REHAU®

Unlimited Polymer Solutions

AWADUKT THERMO RESEARCH PROJECT

GROUND-AIR HEAT EXCHANGER CASE STUDY

Ground-air heat exchanger using the Tichelmann system

Connecting the ground-air heat exchanger and ventilation control centre

Project site:
TESCO Supermarket in Zdzieszowice near Oppeln, Poland.

Client:
TESCO Poland

Installer:
GLOBAL-TECH

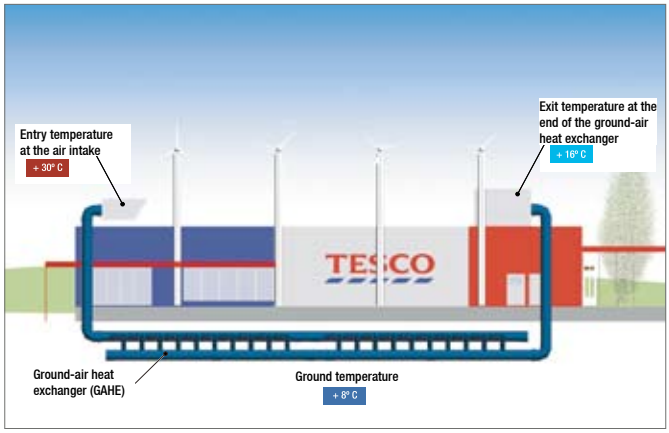
Project description:
Through optimised energy management, it is possible to reduce the energy requirement considerably at the newly built TESCO supermarket in Zdzieszowice compared to conventional supermarkets. Sun, wind and ground-source energy are being used as natural, renewable energy sources. The ground-air heat exchanger system AWADUKT Thermo uses the near constant ground temperature for pre-cooling and pre-heating the external air. In this way, in connection with a central ventilation and heat recovery system, an optimum supply of fresh-air is guaranteed.

Project description:
Through the use of the ground-air heat exchanger AWADUKT Thermo, the intake of fresh air is pre-heated by the ground in winter. To achieve the necessary target air temperature, this pre-conditioning of the outside air leads to a considerably reduced energy consumption.

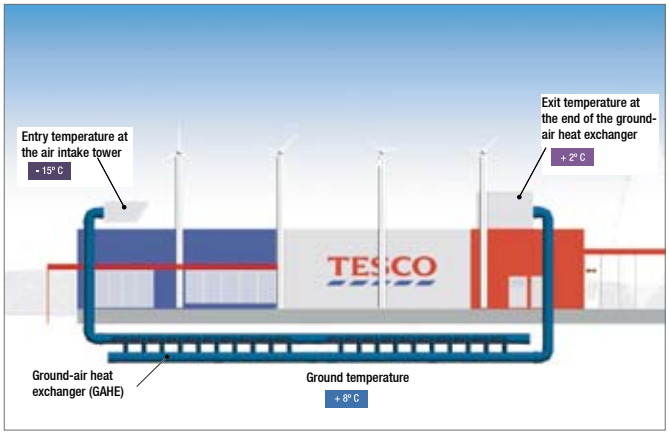
With an annual requirement of 46,320 kWh, the ground-air heat exchanger provides a heating output of some 20,500 kWh per year. This means a saving of around 2,000 €.
However, because of the constant ground temperature, the ground-air heat exchanger is also able to cool the outside air in summer. Compared with cooling performed by a conventional air-conditioning unit, approx. 1,000 € can be saved with the ground-air heat exchanger.
In order to check the calculated values, the company REHAU has opted to carry out a one-year research project in relation to the ground-air heat exchanger system on the site of the TESCO Zdzieszowice building in cooperation with the Technical University of Posen.

Data:
Installation using the Tichelmann system

– AWADUKT Thermo pipe in 200 OD	700 m
– AWADUKT Thermo distribution pipe in 500 OD	50 m
– Air volume flow	2700 m^3/h
– Heating energy in winter	20,500 kWh/a
– Cooling energy in summer	10,700 kWh/a



Example of summer operation



Example of winter operation

Research project:

Involved in the project aiming to confirm the actual performance of the ground-air heat exchanger are:
- Technical University of Posen - Institute for Heating Technology, Air Conditioning Technology and Environmental Protection.
- TESCO – Engineering Department
- REHAU AG+Co – Technical Department

The test equipment was configured by the Technical University of Posen. The measurements of the seven sensors are recorded at five-minute intervals.

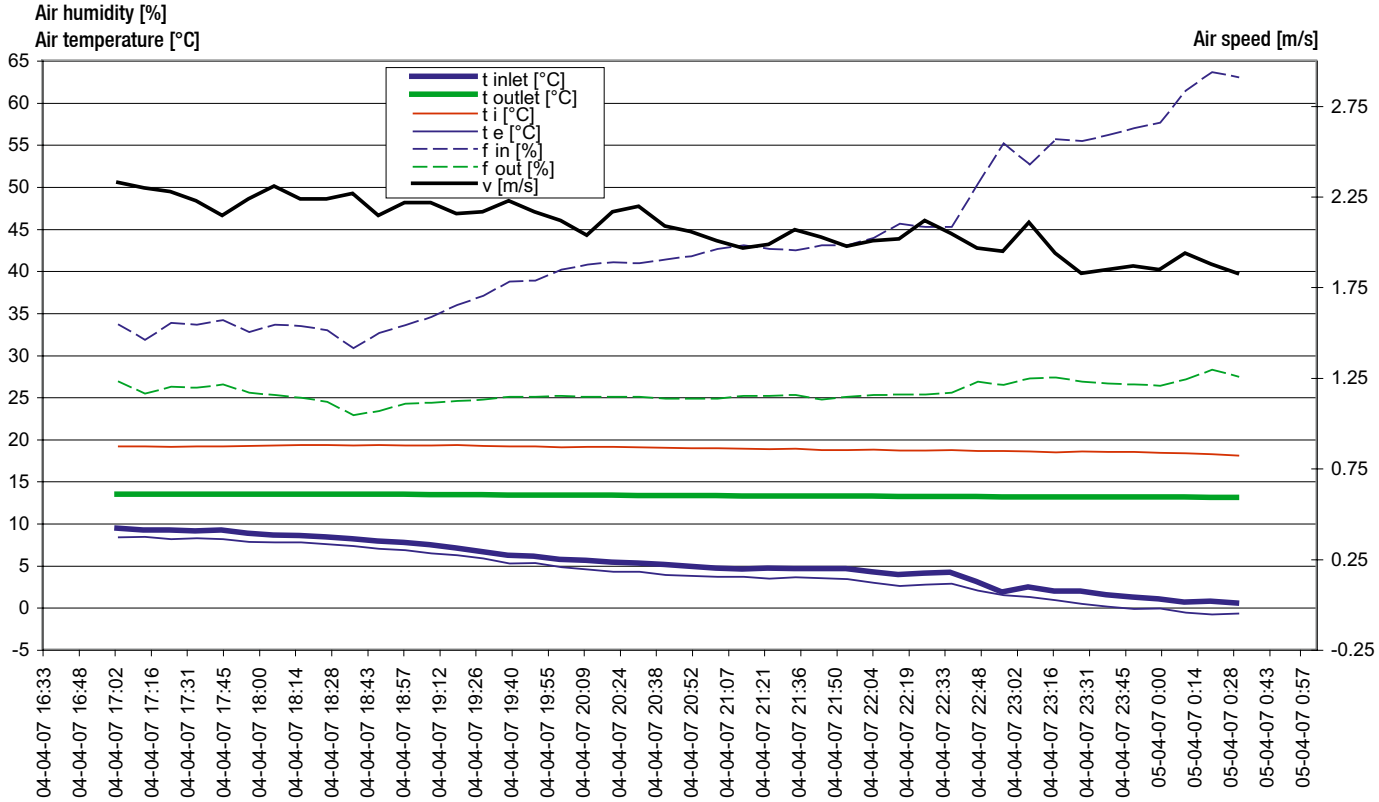
After the opening on 06/03/2007, a one-year measurement recording phase began on 04/04/2007, where the data is recorded at intervals of five minutes.

1. Air temperature before GAHE (inlet tower)	t inlet [°C]
2. Air temperature after GAHE (outlet)	t outlet [°C]
3. External air temperature	t e [°C]
4. Temperature inside the supermarket	t i [°C]
5. Air humidity before GAHE (external)	f in [%]
6. Air humidity after GAHE	f out [%]
7. Air speed in the duct	v [m/s]

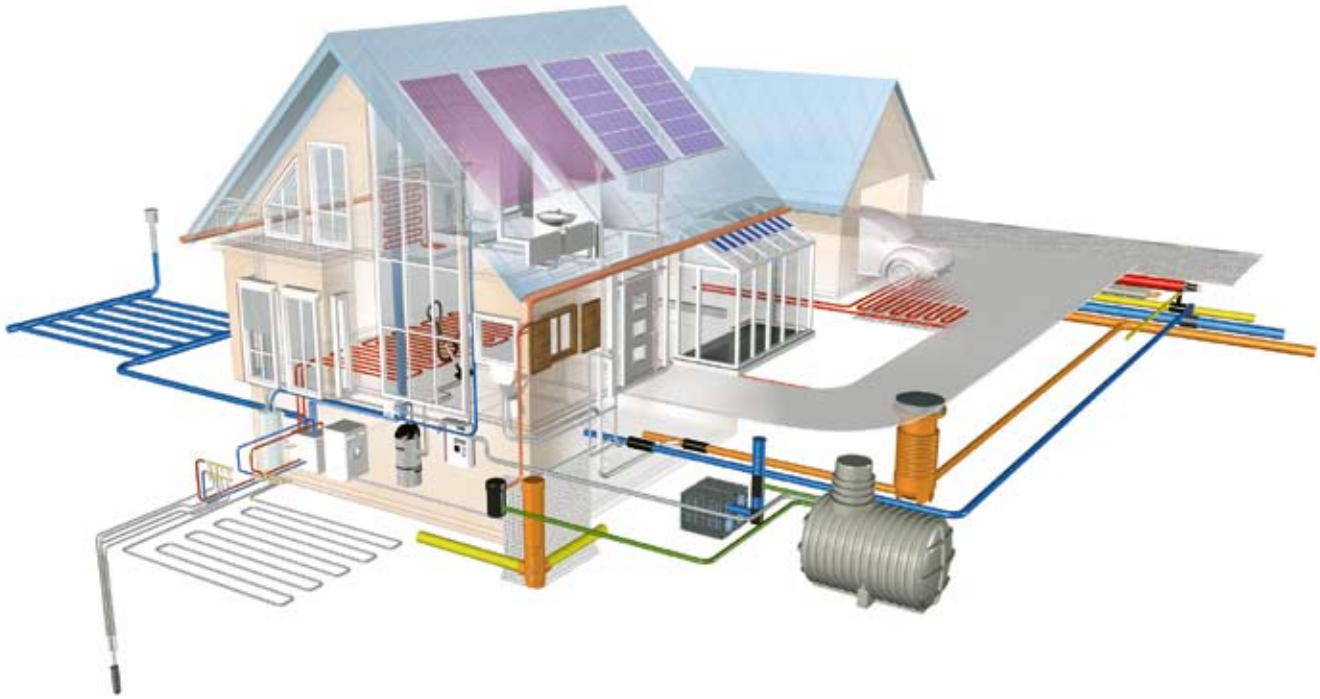
Initial results already confirm the high performance of the ground-air heat exchanger. For example, on 04/04/2007, with an external air temperature of up to -2°C, exit temperatures at the end of the G.A.H.E of 13°C were achieved! Detailed measurements can be found in the chart below.

To achieve an internal temperature of +19°C, the air therefore only has to be heated by 6K. The initial measurement data shows that the ground-air heat exchanger AWADUKT Thermo contributes significantly to savings in heating costs.

Measurement results of the GAHE at the TESCO supermarket in Zdzieszowice on 04.04.2007



ENERGY EFFICIENT CONSTRUCTION WITH REHAU



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