

EXPECTED OUTCOMES

The proposed innovative Heat Pumps are expected to help boost Europe's HP industry, increase efficiency, and foster residential use, assisting the EU in achieving its decarbonisation goals.

Improved heat pump overall efficiency and components performance and resilience

- Standardised Digital Manufacturing Production Techniques to integrate components combining dissimilar recycled materials.
- 1 • Two alternative HPs prototypes with smart devices and sensors for enhanced operational efficiency.
- Development of Additive Manufacturing and Hybrid Manufacturing models for minimum production time and maximum component efficiency.
- Best Practice Guides for material choice and process parameter optimisation, based on components' functional characteristics.

Reduced environmental footprint of components construction and HP assembling

- Standardised testing, manufacturing process and assembly protocols allowing small-scale, on-site manufacturing of HPs, minimising transportation.
- 2 • Protocols for sourcing recycled and recyclable material.
- Use of refrigerants like propane to reduce ozone depletion, global warming, and flammability danger.

Reduced greenhouse gas emissions from the HP construction and operational life cycle

- Use of Functionally Graded materials for more energy saving components.
- 3 • Embedding sensors and devices within HP components during manufacturing, for optimal monitoring and operating.
- Novel manufacturing design that incorporates life-cycle parameters for maximum efficiency, sustainability, and reliability.

Improved energy system integration and overall HP efficiency, applicability and flexibility

- 4 • Design plans for compact, modular, smart residential HPs, to increase flexibility and adoption.
- Innovative 3D printing methodologies allowing for local production and material sourcing, reducing costs.

CONSORTIUM



PROJECT DETAILS

WEBSITE
smartpumps-project.eu

LINKEDIN
Smart-Pumps

CONTACTS

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Sustainable
Multi-Functional
And Recyclable
Heat Pumps



Funded by
the European Union

Project duration:
June 2024 – May 2027

PROJECT OVERVIEW

Smart-Pumps aims to **revolutionise heat-pumps' design and manufacturing.**

By leveraging cutting-edge techniques, this Horizon Europe funded research project will design heat-pumps **with smart functionalities** that are **sustainable and efficient.**

This involves prioritising recycled materials and ensuring component recyclability throughout the heat-pump lifecycle, integrating **sensors** for performance optimisation, and establishing standardised **protocols** for mass production.

Smart-Pumps seeks a future where heat-pumps' technology is both environmentally responsible and adaptable, for superior operations and energy saving.

OBJECTIVES

Smart-Pumps will develop **innovative, energy saving, highly efficient Heat Pumps (HPs)** for residential use, and design a new manufacturing process to reduce their environmental impact and facilitate their maintenance.

- Heat Pumps component redesign for improved performance**
Redesigning heat-pumps' components, architecture and operation to maximise efficiency, based on extensive analysis and digital testing with components with different mechanical, thermal and electrical properties.
- Heat Pumps design for minimal environmental footprint and reduced greenhouse gas emissions**
Developing simulation models for the energetic, environmental, and financial analysis of the new Heat Pumps. Minimise CO2 footprint, material usage and processing energy and maximise recyclability of the investigated materials alternatives for optimised designs.
- Developing and embedding smart properties to HP components**
Defining the type of sensors and devices needed for obtaining and securely transferring and storing data for HP operation, monitoring, and digital communication and handling. Defining their optimal placing in HPs and components for best performance and minimal complexity during fabrication.
- Standardised digital manufacturing and testing in HP production**
Utilising hybrid manufacturing to handle materials of different melting points and structures and multifunctional parts with embedded smart devices. Optimising processes and defining strategies and protocols for cost-effective and environmentally friendly testing of hybrid manufacturing.
- Training paths on Digital Manufacturing of smart HPs**
Identifying training needs based on the new HP specifications. Developing training paths tailored to different employee groups to enable safe, competitive and efficient design for additive/hybrid manufacturing, manufacturing monitoring, and HP testing.

TIMELINE

