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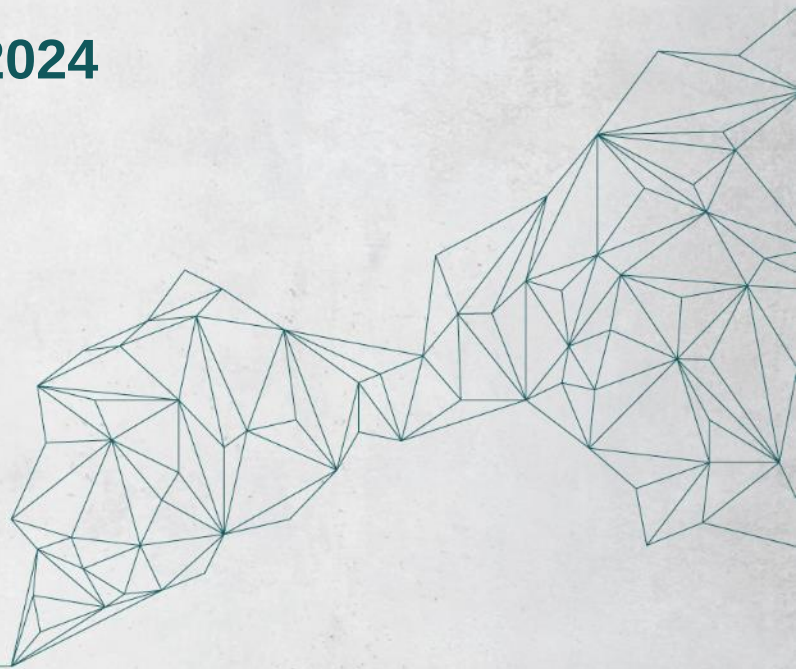
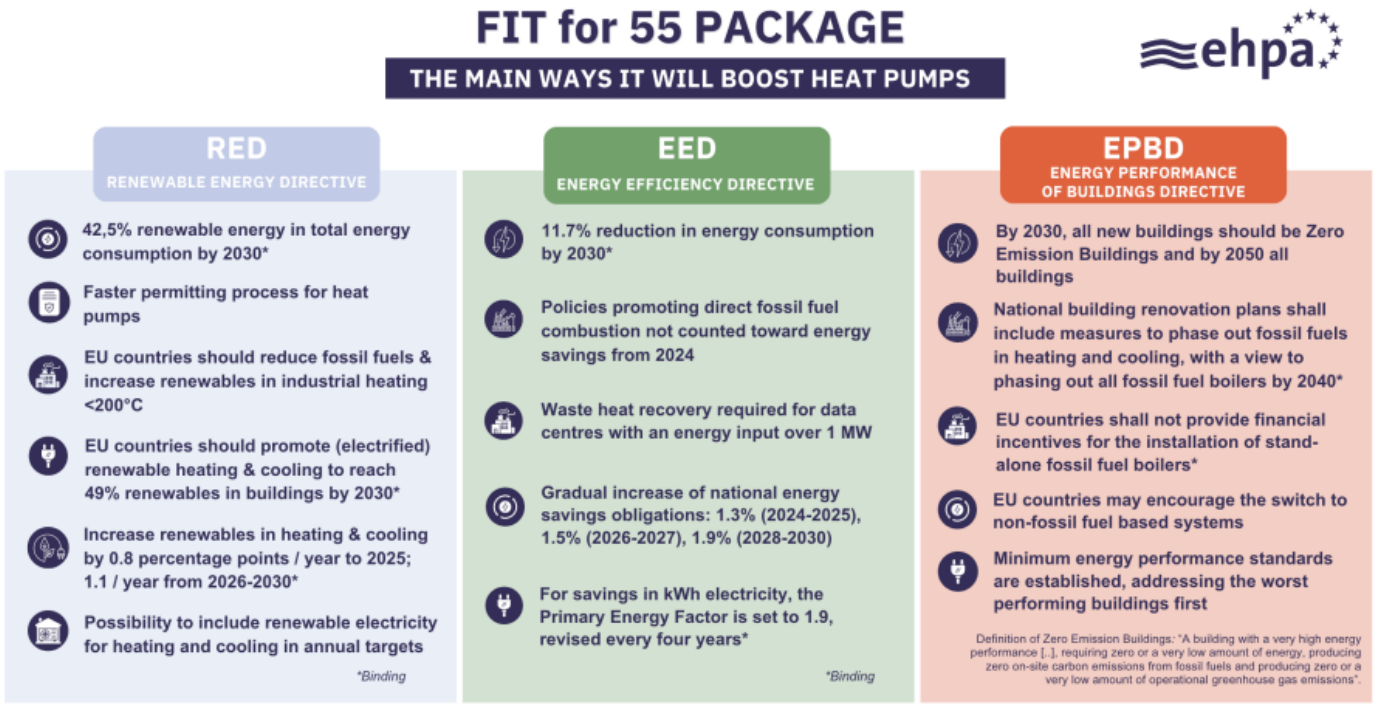
CONNECTING EXPERTS.



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

Federico Ferrari | Eliwell by Schneider Electric
Luca Rossi | Biaggini Frigoriferi

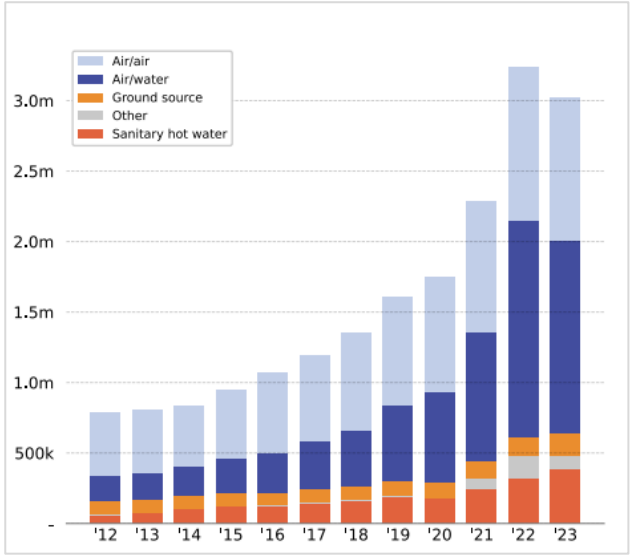
EU Heat Pump Action Plan



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

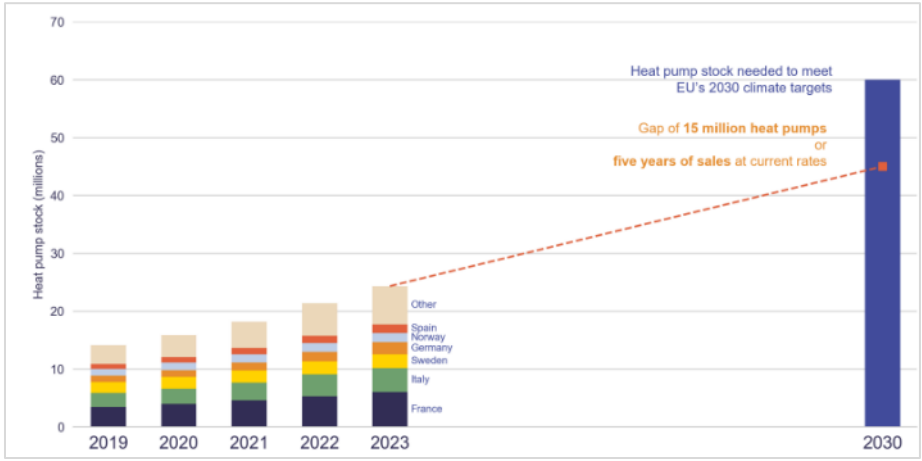
HP market in EU

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)

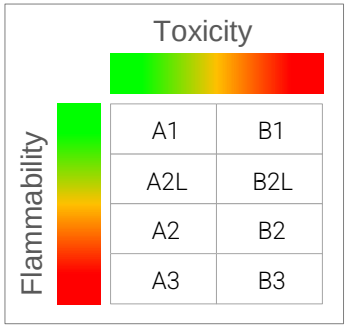


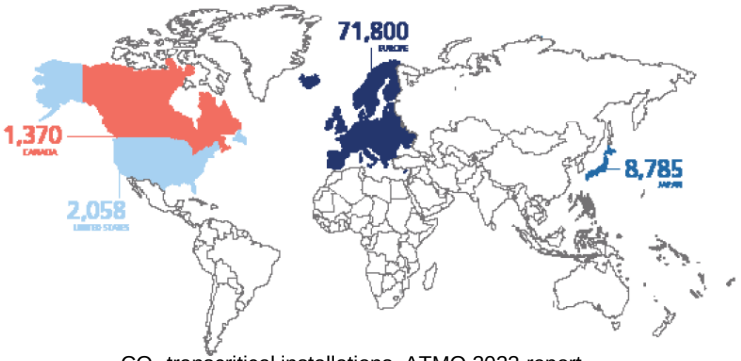
Source: EHPA – European Heat Pump Association 2023 report

CO_2 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





CO_2 transcritical installations, ATMO 2023 report

CO_2 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 CO_2 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

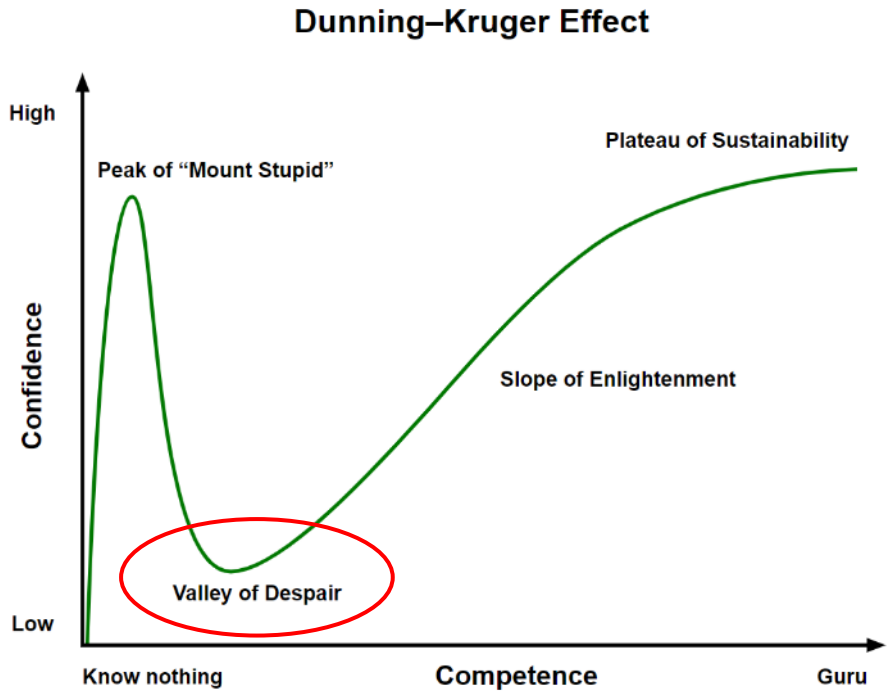
- Stable pressures operation
- Multiple compressors modulation
- Maximization of suction pressure

- Compact size
- Expandable
- Motorized valve driver & backup

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

The challenges

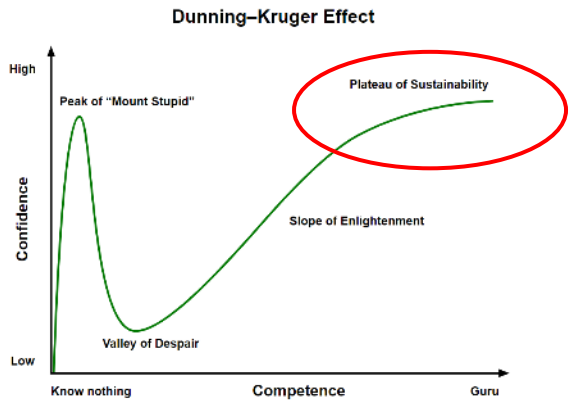
- The electronics with dedicated software
- Efficiency to be competitive
- Seasonality
- Polyvalent machines
- High pressure management during compressors ON-OFF (no gascooler “buffer”)
- Digital input and not pressure increasing-decreasing
- High pressure management in order to maximize COP in different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



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

Case study 2: air/water machine

Lipo Contone

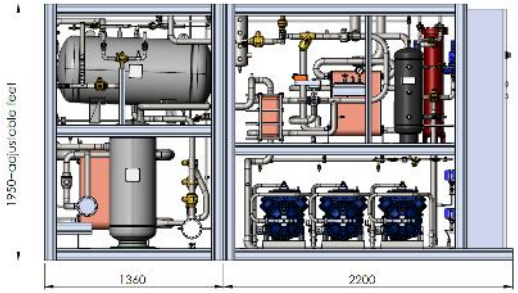
2 pcs.	Capacity [kW]	ΔT water [°C]	Text [°C]	COP/EER	Evaporator/Gascooler
Heat pump	320	+36 -> +45	-5	3.20	Air
Chiller	380	+12 -> +7	+35	3.70	Air

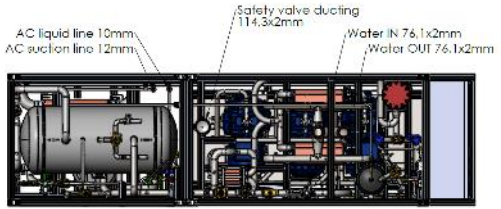
Case study 3: air/water machine

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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