Propane Vs Non-Propane Heat Pump

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Aim of the Project

This project investigates how propane (R290) and other heat pumps perform in real-life settings focusing on how they work, what they cost, how safe they are, and what impact they have on the environment.

Background

Building heating and cooling contributes to carbon emissions and energy consumption. According to Nova Science Publishers (Espenson,2018) building use a lot of energy around 40% of total consumption in developed countries and are responsible for roughly 25% of greenhouse gas emissions. Most of this comes from burning fossil fuels, which account for nearly 90% of CO_2 emissions worldwide Heat pumps are a more effective and cleaner substitute. Propane (R290) heat pumps are particularly promising because they are efficient and environmentally safe , but there are still safety issues with their flammability. This study looks into how these systems function in practical environments.

Safety and Environmental Impact

An environmentally friendly refrigerant, propane (R290) has a GWP of only 3, while R410A has a GWP of 2088. Although it has many positive effects on the environment, safety must be closely monitored due to its flammability.

Low refrigerant charges, leak monitoring, and sealed monobloc units are some of the ways that modern systems handle this. At Greenpeace UK's headquarters, for instance, the Palladium mono bloc R290 heat pump was installed safely in an urban environment and utilised only 4.8 kg per circuit.

Economic and Practical Viability

The initial cost of heat pumps is one of the main obstacles to their adoption, particularly for older buildings. R290 propane systems, on the other hand, are demonstrating that cost-effective fixes are achievable without requiring extensive, in-depth retrofits.

Instead of spending about €50,000 on a comprehensive renovation, a homeowner in Ireland changed to a propane heat pump system for less than €10,000. A major factor in increasing the accessibility of these systems is financial assistance programs like the SEAI grant, which can total up to €6,500.

A larger-scale installation of a propane-based system took the place of gas boilers in an Italian academic building. Up to 55% less money was spent on heating the building each year when solar PV and insulation improvements were combined .

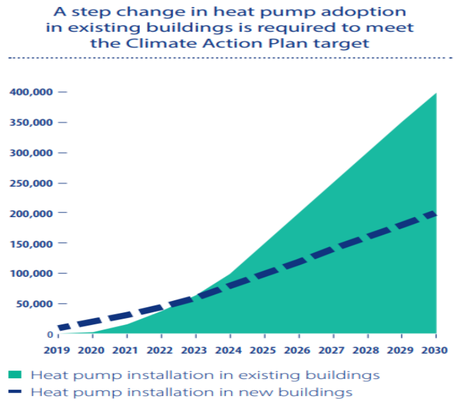

Figure 2: heat pump adaption (SEAI

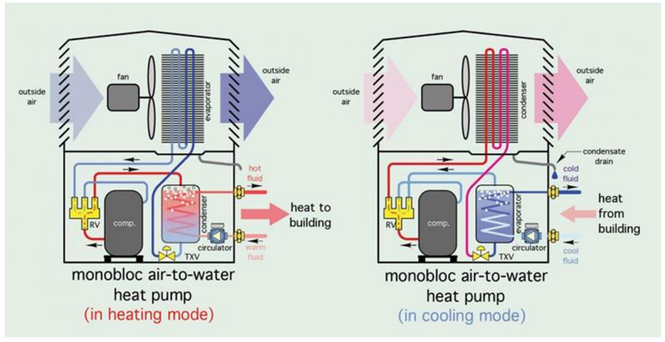

Figure 3: Mono Bloc Unit (Green Peace uk)

Technical Performance and Reliability

An efficient heating system must function consistently in a variety of climates, building types, and usage patterns. Reliability, efficiency, and ease of integration are critical components in the transition away from fossil fuels. In practical settings, propane (R290) heat pumps have proven to be highly effective. A system that achieved a SCOP of 5.06 in a Scottish refit functioned effectively at temperatures as low as -10˚ C. Propane units are 5–9% more efficient than R410A systems, according to other case studies. For both home and business use even under harsh circumstances these systems are proving to be technically sound and dependable thanks to clever features like dual circuits, automated defrosting, and remote monitoring.

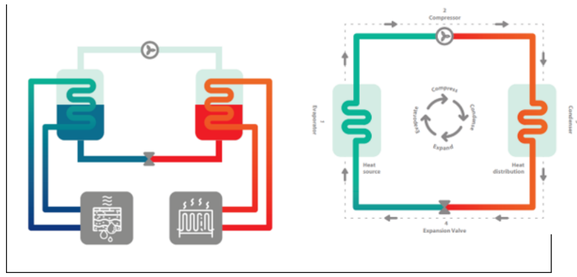

Figure 1:heat pump cycle (seai,2020)

Figure 4: indoor and out door units of HP

Conclusion

Propane (R290) heat pumps are becoming a viable and environmentally friendly option for today's heating requirements. Through funding and developing technology, they provide strong energy performance, much reduced environmental effect, and rising affordability.

These technologies can be successfully incorporated into both new and existing buildings with the proper planning and safety precautions. Propane heat pumps have the potential to significantly contribute to a cleaner, more efficient future as we work towards low-carbon energy targets.

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