40/80 °C (district heating)	4.9 (total)



Lidl
Customer: Helen Oy
Heat pump: P220 SU HC VFDx2 R134a
Design temperature conditions °C:
15/10 C and 40/80 C
Heating/cooling capacity (kW): 743 / 517 kW
Heat pump quantity: 2
Location: Helsinki, Finland

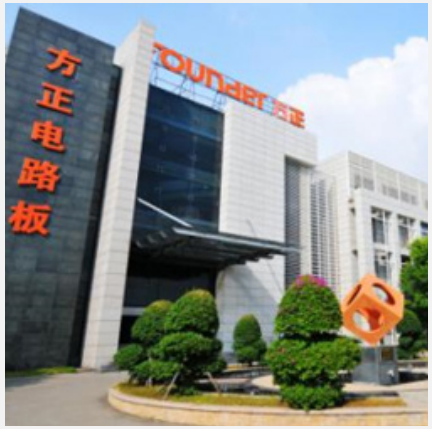


Jorvi Hospital
Customer: Fortum Power and Heat Oy
Heat pump: S600 ECO HC VFDx1 R134a
P300 SU HC+ VFDx4 R134a
Design temperature conditions °C:
18/10 C and 60/70 C
Heating/cooling capacity (kW): 1379 / 901 kW
Heat pump quantity: 2
Location: Espoo, Finland

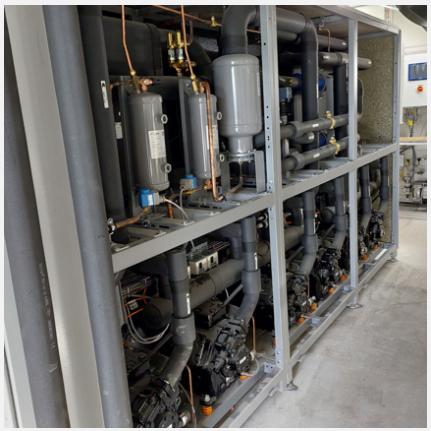
Data center
Customer: Koy Tampereen HVT 30
Heat pump: S580 AD LI SU HC VFDx1 R1234ze
P450 SU HC VFDx4 R1234ze
Design temperature conditions °C:
23/15 C and 50/95 C
Heating/cooling capacity (kW): 4266 / 2724 kW
Heat pump quantity: 6
Location: Tampere, Finland

Nestle
Customer: Nestle
Heat pump: P150 SU HC+ VFDx1
Design temperature conditions °C: 5C / 65C
Heating/cooling capacity (kW): 156 / 101
Heat pump quantity: 1
Location: Dongguan, Guangdong, China

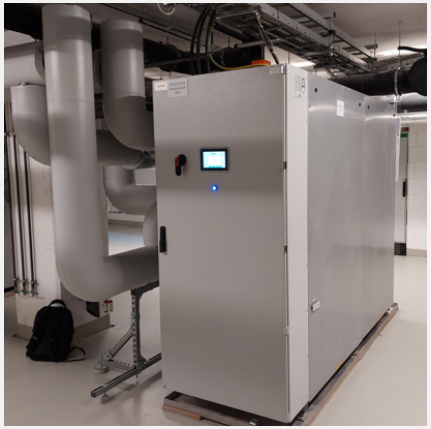
Puratos
Customer: Puratos Brasil
Heat pump: P60 SU HC VFDx2 R134a
Design temperature conditions °C: Cold: 20/7 C,
Hot: 50/55 C
Heating/cooling capacity (kW): 83 kW / 59 kW
Heat pump quantity: P60 SU HC VFDx2 R134a
Location: São Paulo, Brazil



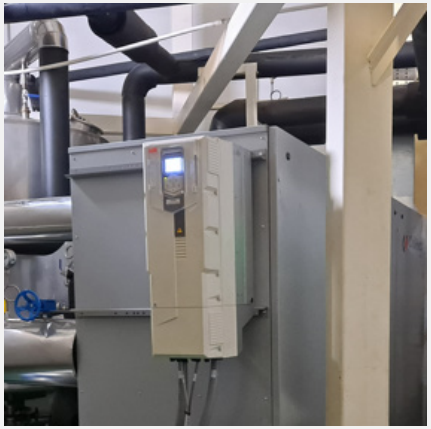
Fangzheng Group
Customer: Fangzheng Group
Heat pump: P150 HC+ VFDx1 R1234Ze
Design temperature conditions °C: 40 / 95
Heating/cooling capacity (kW): 786 / 312
Heat pump quantity: 3
Location: Zhuhai, Guangdong



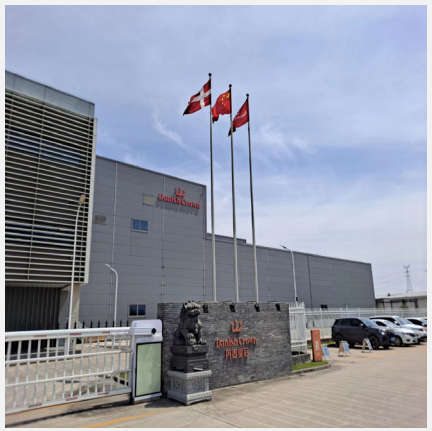
Stadtwerke
Heat pump: P450
Design temperature conditions °C: 55/80 °C - 8/4 °C
Heating/cooling capacity (kW): 831 / 516 kW
Heat pump quantity: 2
Location: Norderstedt Germany



Vattenfall
Heat pump: P 450, P 300
Design temperature conditions °C: 60/80 °C - 21/16 °C
Heating/cooling capacity (kW): 970 kW /651 kW
Heat pump quantity: 2
Location: Espoo, Finland



Nongfu Spring
Customer: Nongfu Spring
Heat pump: P450 SU HC VFDx1 R450a
Design temperature conditions °C: 30C / 85C
Heating/cooling capacity (kW): 831 / 565
Heat pump quantity: 1
Location: Heyuan, Guangdong, China



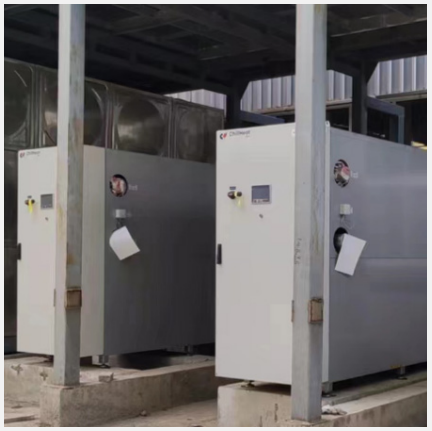
Danish Food
Customer: Danish Food
Heat pump: S280 SU HC
Design temperature conditions °C: 25 / 70
Heating/cooling capacity (kW): 470 / 609
Heat pump quantity: 1
Location: Jiaxing, Zhejiang, China

Sunshine Dairy
Customer: Sunshine Dairy
Heat pump: P300
Design temperature conditions °C: 25.5C / 75C
Heating/cooling capacity (kW): 881 / 604
Heat pump quantity: 1
Location: Nanchang, Jiangxi, China

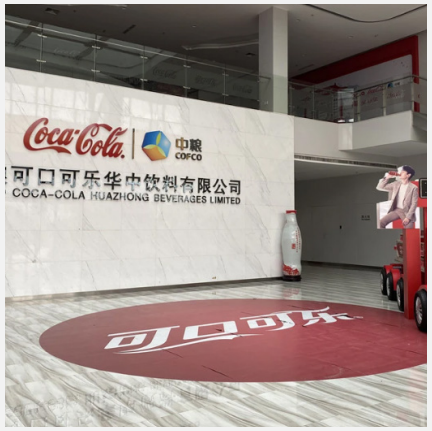
Coca Cola
Customer: Coca Cola
Heat pump: RE210
Design temperature conditions °C: 30C / 50C
Heating/cooling capacity (kW) 451 / 378
Heat pump quantity 1
Location: Zhuhai, Guangdong, China

Buhler
Customer: Buhler
Heat pump: P30 SU HC VFDx1 R134a
Design temperature conditions °C: 28C / 80C
Heating/cooling capacity (kW): 85 / 63
Heat pump quantity: 1
Location: Changzhou, Jiangsu, China

Junlebao Dairy
Customer: Junlebao Dairy
Heat pump: P220
Design temperature conditions °C: 40 / 75
Heating/cooling capacity (kW): 600 / 450
Heat pump quantity: 1
Location: Shijiazhuang, Hebei, China



Guanfang Juice
Customer: Guanfang Juice
Heat pump: P450
Design temperature conditions °C: 30C / 85C
Heating/cooling capacity (kW): 750 / 2005
Heat pump quantity: 3
Location: Tianjin, China



Coca Cola
Customer: Coca Cola
Heat pump: P30 SU HC VFDx1 R134a
Design temperature conditions °C: 10C / 70C
Heating/cooling capacity (kW): 40 / 30
Heat pump quantity: 1
Location: Changsha, Hunan, China

Kraft Heinz
Customer: Kraft Heinz
Heat pump: S380, P300
Design temperature conditions °C: 50 C/ 90C
Heating/cooling capacity (kW): 2050 / 1500
Heat pump quantity: 2
Location: Yangjiang, Guangdong, China

Wantwant
Customer: Wantwant
Heat pump: P220 SU HC+ VFD1 R134a
Design temperature conditions °C: 40C / 80C
Heating/cooling capacity (kW): 948 / 680
Heat pump quantity: 1
Location: Neijiang, Sichuan, China

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