

Heat Pump Manufacturing Automation for Scale and Cost

Project Lead: ICAX Ltd

Funding:

£923,817



The problem: Can heat pumps be manufactured more efficiently?

Traditional production methods for building a heat pump unit require a sequence of complex processes and involve considerable manual assembly and manoeuvring. This makes their manufacture and final sale price costly.

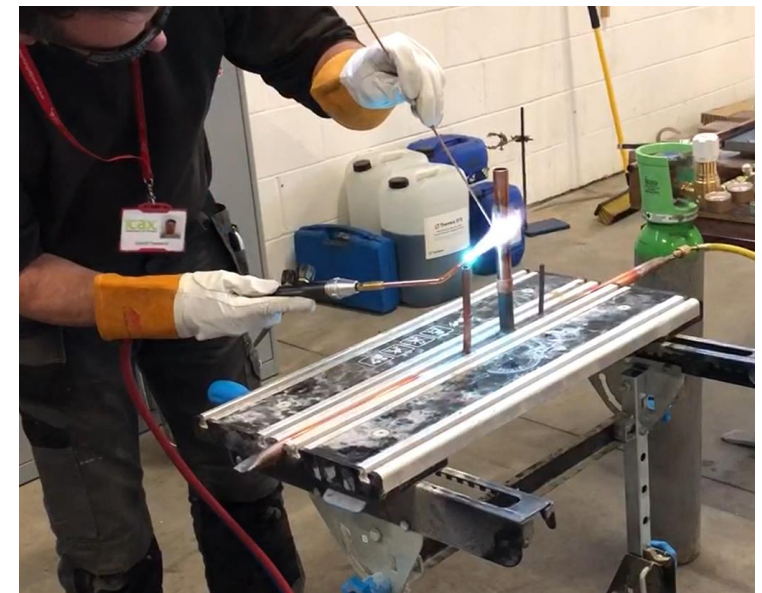
The solution

By re-designing the heat pump assembly to include intelligent automation, units can be assembled more efficiently leading to increased throughput and higher levels of standardisation and quality control.

In this project, ICAX will tackle the cost barriers of heat pump deployment by designing and building a trial manufacturing assembly line for residential heat pumps, using state-of-the-art analytical and physical tools. This will reduce unit production times and increase the scale and manufacturing capacity. This will reduce unit costs, offering a systemic approach to optimised manufacturing based on current state of the art intelligent manufacturing design and operation capabilities.

“ Our team is very inspired by the Heat Pump Ready programme. This is a difficult challenge, and requires completely re-thinking traditional processes in this sector, but we are making rapid progress and are looking forward to having our cell online in 2024. ”

Mark Hewitt
CEO, ICAX



Automating heat pump manufacturing

What are we going to do?

We are developing and testing a strategy to increase the process efficiency of heat pump manufacture and assembly by using selective, intelligent automation.

We are designing and building a trial manufacturing assembly line for residential heat pumps, which combines state-of-the-art analytical and physical tools and robotics into the traditional assembly line.

Why is this an improvement on current solutions?

Heat pump technology is not new; historically the manufacturing process has been able to keep up with existing levels of demand. The processes for manufacturing a heat pump unit traditionally require manual handling of the components and part-assembled units at each stage in the process and is therefore inherently relatively inefficient compared with more automated industries, and unlikely to provide sufficient output for the increasing future demand levels.

By intelligent use of automation, we are looking to increase the speed and efficiency of the manufacture and assembly process.

What would success look like?

A systemic redesign of the heat pump assembly process, where the target is to increase product quality.



How will this project help towards the target of installing 600,000 heat pumps per year by 2028?

The current manufacturing capacity of heat pump units in the UK is not sufficient to produce the numbers of heat pumps needed to meet the 2028 target.

By further automating the manufacturing process, more units can be produced in a shorter timescale, contributing to the projected increase in demand for this technology and building capacity in the UK supply chain.

The Optimised solutions development stream of the Heat Pump Ready programme supports the development of innovative tools, technologies and processes to overcome specific barriers to heat pump deployment in the UK. This stream supports solutions aiming to reduce the life time cost and increase the performance of domestic heat pumps, minimise home disruption whilst providing high quality installations, develop and trial financial models to support heat pump deployment, improve the heat pump consumer journey and provide a smart and flexible home energy system.

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Funded by:



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Key Findings

- Lead times for robotic parts and equipment can be several months, so the procurement and delivery time needs to be factored into the build schedule.
- Precision is so important in the design of a manufacturing cell, and various solutions for holding the base plate in place have been trialed.
- Understanding which processes can be made more efficient by automation is one step, calculating which automated process would result in reduced manufacturing cost is another. Not all processes need to be automated, and some processes have to still be carried out manually for convenience.

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Project Progress (Autumn 2023)

What progress have we made so far?

We have now designed the layout of our robotic cell for manufacturing and assembly of heat pump units, and have procured many of the parts and equipment ready for testing and assembly.

We have completed three out of the eight project milestones, including setting out the full design specification and defining the approach to procurement of parts.

We have started constructing the robotic cell with our manufacturing subcontractor Loop, and have begun testing each component and stage in the process.

What barriers have we identified and how has this changed our approach to delivering our project?

As our manufacturing subcontractor is located some distance from the final factory base in Blaina, we have decided to extend the build and factory acceptance testing stage to allow this to take place at Loop's factory. This way, any improvement actions needed can take place quickly by the manufacturing team. Once the whole cell assembly is checked and verified, the cell will be disassembled and moved to Blaina.

What are our next steps?

Over the next six months we will continue to procure parts and equipment for the cell, factoring the lead times into the assembly process to ensure everything arrives in time for when it is required.

We will work further on the build of the cell at the manufacturer's site.

We will also continue the iterative approach to each process in the cell, ensuring every process is as efficient as can be.

