

Which Refrigerants Are Used in Europe?

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As we have previously written in this column, the new F-gas regulation will compel a transition to **natural refrigerants**, at least in systems with capacities below **12 kW** (see *Kyla & Värmepumpar* No. 1, 2024, or link (1), where all earlier refrigerant columns are available). **HFCs** are to be phased out by **2050** for all types of systems, while for **HFOs** there is no time limit regarding use in systems above **12 kW**.

We know that many manufacturers are currently developing new products using natural refrigerants—primarily **propane**—but how far has this work progressed? During the spring, together with colleagues from Germany, Spain, and England, I worked on an **Informatory Note (IN)** for the **International Institute of Refrigeration (IIR)** on the topic of propane as a refrigerant in heat pumps. In connection with this work, we sought to compile statistics on sales of various heat-pump types and the refrigerants they contain. This Informatory Note will be available on the IIR website in the autumn alongside other recommended summaries, see (2).

It should be emphasized that heat pumps and refrigeration systems using propane are not new. As early as **2008** I conducted a survey of propane-based products (3) and was able to list **more than 50** such products (some may have been marketed under multiple names).

There is **no official sales statistic** for heat pumps that specifies the **type of refrigerant** used. The **European Heat Pump Association (EHPA)** compiles annual sales figures from 14 European countries and publishes the results in a data-rich report (4), but their statistics do not include refrigerant information. The material we were able to gather for the IIR-IN report is based on two sources, described below:

- **CEN Heat Pump Keymark** is a list of **certified products** on the European market (5). This source does not indicate how many units with a given refrigerant are sold; it only shows how many certified products of different kinds—and with different refrigerants—exist and thus are likely present on the market. **Figure 1** shows these statistics. As can be seen, **R32** and **R410A** dominate, i.e., most certified products use these refrigerants. We also observe that products with **R410A** decreased sharply between **2021** and **2023**, while products with **R32** increased correspondingly. **R407C** accounted for **10%** of products in 2021, but its share halved by 2023. **Propane (R290)** was used in only a few percent of products in 2021; by 2023 this had risen to **nearly 10%**. It is also notable that **HFO blends** constitute a very small share of certified products. The “**Others**” bar includes **R134a, R404A, R449A, R452B, and R417A**.

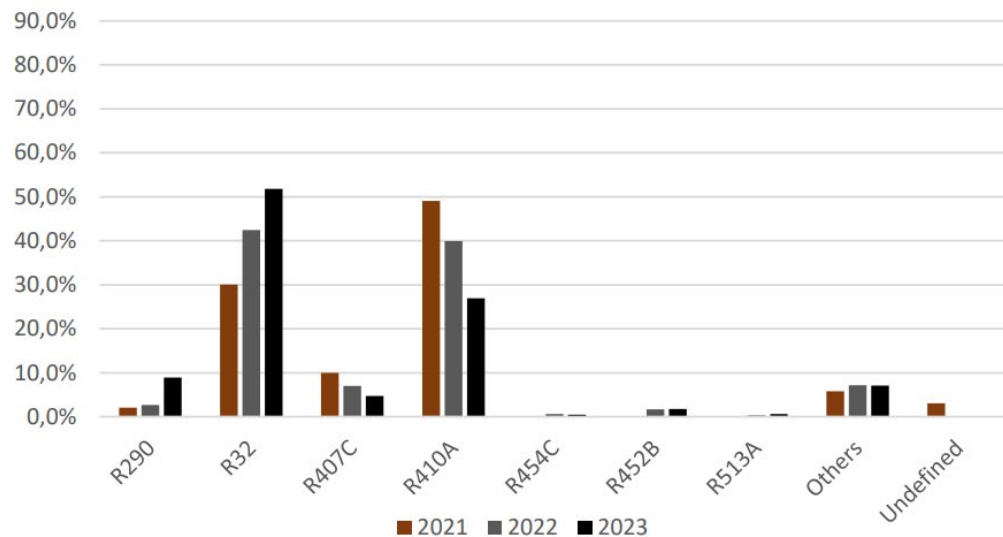


Figure 1. Development of the number of heat-pump types on the market by refrigerant used (from an upcoming IIR Informatory Note).

- In **Germany**, one can apply for **subsidies** to install a heat pump. The application must specify the **type of heat pump** and the **refrigerant** it contains. By reviewing the application statistics, one can obtain an indicative distribution of **sold** heat pumps by refrigerant. It should be noted, however, that **not all air-to-air** units are necessarily included. The results, covering **2015–2023**, are shown in **Figure 2**. The trends resemble those above: **R410A** dominated overall until **2020** but has since declined substantially, while **R32** rose from **zero in 2015** to around **34%** of the market in **2023**. Over the same period, **R407C** fell from **20%** to about **3%**. **Propane** increased from a few percent up to **2018** to around **20%** in **2022–2023**. **R454C** appears in the statistics for the last three years and is steady at a few percent of the market. The entire “Others” group has remained **below 2%** since **2016**. Some applications evidently did not specify the refrigerant type, but this group is small and unlikely to affect the statistics materially. We also know the refrigerant mix differs markedly by **product category**: **air-to-air (split)** heat pumps are mainly manufactured in Asia for the global market, where **R32** and **R410A** dominate. In Europe, **air-to-water** heat pumps—often **outdoor-installed**—are common and frequently manufactured in Europe for the European market; these outdoor units **often use propane**.

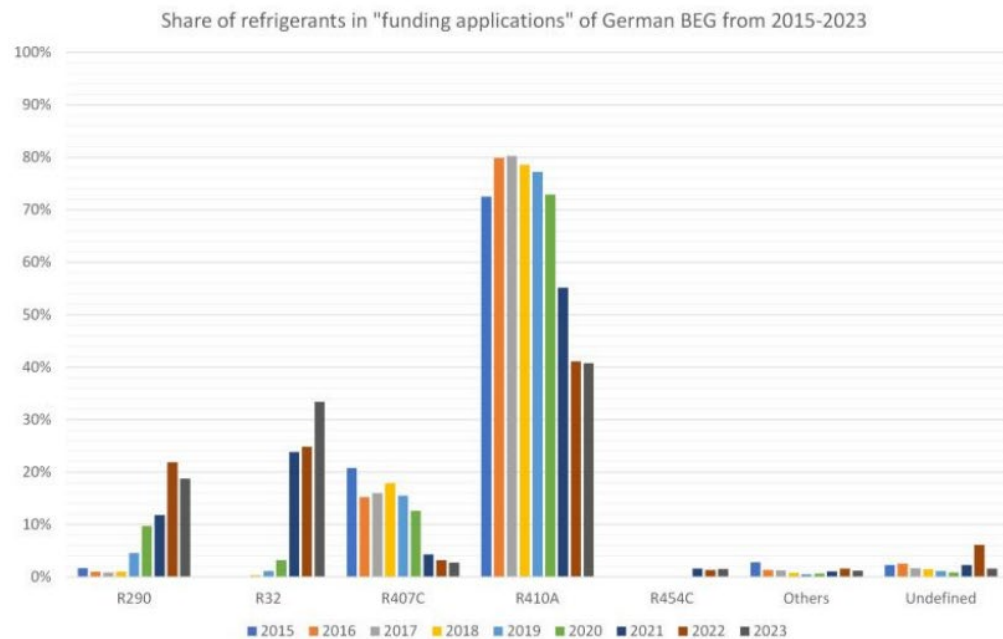


Figure 2. Estimated sales statistics for heat pumps in Germany based on subsidy applications (from an upcoming IIR Informatory Note).

During the spring I also worked on a presentation for the **Gustav Lorentzen Conference** in August. In that context, I was in contact with colleagues in **France** who have access to national sales data. These figures confirm the findings from Germany and the CEN Keymark: for **air-to-air** heat pumps, **R32 (and R410A)** dominate overall, while **propane** has a total sales share of around **10%**; for the **air-to-water** category, the share is estimated at **about 25%**. These units are almost exclusively intended for **outdoor installation**.

For **Sweden**, there are no sales statistics that include refrigerant type. However, **SKVP's Pulsen** provides estimates based on **installer surveys** (6). The question posed is which refrigerant is found in the heat pumps installed for consumers. Respondents could choose among **propane, R134a, R32, R407C, R410A, and R452B**. The number of respondents is not large—**55 of 600** invited in **2023**—but the results are nonetheless interesting to compare with Germany and France (see **Figure 3**). This survey yields a clearer picture than total-sales figures: for **air-to-air**, **R32** is overwhelmingly dominant and **R410A** represents only a few percent of Swedish installations. For **air-to-water**, **R32** is again most common (**>50%**), but here **R410A** has **37%** and **R407C** **10%**. For **brine-to-water (ground-source)** systems, **R410A** dominates with **~50%**, **R407C** is second at **26%**, and **R32** third at **18%**. In this category, **R452B** is also present, estimated at **7%** of installed units. **Propane** accounts for only a **couple of percent** across these three heat-pump types. In **exhaust-air heat pumps**, the situation is quite different: **propane** is **34%**, much higher than for any other type. The most common refrigerant in exhaust-air units, however, is **R134a** at **36%**, a refrigerant not used at all in the other heat-pump categories in the survey. To improve the statistics, it would of course be desirable for **more installers** to participate in **Pulsen**.

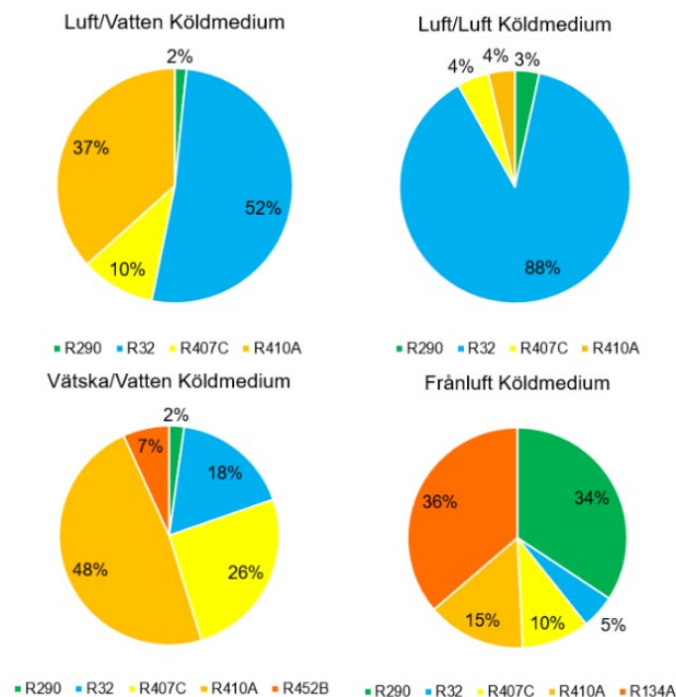


Figure 3. Installers' estimate of the distribution among four refrigerants in heat pumps installed in 2023. From Pulsen 2023 (6).

General conclusions from these sources

- **R32 and R410A** dominate as heat-pump refrigerants; **R32 is increasing** while **R410A is decreasing**.
- **R407C and R290 (propane)** are less common. **R290 is increasing**, especially in **air-to-water** heat pumps on the continent, while **R407C is declining**.
- No other refrigerant exceeds a **few percent** of the total market. **HFO blends have not** gained significant traction.

Readers are encouraged to consult earlier contributions to this refrigerant column.

References

- (1) *Nya F-gasförordningen nu godkänd, Kyla & Värmepumpar* No. 1, 2024; also available at <https://www.energy.kth.se/sv/applied-thermodynamics/publications/articles-for-kyla-varme-1.1113088>
- (2) IIR Informatory Notes (iifir.org), <https://iifir.org/en/iir-informatory-notes>
- (3) B. Palm, "Hydrocarbons as refrigerants in small heat pump and refrigeration systems—A review," *International Journal of Refrigeration*, 31(4), 552–563, Jun. 2008. <https://doi.org/10.1016/j.ijrefrig.2007.11.016>
- (4) Market data – European Heat Pump Association (ehpa.org), <https://www.ehpa.org/market-data/>
- (5) CEN Heat Pump Keymark, <https://keymark.eu/en/products/heatpumps/certified-products>
- (6) Pulsen 2023, <https://skvp.se/skvpold/statistik/pulsen/2023>