

EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

SYMPOSIUM + EXPO
NUREMBERG, 20-21.10.2015

Industrial | Commercial | Residential
Heating & Cooling | Components & Equipment

hp-summit.de

NÜRNBERG / MESSE

Compressor technology outlook in the HP market

A tiered approach

EUROPEAN
HEAT PUMP
SUMMIT

Enrico Fraccari
Manager Residential Comfort Marketing
Emerson Climate Technologies



Contents

- Market Trends
- Heat Pump System Tiering
- Challenges and Opportunities
- Compressor Technology
- Integrated Solutions
- SCOP Energy Performances
- Refrigerants
- Conclusions

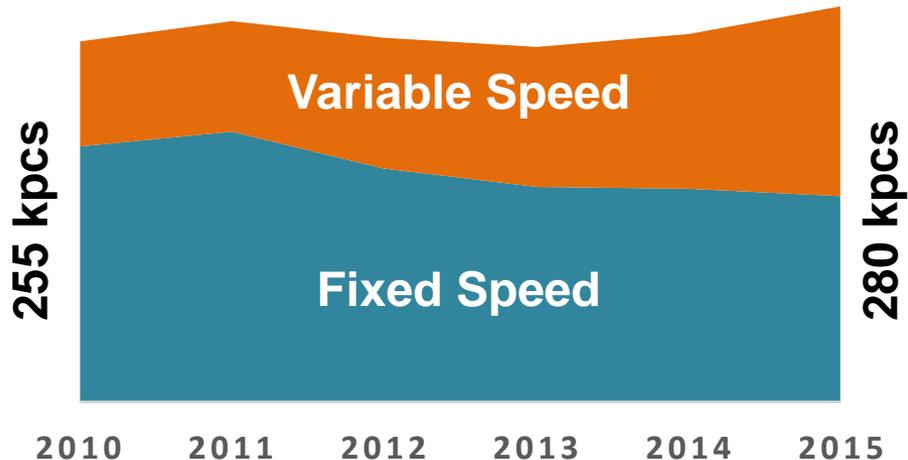
Market Trends

Focus on Residential space heating

European Heating Market by Type <20kW Heating Capacity
Heat pump systems used for space heating and tap water, domestic hot water only not included

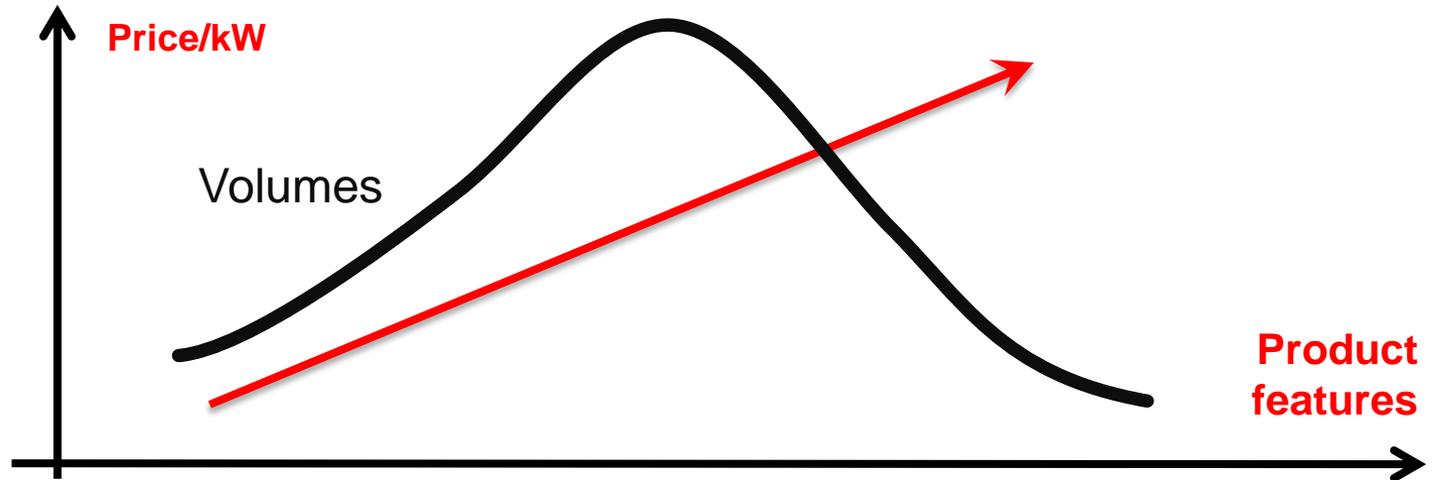


Air-to-water (+5% CAGR) system gaining constantly share in a overall almost flat market (+2% CAGR)
Brine-to-water contracting slightly



VS speed systems close to 50% of total (+13% CAGR)
Increasing interest also in brine-to-water

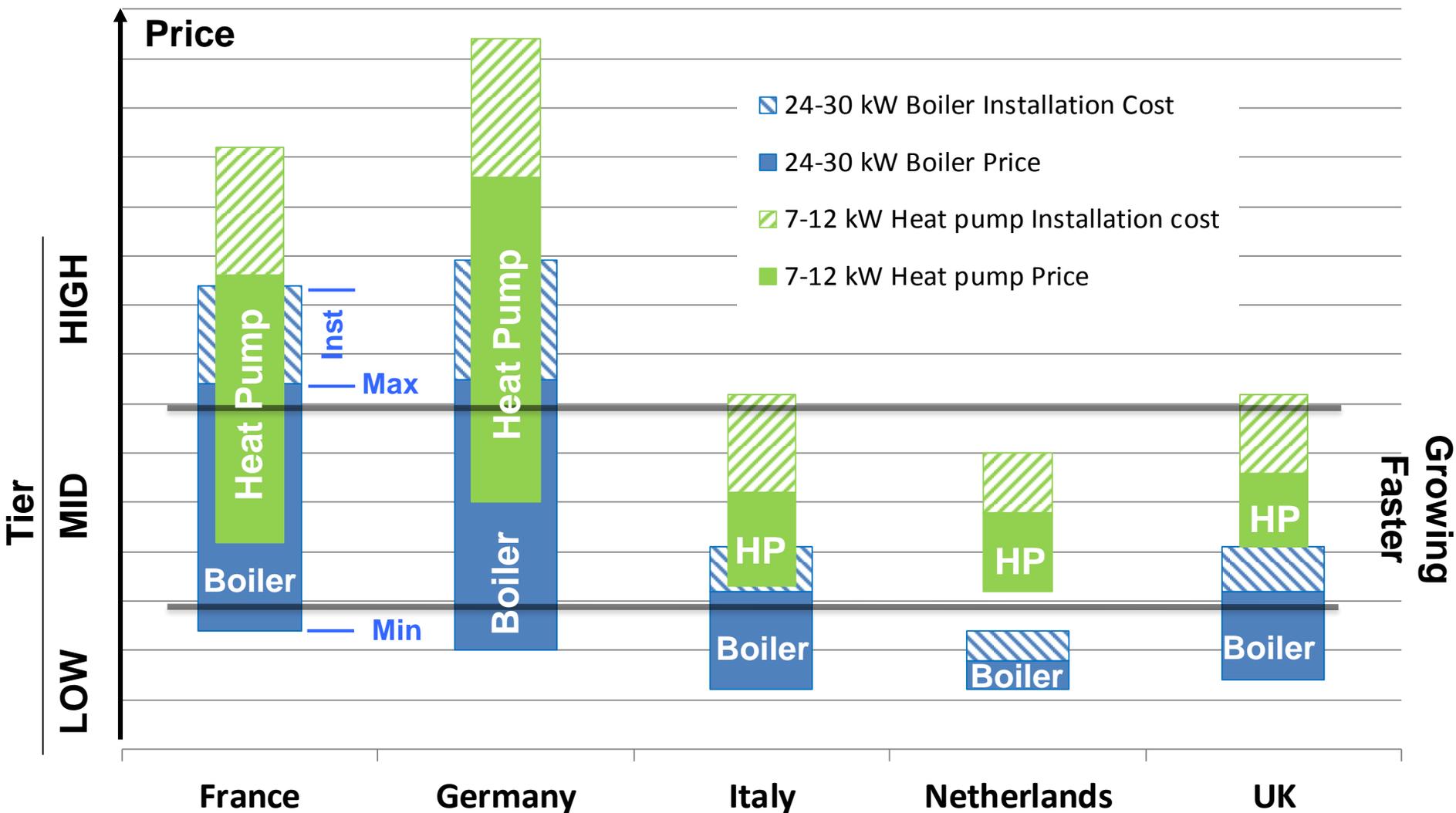
Heat Pump System Tiering



	Low Tier	Mid Tier	High Tier
Product Features	Avg. Sound, Low Water Temp Max 35-40°C	Low Sound, High Efficiency, Max 55-50°C	Best in class Sound and Efficiency 65°C
Market/Climate	Warm	Average	Average and Cold
Low Ambient Capability	Extensive Use of Back-up heaters	Limited Use Of Back-up heaters	No Back-up Heaters
Preferred Application	Retrofit	Retrofit/New Build	New Build

Heat Pump Pricing Vs. Boilers

Today electricity/gas price ratio is not favorable for HP



Challenges and Opportunities

Use of value levers tailoring solutions to meet demands

EUROPEAN
HEAT PUMP
SUMMIT

Tiering

Low
Mid
High

Integrated
Solutions

Refrigerant
Circuit Controller

Flow Controls

Optimized
Compressor

Customers

F-Gas
Regulation

Sound
Emission

Seasonal
COP

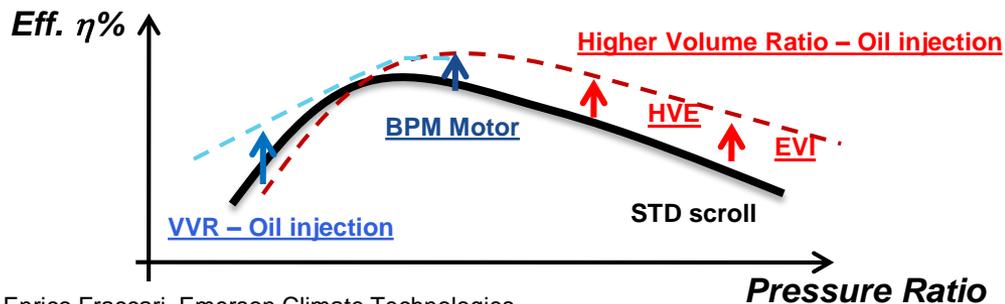
Market Challenges

Variable Speed Compressor Technology

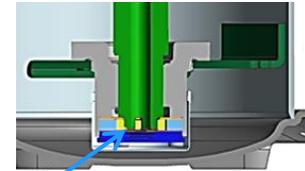
Providing high level of expertise

EUROPEAN
HEAT PUMP
SUMMIT

	XHV	ZHW
Scroll Optimization	35°C Low Temperature	55°C High Temperature
Oil Injection	Yes	Yes
High Volumetric Efficiency Valve (HVE)	Yes	Yes
Oil Pump	Yes	Yes
Variable Volume Ratio	No	Yes
Enhanced Vapor Injection (EVI)	No	Yes (wet)
OK or Wet Suction Superheat	Yes	No

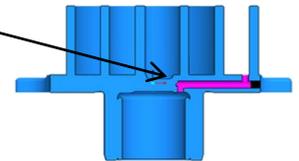


Enrico Fraccari, Emerson Climate Technologies



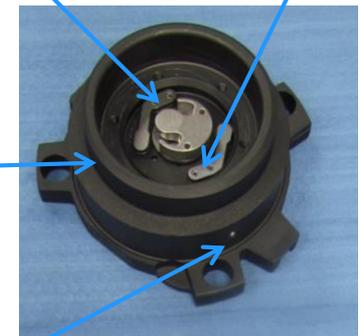
Oil Pump
Positive Displacement
- Low Speed Capability

Oil Injection
- Low Speed Performance
- Heating Performance



HVE Valve
- Heat Pump Performance
- Shutdown device (no reverse rotation)

Variable Volume Ratio
- Improve Cooling Efficiency
- Transient Sound (Defrost)

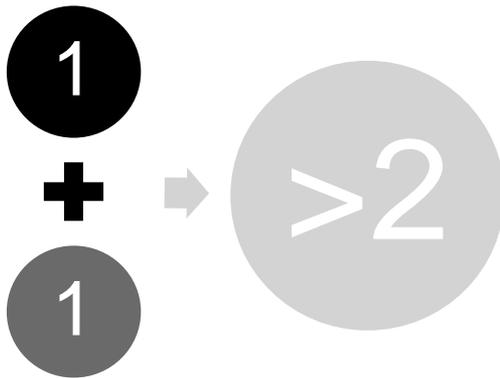


Optimized Scrolls (BIVR)

EVI: Enhanced vapor injection

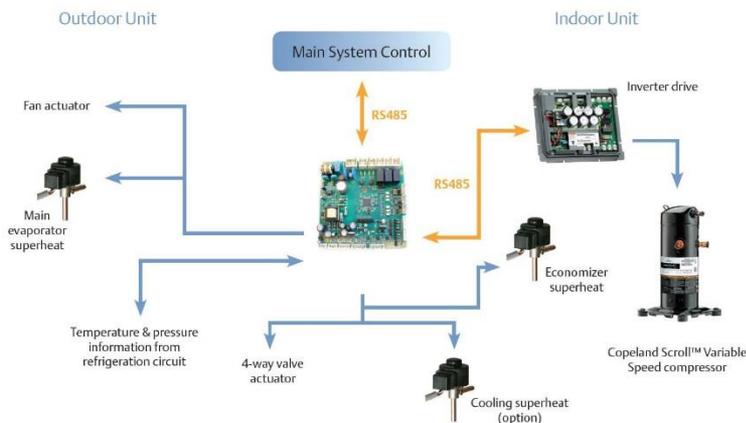
Integrated Solutions

An integrated solution is a package of products, services and technologies that function more effectively as a whole than the individual elements separately

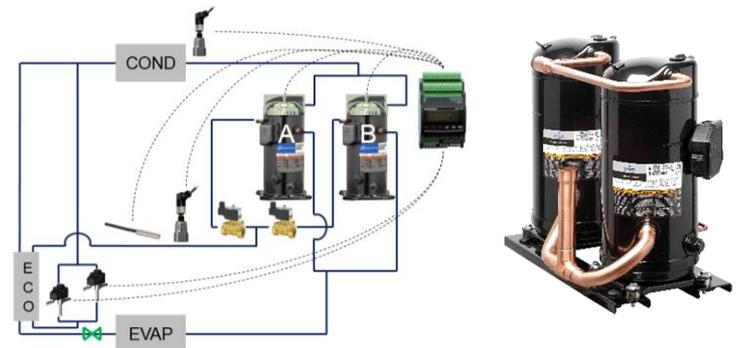


- Reliability
- Efficiency / performances
- Development and Applied cost
- Time to market

Superheat/Envelope Controller



EVI and Tandem Controller



SCOP Targets

110%

Eff. Class	High temperature 55°C (η% / SCOP)		XHV ZHW		Low temperature 35°C (η% / SCOP)		XHV ZHW	
	A+++	150%	3.88	-	-	175%	4.50	v
A++	125%	3.25	v	v	150%	3.88	v	v
A+	98%	2.58	v	v	123%	3.20	v	v
A	90%	2.38			115%	3.00		
B	82%	2.18			107%	2.80		
C	75%	2.00			100%	2.63		
D	37%	1.05			62%	1.68		
E	34%	0.98			59%	1.60		
F	30%	0.88			55%	1.50		
G	<30%	<			<55%	<		

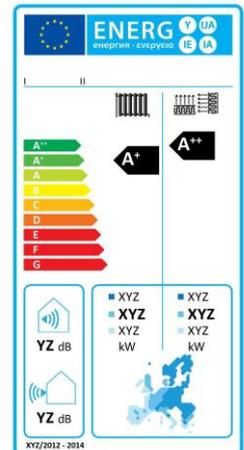
125%

Air-to-water system

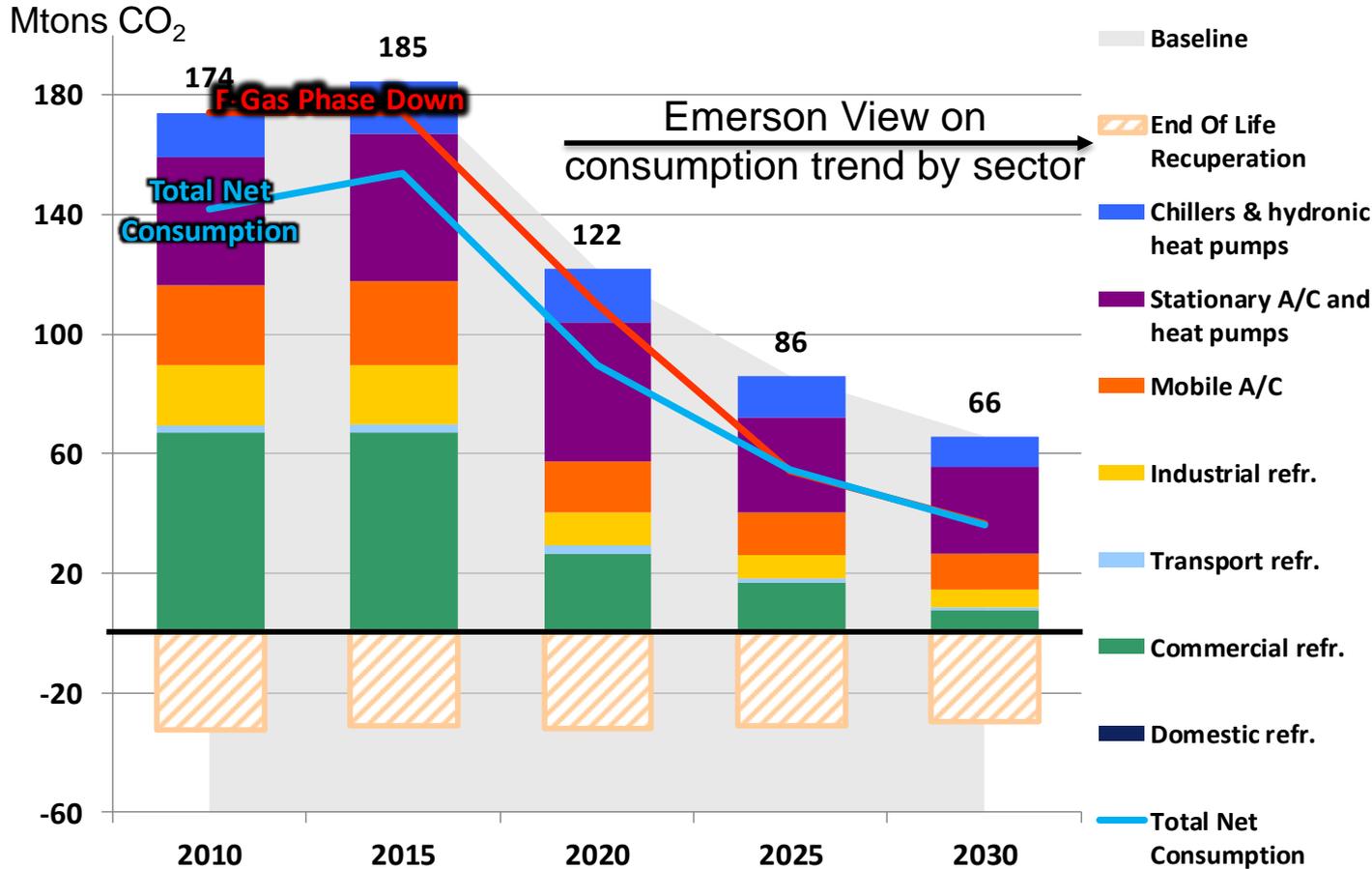
Simulated system performance information is provided for comparison purposes. Actual performance difference found between predicted/simulated result and measured data.

2017 Tier 2 adoption: 110% = 2.88 SCOP / 125% = 3.25 SCOP

- HP should benefit vs. other technologies
- ZHW will provide higher efficiency especially at high water temperature (domestic hot water and 65°C)
 - Enhanced Vapor Injection will not benefit from a labelling point of view



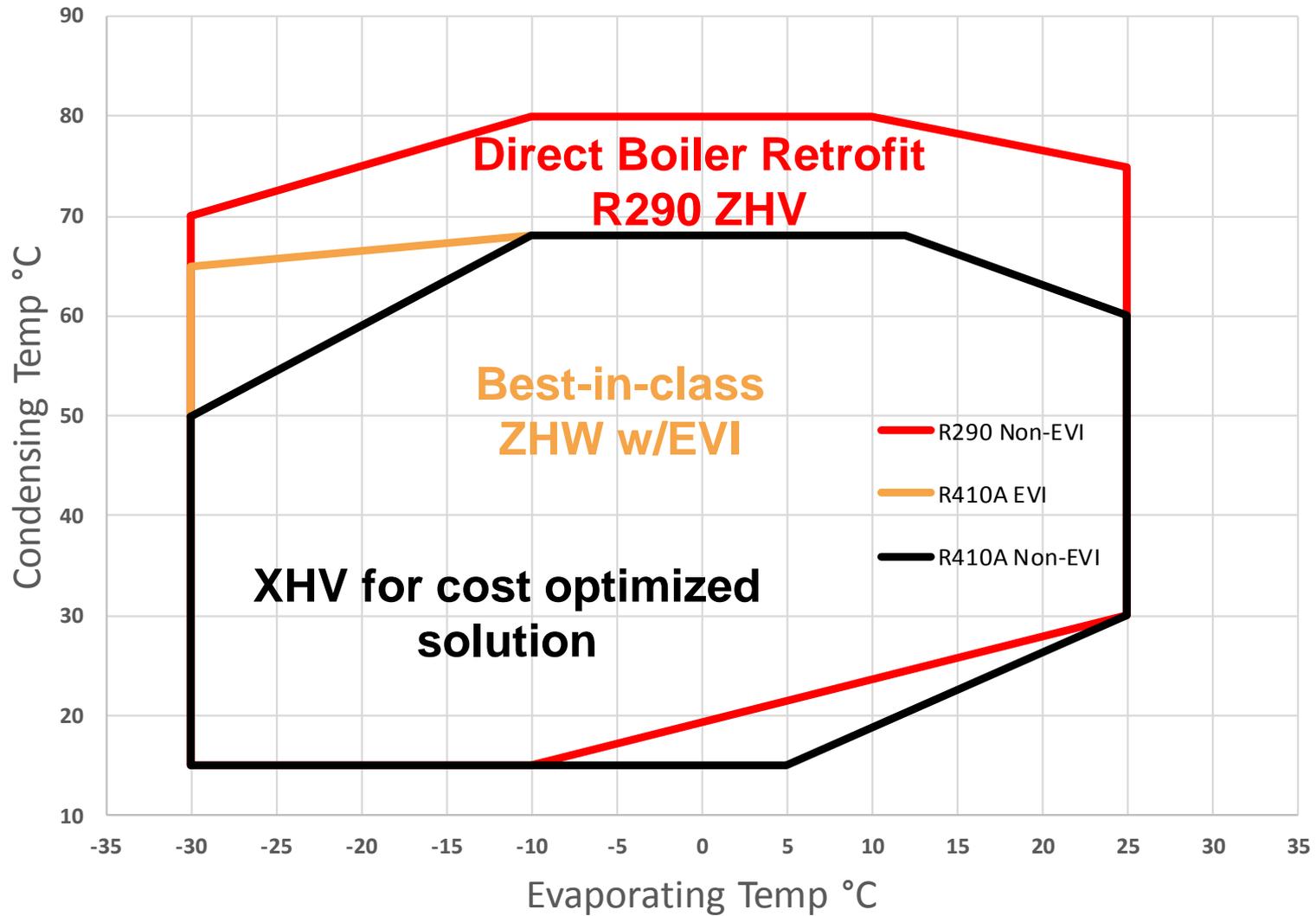
Refrigerants



Hydronic HP Vs
Total Industry
Max 5%

- Residential Heat Pump Impact is low
- More than one candidate for R410A replacement
- R290 good candidate for outdoor systems
- R290 helps achieving long term GWP targets
- It allows very high temperature >65°C for direct boiler replacement boiler replacement

Compressor Platform Overview



Conclusions

- Market trends (oil vs. electricity prices, overall economical situation)
- Space heating market overall flat (<2% CAGR)
- A/W gaining market share and fast VS technology adoption also in brine-to-water system
- Shift to cost competitive solutions with mid tier
- Several candidates to replace R410A refrigerant (ex. R32, R454B, R447A, ARM71A)
- R290 viable candidate for outdoor systems



Thank you very much for your attention

EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

SYMPOSIUM + EXPO
NUREMBERG, 20-21.10.2015

Industrial | Commercial | Residential
Heating & Cooling | Components & Equipment

hp-summit.de

NÜRNBERG / MESSE