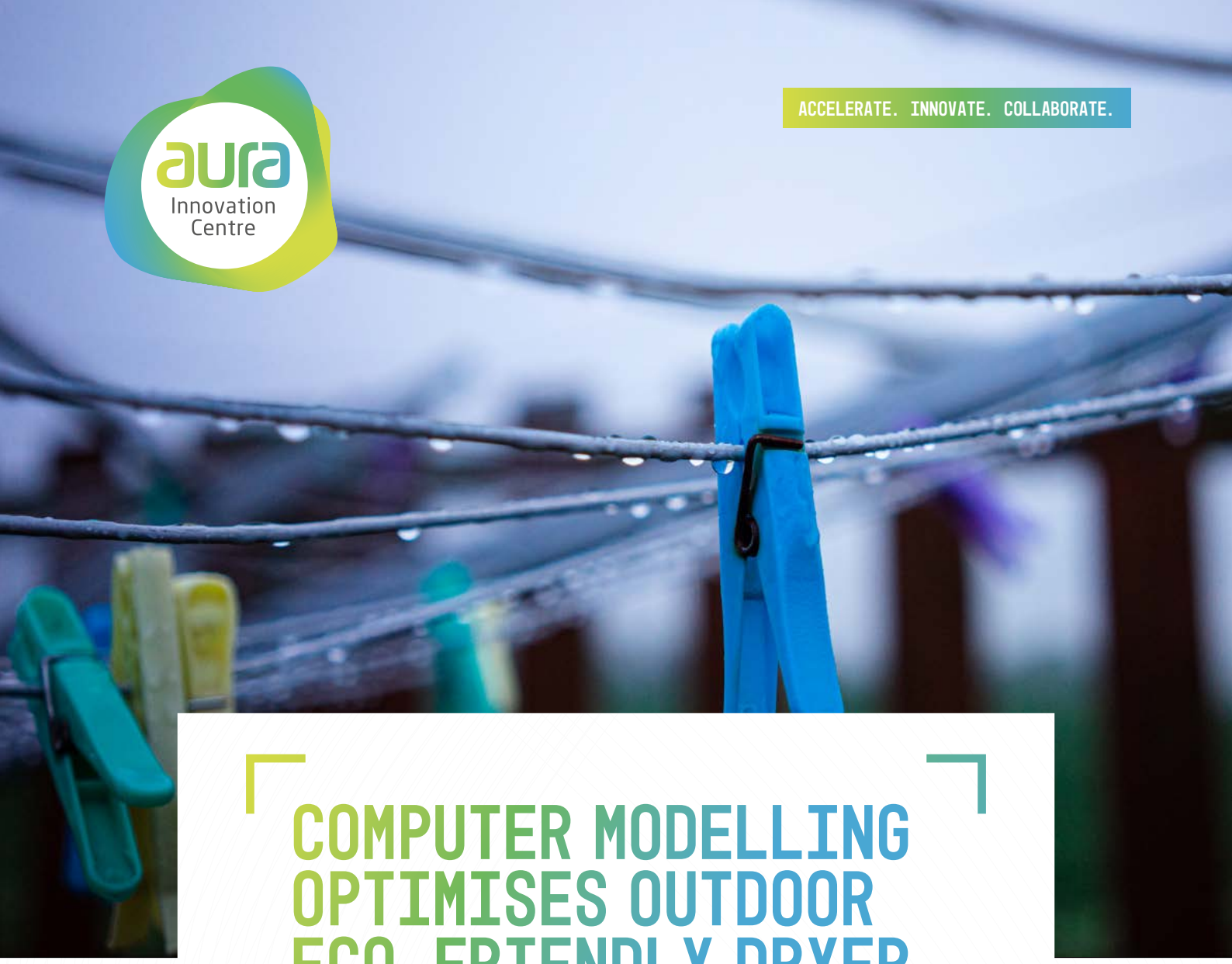

ACCELERATE. INNOVATE. COLLABORATE.

COMPUTER MODELLING OPTIMISES OUTDOOR ECO-FRIENDLY DRYER

The inventor of an eco-friendly outdoor clothes dryer powered solely by the sun and wind had developed four prototypes before acknowledging that years might go by before he managed to optimise the design for all weather conditions. He talked to the Aura Innovation Centre (AIC) about using computer simulation to accelerate what was a family-led project.

CASE STUDY: Dri-Dome

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THE CHALLENGE

Developing the most efficient design solution for drying clothes outdoors.

As Steve Page watched through the window as wind and rain lashed the washing on his rotary dryer, he mused that there must be a better way of drying clothes naturally outdoors.

As a business consultant, Steve knew the commercial potential of a device that could protect clothes drying outdoors from the elements. He also saw the environmental benefits of a reliable, effective, zero-energy alternative to the tumble dryer. He soon realised his idea could prevent ill health too, as warm moisture that results from drying fabrics indoors is a breeding ground for spores and mould.

Steve envisaged an enclosure that protects clothes from the weather and allows garden breezes to enter and circulate through adjustable vents. "I experimented with a number of prototypes but I wasn't confident in the design," he says. "It was clear a more robust structure was needed to dry clothes very quickly without the rain getting in."

THE SOLUTION

Steve and our Innovation Manager Dave Dawson agreed that the project's pinch point was the amount of time and effort required to develop handmade prototypes for the testing process. "We needed to digitise what Steve and his daughter and business partner Kerry Wainman had done so far, building a CAD model so that computational fluid dynamics (CFD) could be used to look at different airflow options to test new iterations quickly and efficiently," says Dave.

To take the project forward, Dave brought in University of Hull Professor Philip Rubini, who has been using CFD to solve engineering problems for three decades. Professor Rubini is always keen to get his students and researchers involved in real-world challenges. Under his guidance, Postdoctoral Researcher Esther Quaintmere got to work on the Dri-Dome project.

Esther ran CFD simulations – including airflow path analysis – to vary and test key design features and dimensions of the enclosure under different weather conditions, using baffle plates in the drying chamber to represent different wash load contents.

Her analysis of the results drew out conclusions addressing a range of design optimisations, from the position of the wind vanes to the shape of the drying chamber. Within a month the research had informed a fifth dryer design with optimal shape, size and internal configuration.

THE RESULT

The project's results went beyond what Steve had anticipated. Not only did the research identify a validated optimal design, enabling a jump from fourth to fifth – and final – iteration very quickly, but in reducing the number of input flues to produce a stronger flow of air, the proposed design makes the dryer lighter and cheaper to produce too.

"Esther managed the agile design approach of the project very well," says Steve. "Each time [Esther ran a new simulation] there were surprises in the agile cycle which took us down different design routes to the ones I think I would have followed on my own. We are now much closer to commercialisation."

Steve is considering funding options for the next stage of development – building a prototype dryer – and will also investigate manufacturers and environmentally friendly materials. For he is determined that production of his dryer will be as low-carbon as possible, as well as helping to reduce the 1.6m tonnes of CO2 emitted annually by the UK's 10 million tumble dryers*.

* Based on the UK's estimated 10 million machines (www.whiteknightdryers.com/eco-frendly-dryers/) emitting annual CO2 as per figures from www.carbonfootprint.com/energyconsumption.html

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