

Chillventa Specialist Forums 2024
Chillventa Fachforen 2024

**CONNECTING
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HVAC sustainable transition: R-744 Heat Pumps for both retrofits and new installations

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EU Heat Pump Action Plan

FIT for 55 PACKAGE

THE MAIN WAYS IT WILL BOOST HEAT PUMPS

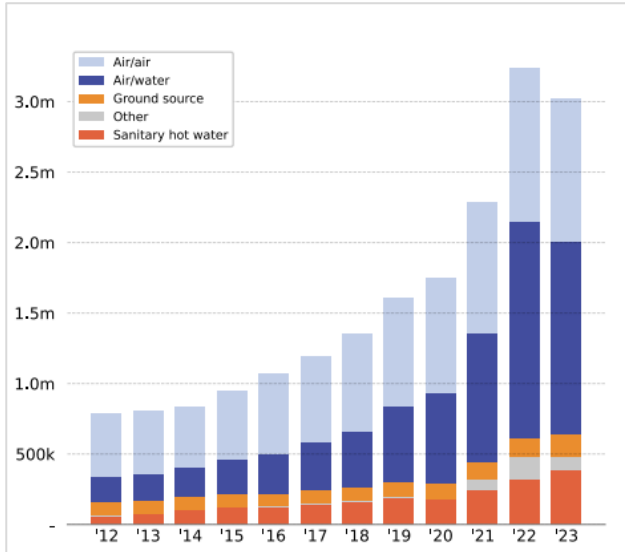


RED RENEWABLE ENERGY DIRECTIVE	EED ENERGY EFFICIENCY DIRECTIVE	EPBD ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE
<ul style="list-style-type: none">42,5% renewable energy in total energy consumption by 2030*Faster permitting process for heat pumpsEU countries should reduce fossil fuels & increase renewables in industrial heating <200°CEU countries should promote (electrified) renewable heating & cooling to reach 49% renewables in buildings by 2030*Increase renewables in heating & cooling by 0.8 percentage points / year to 2025; 1.1 / year from 2026-2030*Possibility to include renewable electricity for heating and cooling in annual targets <p>*Binding</p>	<ul style="list-style-type: none">11.7% reduction in energy consumption by 2030*Policies promoting direct fossil fuel combustion not counted toward energy savings from 2024Waste heat recovery required for data centres with an energy input over 1 MWGradual increase of national energy savings obligations: 1.3% (2024-2025), 1.5% (2026-2027), 1.9% (2028-2030)For savings in kWh electricity, the Primary Energy Factor is set to 1.9, revised every four years* <p>*Binding</p>	<ul style="list-style-type: none">By 2030, all new buildings should be Zero Emission Buildings and by 2050 all buildingsNational building renovation plans shall include measures to phase out fossil fuels in heating and cooling, with a view to phasing out all fossil fuel boilers by 2040*EU countries shall not provide financial incentives for the installation of stand-alone fossil fuel boilers*EU countries may encourage the switch to non-fossil fuel based systemsMinimum energy performance standards are established, addressing the worst performing buildings first <p>Definition of Zero Emission Buildings: "A building with a very high energy performance [...], requiring zero or a very low amount of energy, producing zero on-site carbon emissions from fossil fuels and producing zero or a very low amount of operational greenhouse gas emissions".</p>

Keywords: **reduce carbon emissions, electrification, efficiency**

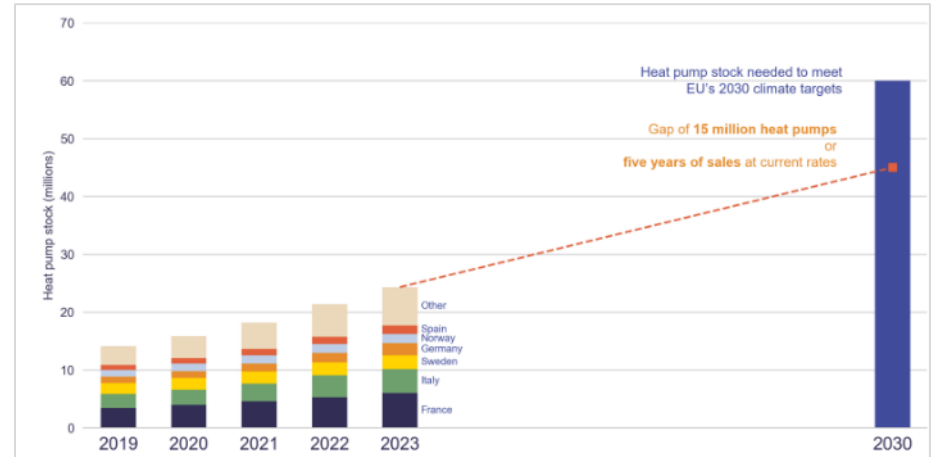
HP market in EU

Sales development by year and type of heat pump (primary heating function)
3M heat pumps sold in 2023



Source: EHPA – European Heat Pump Association 2023 report

2030 EU ambitions vs. current pace (heat pumps installed)





Source: EHPA – European Heat Pump Association 2023 report

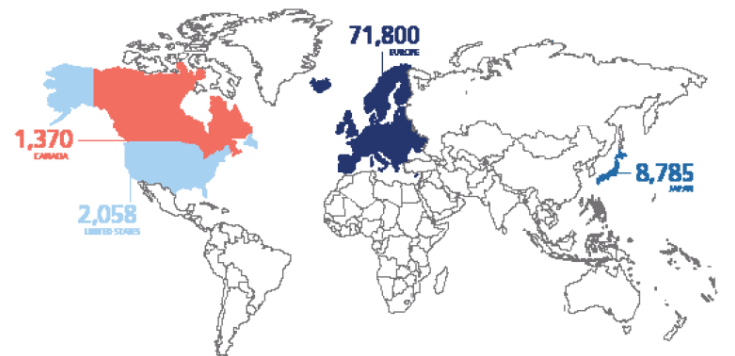
CO₂ from refrigeration to HP market

Natural refrigerant benefits

- Natural, not flammable refrigerant with GWP = 1
- In the last 10+ years, CO₂ has become the new standard for commercial refrigeration in CH
- Mature technology, high reliability and wide availability of components
- Higher achievable energy usage compared to HFC installations
- Several layout options: parallel compressors, heat recovery, subcooling, ejector, PX

Toxicity	
	
A1	B1
A2L	B2L
A2	B2
A3	B3

Flammability 



CO₂ transcritical installations, ATMO 2023 report

CO₂ applied to HVAC

Why Biaggini chose this solution



- Swiss regulations force use of natural refrigerants also in HVAC
- Several requests from consolidated customers who trust in Biaggini
- Proficuous experience with R744 integrated plants since 2019 (in terms of performances, reliability, flexibility, investment costs ecc.) in HVACR

Biaggini and Eliwell



- Long standing collaboration among Eliwell and Biaggini was the perfect starting point
- EWCM 9000 PRO (TM172 PLC) for CO₂ racks in refrigeration has been developed in synergy between the two companies
- High level of experience with this device allowed to realize a dedicated firmware able to manage reversible R744 heat pumps with only one control unit

TM172 Performance: the HVAC PLC

Compact, usable, efficient compressor manager

Compact hardware



Expandable platform



-20°C operation



- Stable pressures operation
- Multiple compressors modulation
- Maximization of suction pressure



- Compact size
- Expandable
- Motorized valve driver & backup

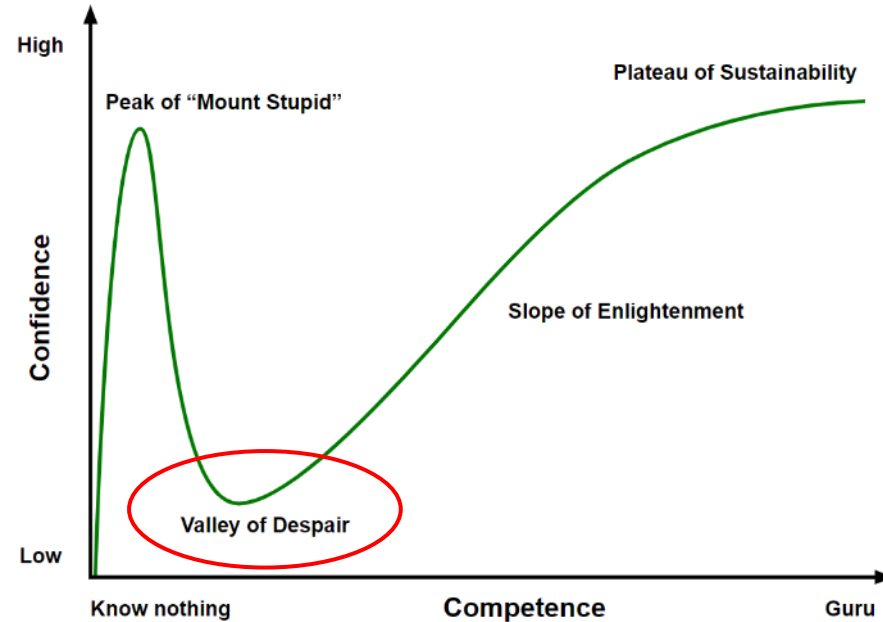


- Configurable for commercial & industrial applications
- Advanced diagnostics
- Configuration & tuning tool

The challenges

- The electronics with dedicated software
- Efficiency to be competitive
- Seasonality
- Polyvalent machines
- High pressure management during compressors ON-OFF (no gascooler “buffer”)
- Digital input and not pressure increasing-decreasing
- High pressure management in order to maximize COP in different working conditions (firmware developed together with Polimi)

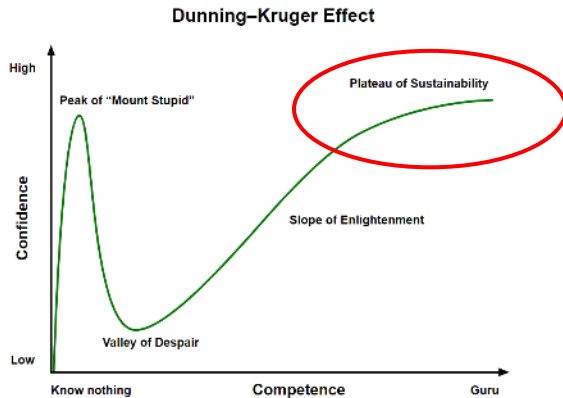
Dunning–Kruger Effect



The value proposition

Biaggini

- New markets
- Different market positioning: USP
- New customers
- Know-how



Our customers

- Sustainable solution
- After sales service
- Diversification
- High reliability of customizable racks derived from refrigeration and applied to HVAC

Case study 1: air/water machine

Migros Agno



2 pcs.	Capacity [kW]	ΔT water [°C]	Text [°C]	COP/EER	Evaporator/Gascooler
Heat pump	600	+27 -> +37	+35	3.50	Air
Chiller	500	+14 -> +8	-5	3.60	Air

Life Is On

Schneider
Electric

Case study 2: air/water machine

Lipo Contone



2 pcs.	Capacity [kW]	ΔT water [°C]	Text [°C]	COP/EER	Evaporator/Gas cooler
Heat pump	320	+36 -> +45	-5	3.20	Air
Chiller	380	+12 -> +7	+35	3.70	Air

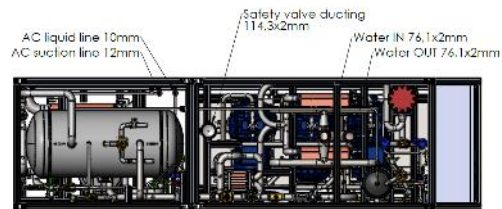
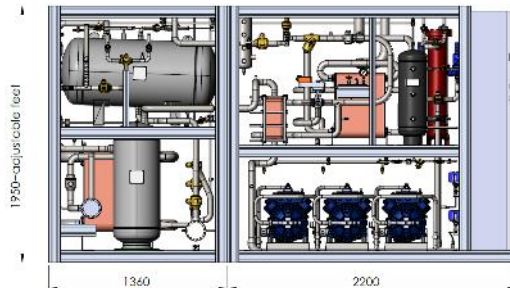
Case study 3: air/water machine



2 pcs.	Capacity [kW]	ΔT water [°C]	Text [°C]	COP/EER	Evaporator/Gascooler
Heat pump	360	+45 -> +65	-5	2.50	Air
Chiller	340	+13 -> +8	+35	3.60	Air

Case study 1: water/water machine

Coop City Lugano



1 pcs.	Capacity [kW]	ΔT water [°C]	Text [°C]	COP/EER	Evaporator/Gascooler
Heat pump	330	+45 -> +65	+8	3.60	Water
Chiller	360	+12 -> +7	+12	7.40	Water

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