

NEW PATENTED TECHNOLOGY

Biothermal heat pump



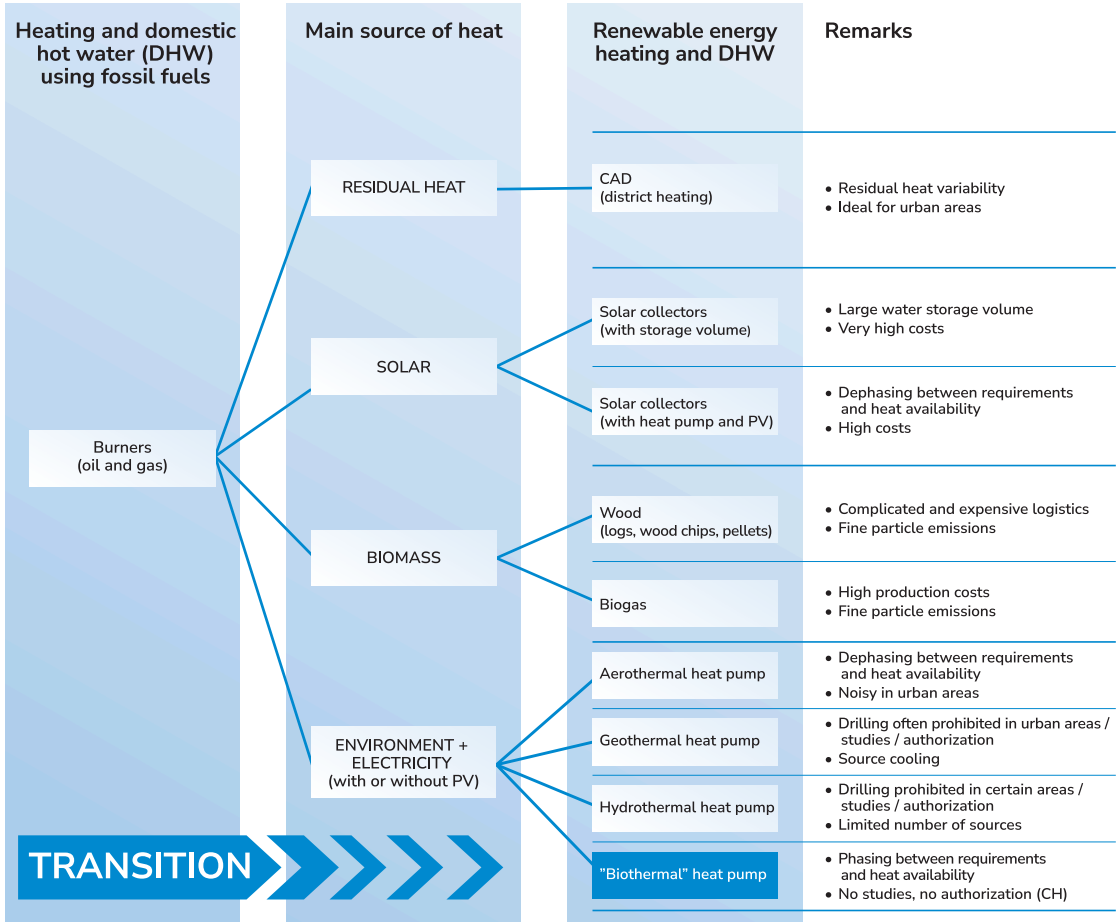
The green roof for active heat recovery, in step with consumption

OVERVIEW

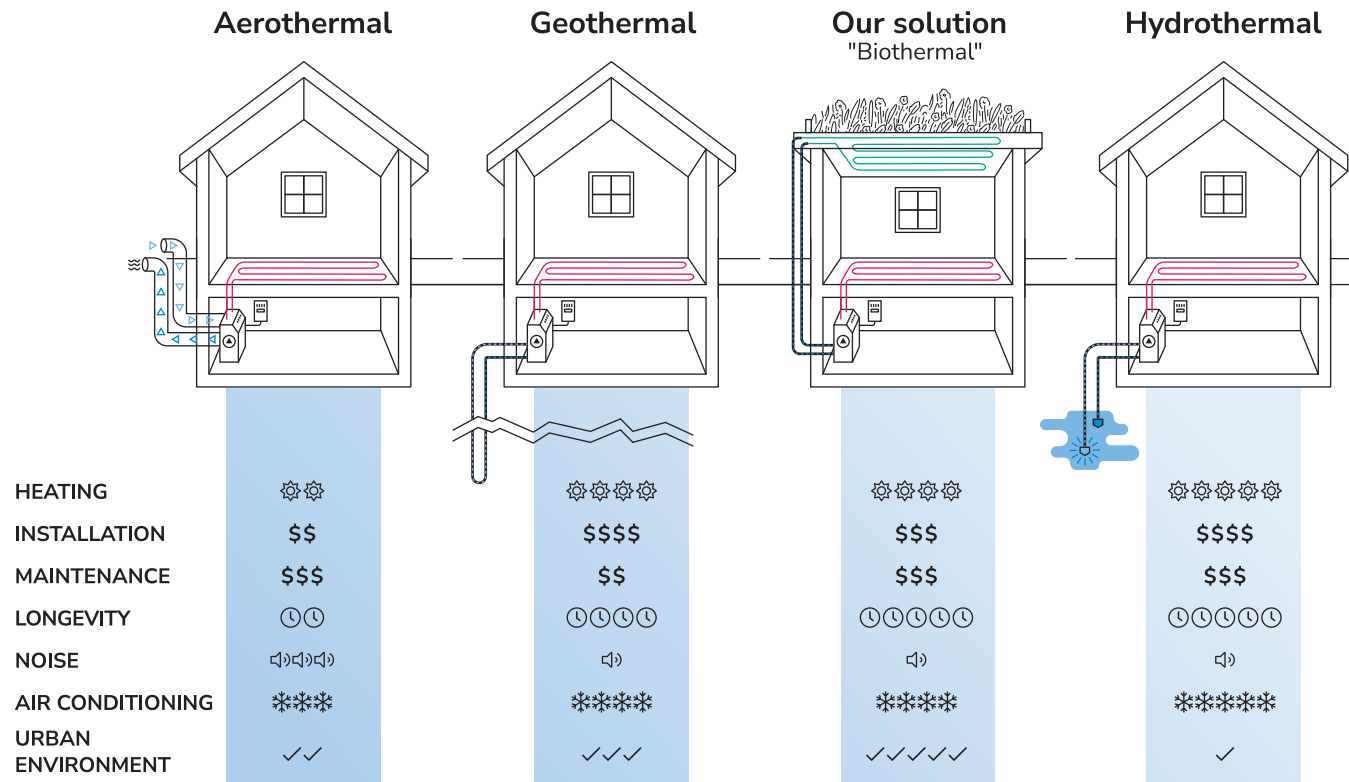
Heat and cool with renewable energy, silently in the city and elsewhere, filter and retain water, sequester CO₂, promote biodiversity, fight urban heat islands, insulate against heat and noise, and extend the lifespan of a roof? Discover our integrated thermal regulation solution: efficient, ecological and intelligent.

By investing in technological innovation, we meet the challenges of our time with efficient and profitable solutions that improve quality of life and support the transition to a more sustainable future.

Energy transition



Comparing heat pump systems

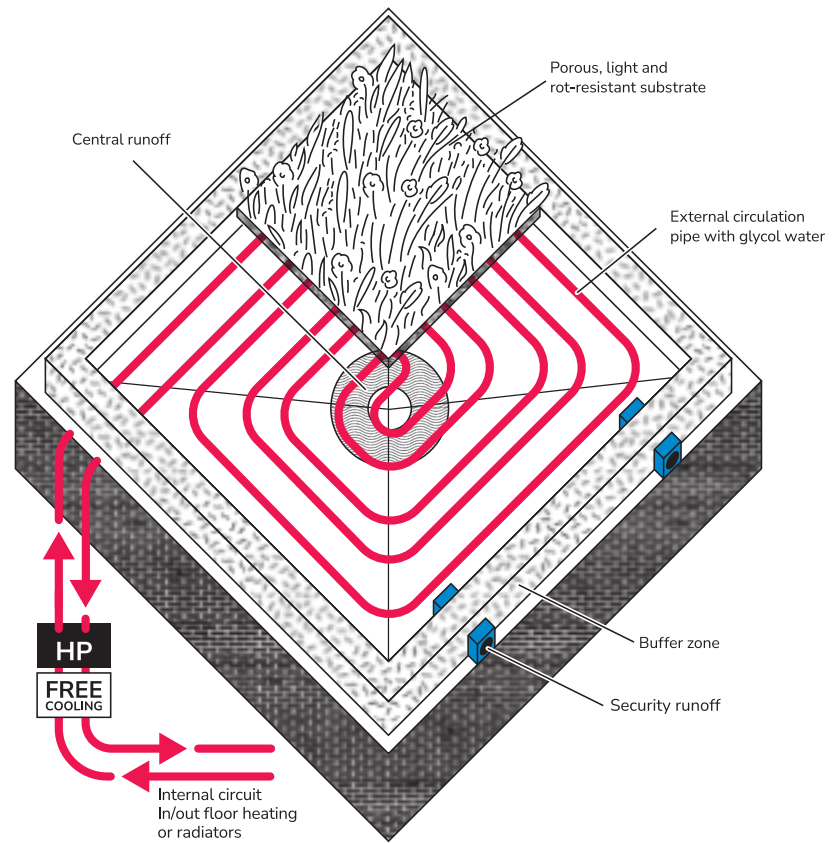


Horizontal integration

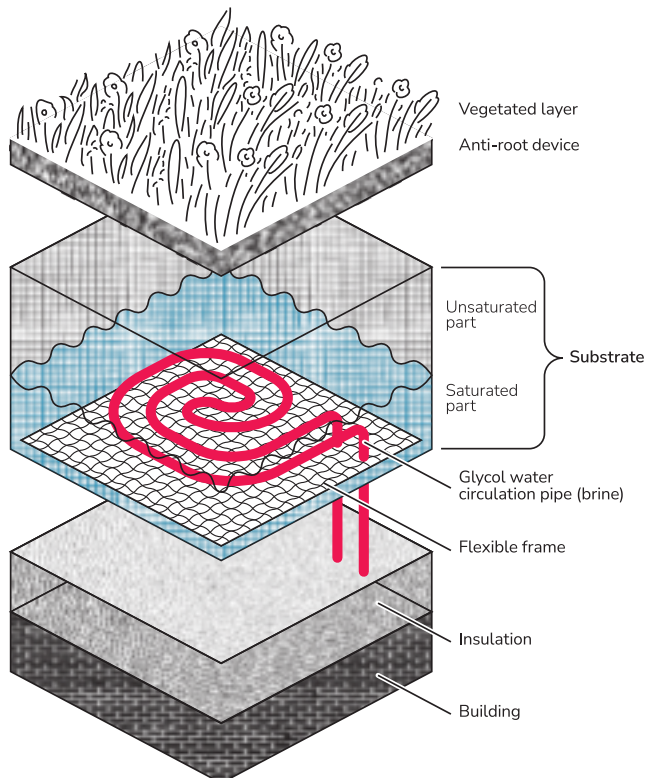
(example of a flat roof with a central drain)

The vegetation is a mix of non-woody plants, including mosses that occur naturally on flat roofs (or are planted).

The substrate is porous, lightweight and rot-proof. In its saturated part, water is trapped in the pores: there is no water movement and no heat loss by convection (unlike a swimming pool).



Vertical integration



The water pipes are fixed to a flexible, non-metallic frame that absorbs volume changes caused by water and temperature differences.

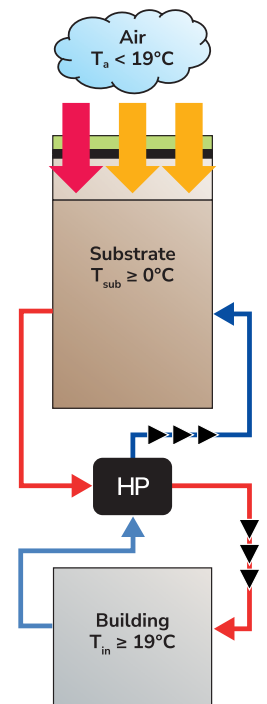
Thermal separation (good insulation) divides the building from the heat exchange system. Heat is exchanged actively between outside and inside.

Heating

The vegetation layer of mosses and herbaceous plants has an exceptionally high leaf area per square metre. This large contact surface with humid air causes intense condensation (as well as freezing and sublimation), recovering a large amount of latent energy. Sun, air, rain and some building structures are further inexhaustible heat sources.

The water-saturated substrate stores these inputs and transfers them slowly downwards, shifting heat availability to match demand: a higher performance than an air-source heat pump, which depends on the day-night cycle.

The network lies a few centimetres below the surface, at the bottom of the saturated substrate, and stays frost-free in mid-winter thanks to the strong temperature gradient. At equal source temperature, the water-to-water heat pump achieves higher COP and SCOP than ground-to-water or air-to-water units. The system recharges every day, with no decline in source temperature over the years.



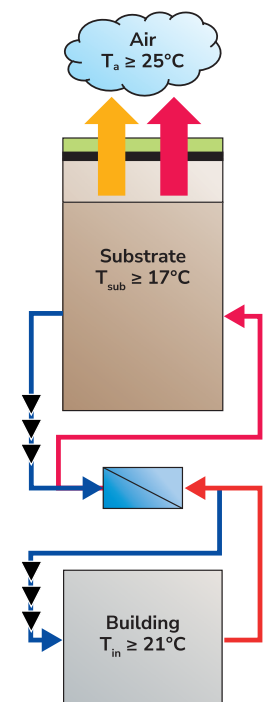
Cooling

Evaporation + transpiration

Mosses have no stomata. In summer they evaporate and transpire much more than other plants and naturally work like a reversed heat pump. This cooling requires no heat pump.

Evapotranspiration draws heat out of the system: the substrate can be 6 to 10 °C cooler than the air – enough to cool rooms pleasantly at low cost. The external circuit transfers heat to the internal circuit through a plate heat exchanger.

In summer, the heat pump can produce domestic hot water very efficiently; by drawing heat from the substrate, it further improves cooling.



Sustainable Development Goals



BioThermal HP contributes to 11 of the 17 UN Sustainable Development Goals.

The real benefits

- 1. A heat pump for cities and beyond**
In areas with noise restrictions and where geothermal or groundwater probes are prohibited (underground pipes, aquifers).
- 2. Efficient heating and cooling**
The water in the substrate acts as a thermal battery. At equal source temperature, this water-to-water system is more efficient (COP, SCOP) than air- and ground-source systems (6 years of comparative data).
- 3. Monovalent or bivalent**
Depending on insulation and number of storeys, the system supplies all the heat or works in tandem or alternately – for example with an existing fossil heating system during a partial renovation.
- 4. Daily recharge**
No gradual depletion of the source as with geothermal probes. On overcast days, indirect radiation still adds about +50%; rain, air and structures add more.
- 5. Synergies in summer and winter**
In summer, producing hot water improves cooling. In winter, drawing heat encourages dew formation and the transfer of latent energy from the air to the substrate.
- 6. Simple installation**
No acoustic or geological studies, no drilling. In Switzerland, as for a green roof (excluding terraces), a simple notification is in principle enough – no building permit.
- 7. Controlled cost**
Cheaper than geothermal probes, more expensive than an air-source system, with economies of scale: adding circuits costs less than adding boreholes.
- 8. Solar-ready**
Can be combined with photovoltaic panels or solar thermal collectors to aim for 100% self-consumption.
- 9. Low maintenance**
Relatively low vegetation, kept in check by low pH, oxygen depletion and a root barrier that prevents woody plants from growing.
- 10. Making use of unused space**
Harvest energy and green the roof, meeting the many challenges of the energy and ecological transition.

OTHER BENEFITS AND ECOSYSTEM SERVICES

- | | |
|---|---|
| 1. Sequestration of atmospheric CO₂
about 400 to 800 g CO ₂ per m ² per year | 5. Better thermal and acoustic insulation
indoor comfort all year round |
| 2. A refuge for biodiversity
habitats, vegetation, wildlife and ecological corridors | 6. A longer-lasting roof
smaller temperature swings |
| 3. Rainwater retention and filtration
lower stormwater fees | 7. Urban aesthetics
added value and ecological architecture |
| 4. Fighting urban heat islands
albedo and microclimate | |

Heat exchange system for the thermal regulation of a building



Heat exchange system arranged on a roof, comprising a substrate partly saturated with water, topped by a vegetation layer that promotes condensation and evapotranspiration, and a heat diffusion device with a pump and a collector network for heat exchange with the exchange volume.

INVENTOR / APPLICANT

Andy Siegenthaler

CONTACT

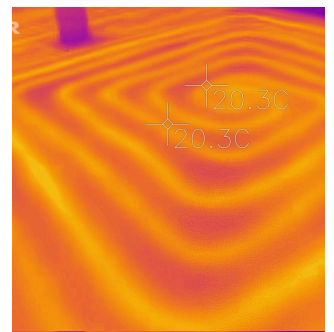
www.biothermalhp.com, [Contact section \(email buttons\)](#)

PATENT ATTORNEY

P&TS SA (AG, LTD.), Neuchâtel, Switzerland



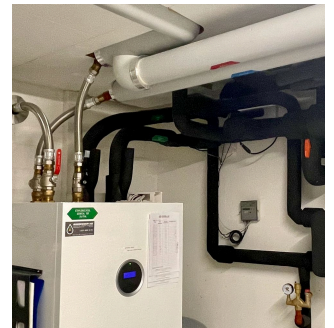
Laying the external collector circuits on a flat roof



Thermal image of a spiral internal circuit



Plant room: manifolds of the external circuits



Boiler room: internal and external circuits integrated with the heat pump or the plate heat exchanger

Licensing opportunity for a technology with high environmental impact

Our innovation is protected by a patent filed under the Patent Cooperation Treaty (PCT). International application WO2021/165824 was filed on 18 February 2021, with priority of 20 February 2020 (CH). The European patent (EP 4107443) was published in the European Patent Bulletin on 24 April 2024. After the national phases, the patent has been granted and is in force in the following jurisdictions: EP-UP, Switzerland, United Kingdom, Ireland, Spain, Japan, South Korea, Australia, New Zealand and the United States.

Our patent is a significant advance for renewable energy in buildings. It offers a unique opportunity to stand out from the competition while fighting climate change and biodiversity loss, and it solves growing problems linked to the energy and ecological transitions.

Company, public or private authority: by taking a licence (sole, non-exclusive, exclusive, territorial, sublicense), you gain access to leading intellectual property, with the ongoing support of our team.

Email BioThermal HP



Email ImpactGreening



www.biothermalhp.com



The website
biothermalhp.com/en/

