

Chillventa Specialist Forums 2024

Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**



HOW AC AND HEAT PUMP CAN CONTRIBUTE TO BUILDINGS DECARBONATION AND REACH EUROPEAN TARGETS IN COMPLIANCE WITH F-GAS III?

9 oktober 2024 – Delphine Martin / Pierre-Emmanuel Danet



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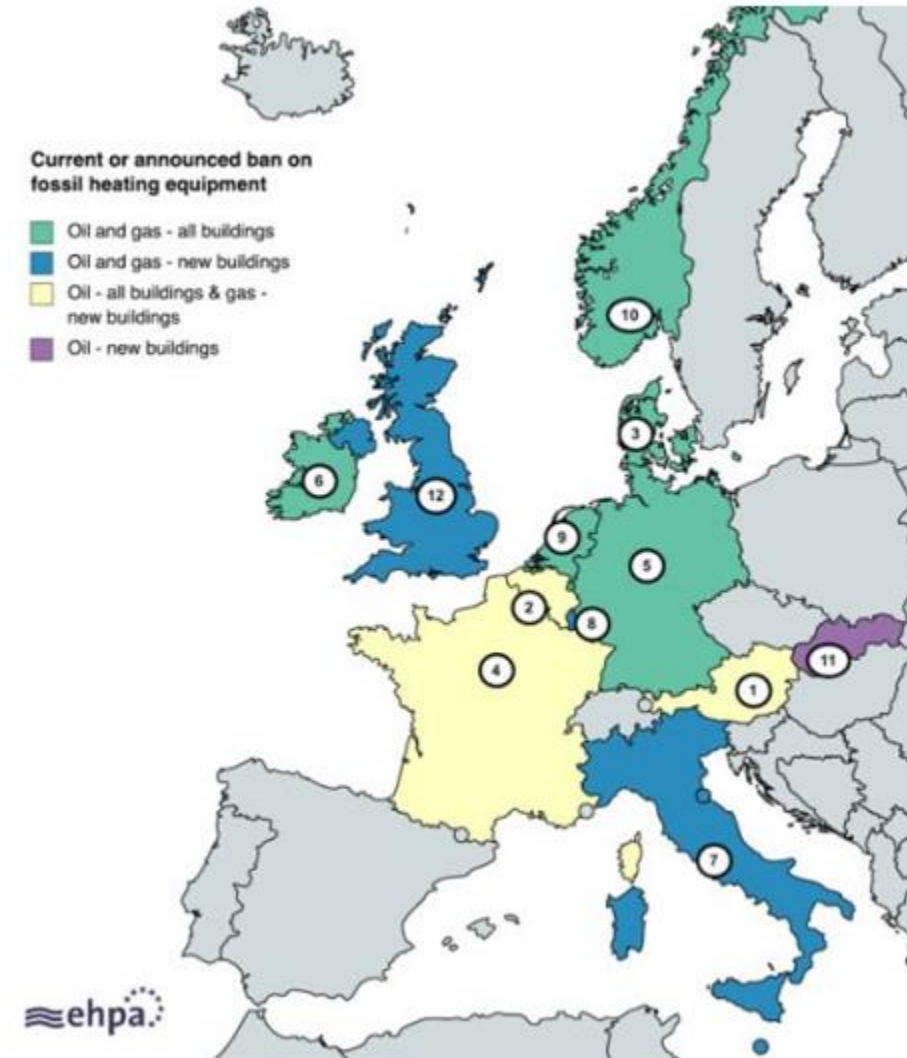
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To achieve carbon neutrality for buildings and homes

We must reduce dependance on fossil fuels

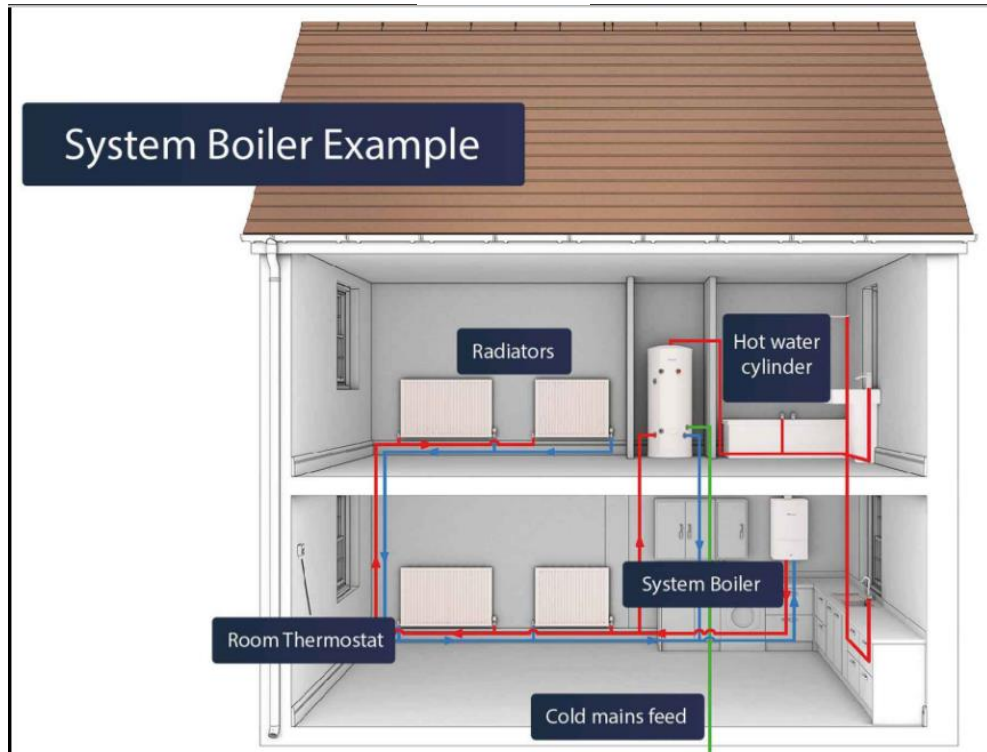
Actions in place by the European Union:

- REPowerEU, EPBD Directive (creation of a carbon-neutral building stock by 2050) - target of 30 millions heat pumps by 2030
- Directive (EU) 2018/2021 (promotion of the use of energy from renewable sources - energy mix in 2030)
- Regulation (EU) 2024/573, known as “F-Gas III





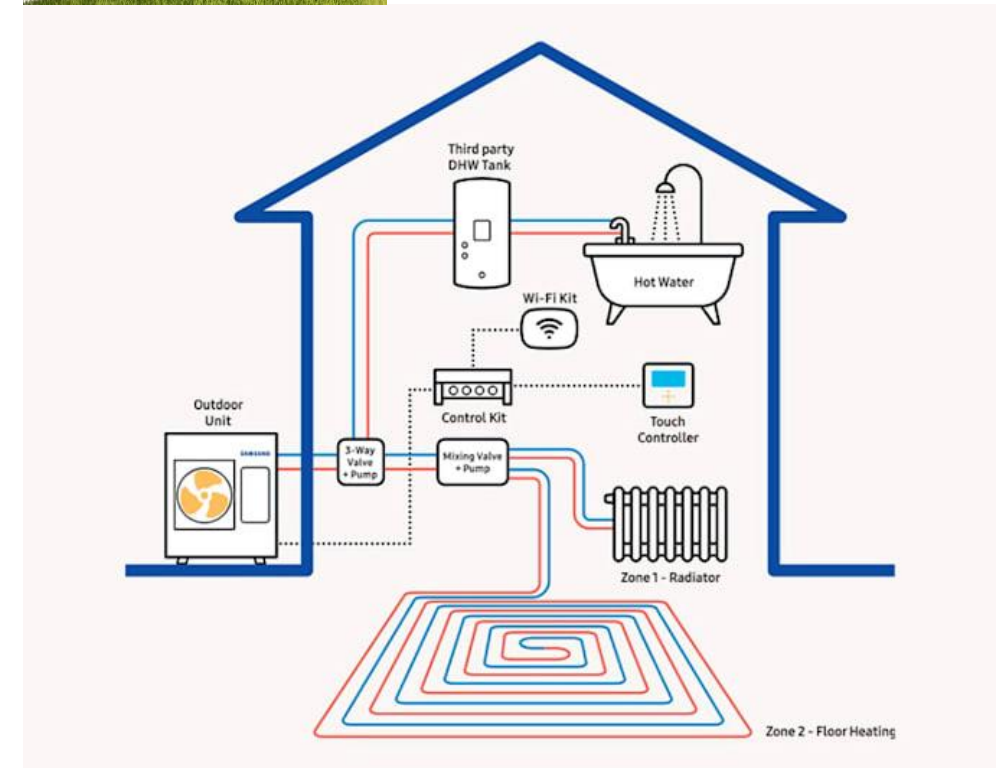
Current



Primary heating form in Europe is hot water to radiator system



Heat Pump



Air to Water heat pump optimum to allow retrofit

PRODUCT ROADMAP | EU RESIDENTIAL HEATING

Heat Pump Application	Market Solution	HON Low GWP Solution	Compressor Type	System Image
Air Source Heat Pump	High GWP like R-410A Medium GWP like R-32	Solstice® 454C * (R-454C) GWP = 148 A2L	Rotary Scroll Micro-Turbo (TBC)	
Ground / Water Source Heat Pump	High GWP like R-134a Medium GWP like R-513A	Solstice® 454C * (R-454C) GWP = 148 A2L		
Domestic Hot Water Only Heat Pump	High GWP like R-134a Medium GWP like R-513A	Solstice® 454C * (R-454C) GWP = 148 A2L		

* Honeywell proposes both solutions: Solstice® 454C * and Solstice® L40X (R-455A)

WHY SOLSTICE[®] RESIDENTIAL HEAT PUMPS?

<150
GWP

Solstice[®] HFO technology offers fossil-free heating with a below 150 GWP refrigerant.



Solstice[®] based heat pumps offer practical, flexible solutions suitable for most residential heat pump and property types, for both indoor and outdoor installation.



Solstice[®] 454C has a lower cost design, allowing cost-effective ASHP application in either split or monobloc configurations, as preferred by the end customer.



They are safer heat pumps to install & service than propane, which is classified as A3 (highly flammable), whereas Solstice refrigerants are at most A2L (mildly flammable).



Solstice[®] 454C heat pumps reduce end customer lifetime costs by being uniquely innovative, using optimised components to improve energy efficiency by up to 11%.

WHY SOLSTICE[®] RESIDENTIAL HEAT PUMPS?

ALTERNATIVE PROPANE (R290) HEAT PUMPS HAVE SERIOUS DISADVANTAGES, SUCH AS:

-  Limitations for indoor use
-  High flammability
-  Petroleum refined
-  O₃ Ozone generation from leaking



Excerpt from AHRI study

WHY SOLSTICE[®] RESIDENTIAL HEAT PUMPS?

Solstice[®] 454C make decarbonising residential heating easier, through **cheaper,**
safer and more **energy efficient** heat pump development



BUILDINGS ARE CRUCIAL FOR SUSTAINABILITY

40%



Buildings represent **40%** of the total energy consumption in the EU

80%



80% of the energy consumed in buildings is for heating, cooling and hot water

36%



36% of the EU's greenhouse gas emissions are from buildings

MAJOR TRENDS FOR HEATING AND COOLING

- **Electrification of end use sectors such as heating, transport...**
- **Systemic Energy Efficiency to reduce energy demand and provide flexibility to the grid**
 - Heat Pumps
 - Waste energy recovery
 - Thermal storage
 - Demand side flexibility
- **Renewable Energies**
 - Facilitate the transition to renewable energies and further decarbonise electricity
- **Digitalisation**
 - IoT and AI to further increase efficiency and help triggering and driving behavioural change



Source: https://commission.europa.eu/news/focus-energy-efficiency-buildings-2020-02-17_en

SOLSTICE REFRIGERANTS | COMMERCIAL BUILDINGS

HVAC Equipment	Compressor Type	Market Solution	Capacity	F-Gas Proposed Bans	Honeywell Solution			System Image
					Interim	Long Term		
Chiller / HP	Centrifugal	R-134a GWP=1430	> 12 kW	<750 GWP from 2027	Indoor & Outdoor Installation R-1233zd A1 / GWP=3.9	Indoor & Outdoor Installation R-1233zd A1 / GWP=3.9		
	Oil-free Screw	R-134a GWP=1430	> 12 kW	<750 GWP from 2027	Indoor & Outdoor Installation R-513A A1 / GWP=630	Outdoor Installation R-1234ze A2L / GWP=1.4	Indoor Installation R-515B A1 / GWP=288	
	Scroll	R-410A GWP=2088	<= 12 kW	<150 GWP from 2027 F-Gas ban from 2032 (subject to legislative review)	Outdoor Installation R-454B A2L / GWP=465	Outdoor Installation R-454C A2L / GWP=146		
			12 - 50 kW	<750 GWP from 2027				
			> 50 kW	<750 GWP from 2027	Outdoor Installation R-454B A2L / GWP=465	Outdoor Installation R-1234ze A2L / GWP=1.4	Indoor Installation R-515B A1 / GWP=288	
	Rooftop	Scroll	R-410A GWP=2088	12 - 50 kW	<150 GWP from 2027	Outdoor Installation R-454B A2L / GWP=465	Outdoor Installation R-454C A2L / GWP=146	
> 50 kW				<150 GWP from 2030				
VRF	Rotary Scroll	R-410A GWP=2088	>12 kW	<750 GWP from 2029 <150 GWP from 2033	Outdoor Installation R-32 A2L / GWP=675	Outdoor Installation R-454C A2L / GWP=146		

*According to the new EU regulation 573/2024 HFCs GWP is calculated as per AR4 standards and HFOs GWP is taken as per AR6 standards

A1: low toxicity, non-flammable
A2L: low toxicity, mildly flammable
GWP: Global Warming Potential

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CHILLERS - INDIRECT SYSTEM

For air conditioning in commercial or tertiary buildings

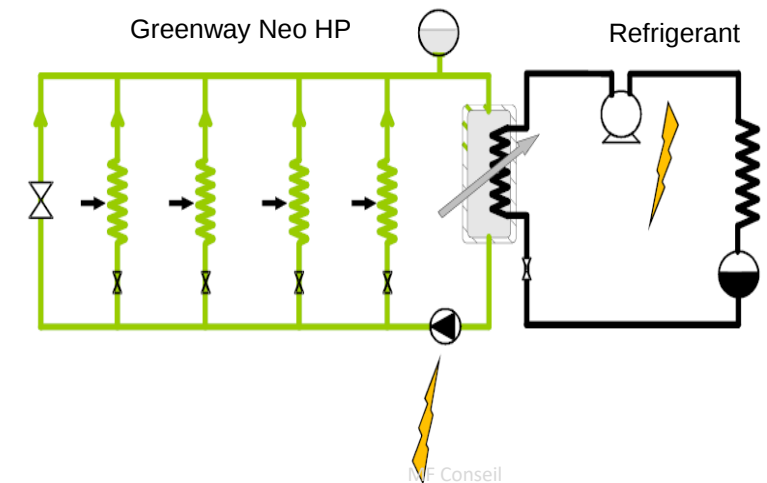
System: chillers, VRV, or rooftop

Technology: geothermal, hydrothermal, solar system

Design: a secondary circuit with a Heat Transfer Fluid

HTF: MEG, MPG, Bio PDO base

Advantage of bio PDO: environmental compliance
high-temperature resistance



CHILLERS - INDIRECT SYSTEM

- Decarbonation, development of bio-source products (formulators)
- Adoption of regenerative practices.
- Advance the livelihood and environmental stewardship by improving soil health, reducing erosion, and potentially sequestering carbon.



41%

Decrease in amount
of land required to produce
a bushel of corn



31%

Reduction in GHG
emissions



41%

Increase in energy use
efficiency per bushel



58%

Reduction in soil
loss per acre



46%

Improvement in
irrigation efficiencies

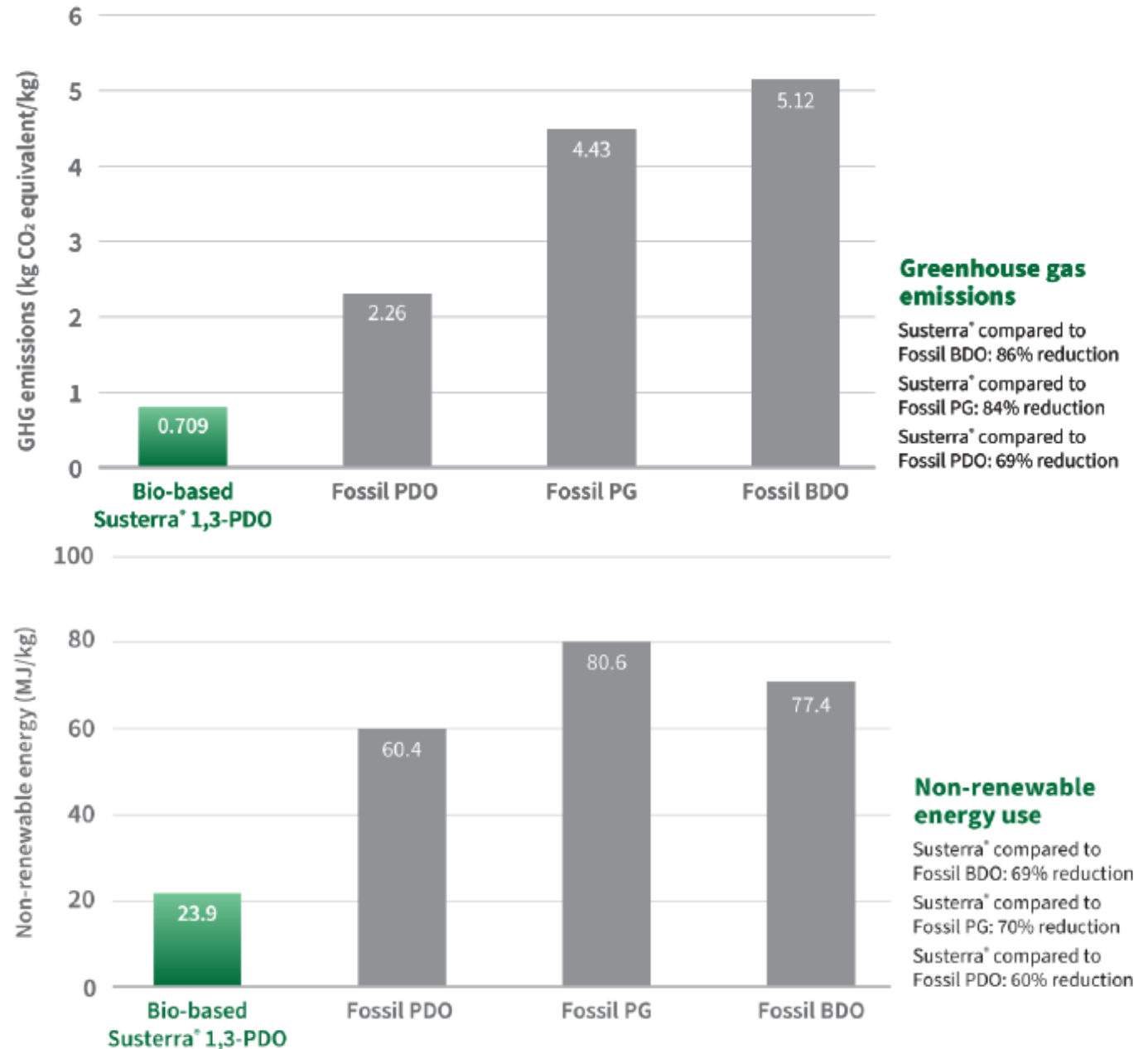
CHILLERS - INDIRECT SYSTEM

A more sustainable ingredient lifecycle

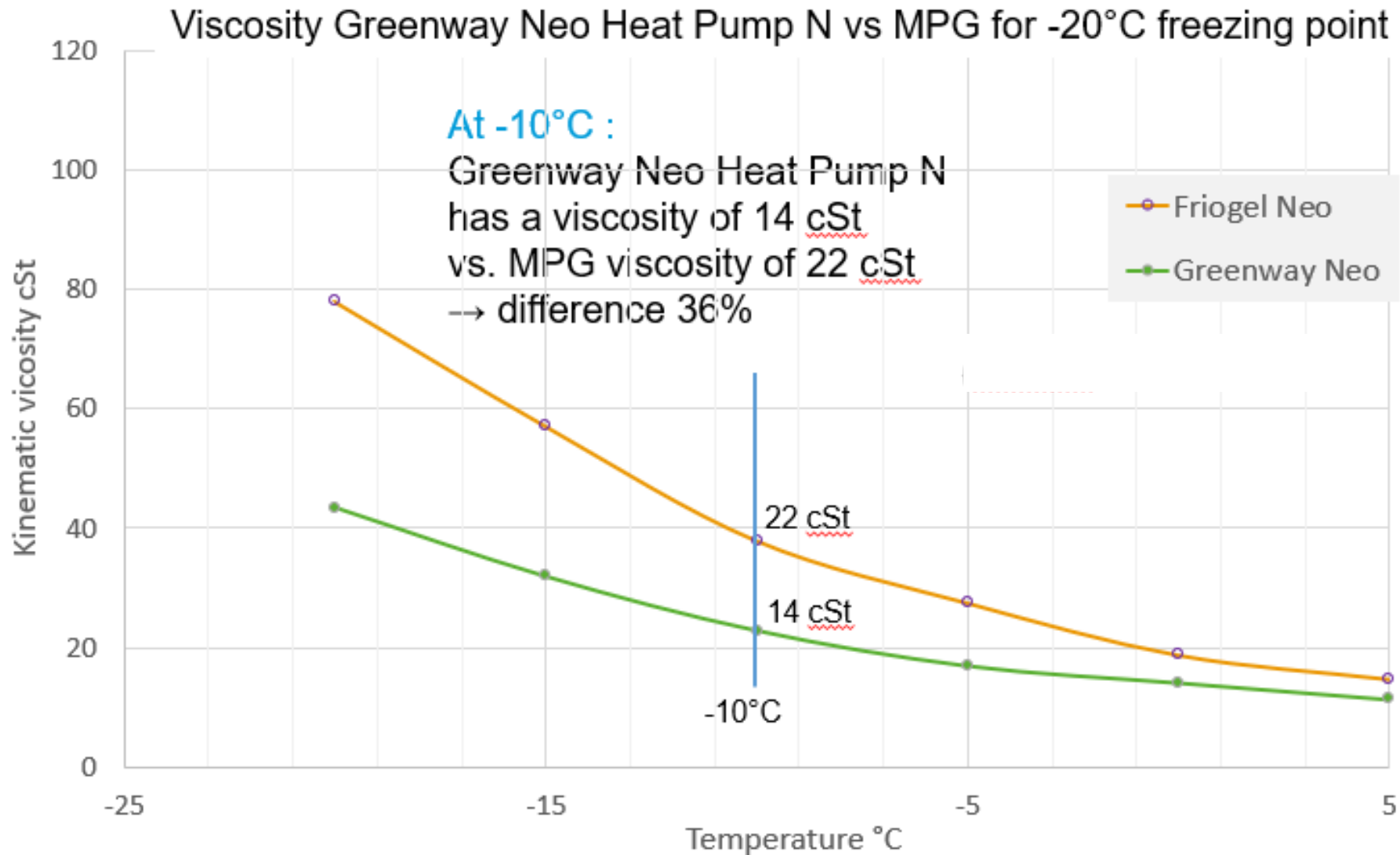
From cradle to door:

- Minimizing environmental impact
- Maximizing performance
- Renewable
- Sustainably-grown
- Alternatives to petroleum-based :
1,3-propanediol, propylene glycol (PG)
and butanediol (BDO)

Life Cycle Assessment (LCA) based on corn farming through the Truterrapartnership program, evaluated by True North Collective and peer reviewed by an LCA Critical Review Panel. SimaPro software and the latest ecoinvent model for corn farming used for system modeling. In accordance with ISO 14040, ISO 14044 and ISO 14071 standards.



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Emmi Energy launches the first high-temperature heat pump using Greenway® Neo Heat Pump N

Designed for heating and domestic hot water without modifying the circuit, the Pompeii model makes sustainability accessible to everyone.

EMMI Energy began developing new high-temperature heat pump technology in 2019. Following tests in a climatic test chamber, generation 1 of Pompeii was operational in 2020. Since 2021, 40 heat pumps have been in operation in four groups of homes. The heat pumps are meticulously checked and adjusted, if necessary, based on data acquired by remote monitoring. "These tests revealed some initial problems, all now resolved, except for the noise level. We therefore designed the second generation of Pompeii, where the noise level has been reduced to 35 dB (below the Dutch directive threshold of 40-45 dB)," explains Denis Tien, technical engineer at EMMI Energy. This second generation of Pompeii is currently being tested in one of the housing units.



Boiler replacement in no time at all

The Pompeii heat pump is designed entirely with the circular economy in mind. For example, all parts are reusable and recyclable. CO₂ (R-744) is used as the refrigerant to achieve the high temperature. When CO₂ is compressed, a large amount of energy is released and the temperature soars. "CO₂ is most cost-effective when operated at 85°C and a return temperature of around 40°C is obtained. Below 31°C, you get frost, which is not desirable," explains Denis.

By producing these high temperatures, the Pompeii heat pump can be connected to the home's existing heating elements. Almost all heating elements, such as radiators, underfloor heating and convectors, are suitable for this heat pump. This means there's no need to make any modifications other than replacing the central heating boiler.

Greenway® Neo Heat Pump N was chosen as the transfer fluid between the heat pump and the buffer tank. "As the heat pump was designed using circular economy principles, it was important that the heat transfer fluid was also sustainable," explains Denis.

Perfect heat transfer

Denis was very satisfied, saying "I had heard of the Greenway® Neo N range and couldn't find an equivalent alternative on the market. I had already tested another plant-based heat transfer fluid but it didn't meet our expectations. After our first tests with the Greenway® Neo Heat Pump N, we found that the heat transfer worked perfectly."

"There are two connections from the heat pump to the buffer tank, to circulate the heat transfer fluid at 80-85°C, with a return temperature to the tank that must always be around 40°C. It's very important for us that the heat transfer medium remains stable throughout the process," explains Denis.

For EMMI Energy, the safety and renewable origin of Greenway® Neo Heat Pump N played a crucial role in the choice, taking into account its other advantages. This heat transfer fluid also contains a bittering agent to prevent accidental ingestion in the event of a leak in the drinking water network. And the plant-based and natural raw materials also reduce the risk of soil contamination.

A bright future

The next step will be to continue marketing the Pompeii heat pump. The hybrid version is currently seen as a boiler replacement solution, but this is only an intermediate step. With this new high-temperature Pompeii heat pump, EMMI Energy can simply replace the gas boiler. More than 2.2 million homes in the Netherlands are now in a position to adopt this solution. ■



PROJECT STAKEHOLDERS

- EMMI Energy: Distributor and developer of innovative heat pump technologies.
- Location: Terwolde, Netherlands
- Year of creation: 2019
- 3 employees
- Website: www.emmienergy.nl



INFO:

Greenway® Neo Heat Pump N is a plant-based heat transfer fluid containing organic 1,3-propanediol and powerful corrosion inhibitors. It protects against freezing and the formation of sludge in circuits.



FOR MORE INFORMATION
climalife.com/product/greenway-neo-heatpump-n-tu

Specifications Pompeii model NO 8600-6C

Heating capacity	6.6kW	Min/max outdoor temperature	-25°C to +43°C
COP	3.4	Compressor	Pascal
Type of heating	Indirectly via EMMI storage tank	Refrigerant	R-744 - 1111g
Heat transfer fluid	Greenway® Neo Heat Pump N - 11°C (volume 20L)	Noise level	35 dBA
Maximum outlet temperature	90°C		

Greenway® Neo Heat Pump N, the bio-sourced heat transfer fluid

Ideal for reducing your carbon footprint

Suitable for heating applications, air conditioning and domestic hot water production

- Formulated with bio-sourced 1,3-propanediol
- Lower energy consumption (viscosity < MPG)
- Biodegradable (reduced risk of soil pollution in the event of a leak)
- Bacteriostatic

04.09.2019

Heating swimming pools and sanitary water with Greenway® Neo Solar heat transfer fluid

Eklor manufactures solar heating systems that incorporate the drainback feature. Today in France, Eklor units represent more than 25,000m² of solar heating systems.



27.06.2017

Greenway Neo application in geothermal engineering – customer testimonial by Jacques Vercruysse, manager at GEO-GREEN.

Established in Belgium in 2011, GEO-GREEN specialises in design and installation of geothermal systems for heating and air conditioning.



12.09.2023 **Newsroom**

Solar Energy Booster makes your solar panel even more efficient with Greenway® Neo Solar N

Solar Energy Booster contributes to the energy transition by enabling existing solar panels to generate not only more electrical energy, but also thermal energy.



THANK YOU FOR YOUR ATTENTION

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