A Novel Heat Pump to Decarbonize Industrial Heat

Business summary

Electrical heat pumps are cheaper than natural gas, but they only work up to 400°F/200°C today. The **Airthium heat pump** extends this range to 1000°F/540°C.

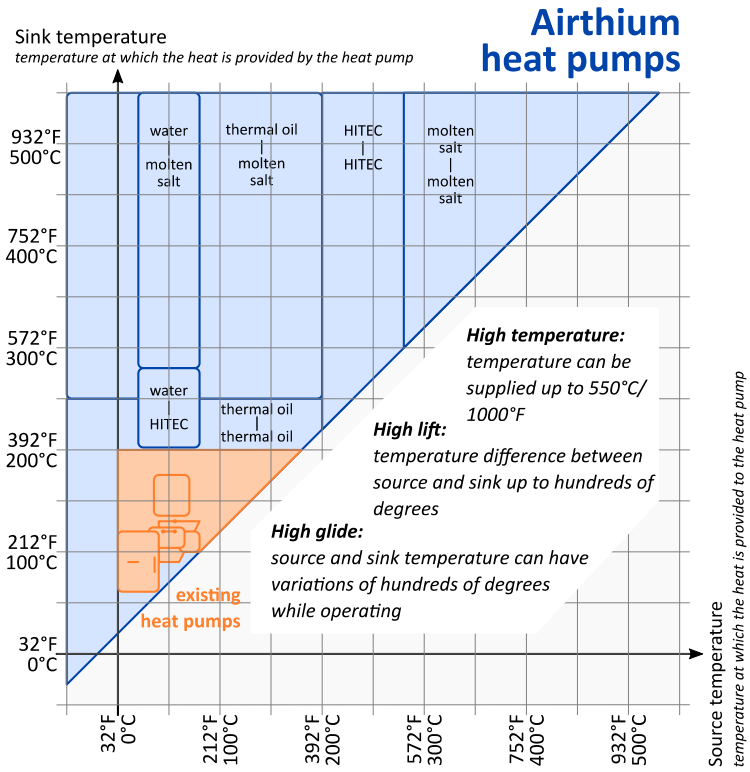
We enable many industrial processes to **slash both operating costs and CO2 emissions**, for the first time.

Technology

Our heat pump harvests available **waste heat** at **any temperature** from 210°F/100°C to **930°F/500°C**, or atmospheric heat down to -60°F/-50°C, and runs a near-ideal Stirling-like thermodynamic cycle to upgrade this heat to the desired process temperature.

Our heat pump uses Helium (R704) as the working gas, and various heat transfer fluids depending on the source and sink temperatures. It even works with **intermittent processes** requiring heat in **bursts/duty cycles**, or heat at temperatures that strongly vary in time (**high glide**). Its extremely simple mechanical design allows very **low maintenance** and downtime.

Depending on the set of temperatures, the Carnot **efficiency** can reach **up to 86%**, compared to about 60% for best-in-class high temperature heat pumps today.



Source (in) temperature	Supply (out) temperature	Heat transfer fluid combination *(cold side – hot side)*
20°C – 80°C / 68°F – 176°F	200°C – 550°C / 392°F – 1022°F	Water –Molten salt (HITEC or Nitrate)
200°C – 520°C / 392°F – 968°F	230°C – 550°C / 446°F – 1022°F	Molten salt – Molten salt (HITEC or Nitrate)
-50°C – 220°C / -58°F – 428°F	-20°C – 250°C / -4°F – 482°F	Thermal oil – Thermal oil
-50°C – 250°C / -58°F – 482°F	200°C – 550°C / 392°F – 1022°F	Thermal oil – Molten salt (HITEC or Nitrate)

Contact info: Franck Lahaye, Cofounder Franck.lahaye@airthium.com +1 650 200 7573