



Using simulation to optimise the design of water filtration systems

STFC Hartree[®] Centre worked with Evove as part of the ERDF funded CW4.0 programme using computational modelling to develop membrane filters with transformational performance in water filtration and the processing of other liquids.

Challenge

During liquid filtration processes like water purification and desalination, polymer and ceramic membranes are commonly used as a filtration and separation barrier. Conventional filtration membranes have random microstructures and pore sizes, resulting in rapid dirtying and polluting and sub optimal filtration. This causes significant inefficiency, over engineering and unnecessary energy cost. Evove, a graphene innovation application company, want to re-design filtration membranes to address these fundamental challenges. Their work aims to significantly reduce power usage, costs and the environmental impact of water treatment processes.

Approach

Software Engineers at the Hartree Centre worked with Evove using their expertise in computational fluid dynamics (CFD) to explore how CFD help accelerate the design process of the Evove Separonics[®]- their new semi-permeable membranes. CFD transformed membrane design by allowing the team to trial new geometries using computer simulation, removing the need to physically build and test all potential membrane design candidates in the lab. The ability to generate detailed simulations of how fluids pass through new membrane structures offered insight into the potential design optimisations that could be adopted by Evove. This approach showed that CFD and simulation can be used to accelerate the design process for the Separonic[®] membranes, reducing reliance on expensive and time consuming prototype testing.

Benefits

Using the power of simulation to model and test highly detailed membranes helped Evove to explore their membrane designs virtually, reducing costs associated with physical prototyping. By accelerating the design process, Evove's customers can rapidly implement more effective membrane filters, which increasing efficiency and reducing power wastage, ultimately helping to meet climate change targets. The collaboration between Evove and the Hartree Centre will continue, using CFD modelling to explore how the design of Separonic membranes can be further optimised as they are deployed globally in the transition to a net zero economy.

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Lab testing has shown these designs have a strong correlation with the Hartree Centre models, which has provided confidence in Evove's understanding of optimising a new generation of membrane technologies for industry.”

Tristan Phillips
VP of Engineering at
Evove





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Continuing our relationship with the Hartree Centre and leveraging the expertise and high performance computing, we will design highly precise filtration membranes that enable resource circularity and significantly cut the carbon emissions of key economic sectors. ”

Tristan Phillips

VP of Engineering at Evove

At a glance

- Proof of concept exploring the application of high performance computing to modelling fluid dynamics
- Offers the potential for a reduction in research and development timelines and costs
- Optimising water treatment processes and helping utility companies reduce large regulatory fines.
- Optimising the water processing treatment process can reduce power wastage and help reach climate change targets

Who we are

- 70+ computational scientists and technologists
- World-leading supercomputing and AI infrastructure
- Bespoke small teams built around your project
- Tailored business development support
- Access to our network of industry, academic and technology partners

What we do

- Boost productivity and enhance innovation for industry
- Big data analytics and artificial intelligence (AI)
- High performance computing and quantum simulation
- Training and skills development
- Insights into future technologies



Credit: STFC Hartree Centre

Our impact on UK industry and society

The Hartree Centre was created by UK Government to help businesses and public sector organisations accelerate the adoption of high performance computing (HPC), big data analytics and artificial intelligence (AI) technologies. We play a key role in realising UK Government’s Industrial Strategy by stimulating applied digital research and innovation, creating value for the organisations we work with and generating economic and societal impact for the UK.

The Science and Technology Facilities Council (STFC) Hartree Centre is part of UK Research and Innovation.