



Ansys + VorTech Water Solutions

“The Ansys Startup Program has given us access to the range of tools needed for comprehensive computational fluid dynamics and finite element analysis. By running simulations on the cloud, we can unlock the potential to learn new things quickly about the performance of our products for different applications. The resulting insights gained ahead of construction or installation of our wastewater management solutions are massively valuable to us as a startup and our customers across the industry.”

— **Sean Mulligan**

Chief Executive Officer / VorTech Water Solutions

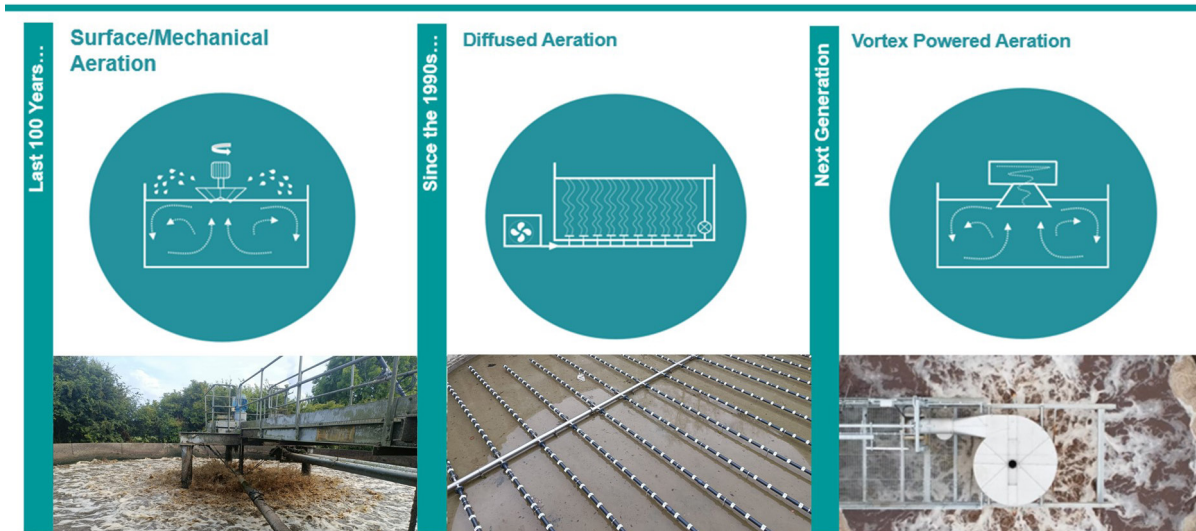
VorTech Uses Simulation to Scale Back Energy Consumption During Wastewater Treatment Aeration by up to 50%

According to the United Nations Environment Programme (UNEP), wastewater is a growing health and environmental threat. Yet with the right infrastructure in place, it has the potential to become a significant source of reusable water and alternative energy.¹ VorTech Water Solutions, an energy-efficient water and wastewater solutions specialist, has developed a groundbreaking platform of water treatment technologies based on vortex and cyclonic flows to solve water and wastewater challenges. The company envisions the global deployment of its products — including its advanced Vortex Power Aeration (VPA) technology — to enhance the sustainability and resilience of water and wastewater treatment infrastructure for future generations.

Challenges

Today approximately 80% of all industrial and municipal wastewater worldwide is released back into the environment without being treated or reused.² Additionally, 20% of the world's population doesn't have enough water to sustain its needs.² As populations and production continue to rise, the wastewater industry faces some immense challenges for the foreseeable future. One of the biggest challenges is connecting humanity to clean, potable water sources. All must be managed within the context of rapidly aging infrastructure and increasingly stringent treatment regulations designed to protect public health and the environment. Furthermore, global water use, treatment, storage, and distribution contribute to 10% of global greenhouse gas emissions,³ incentivizing the need for more sustainable industry solutions.

Classes of Aeration Technology



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Figure 1: A visual comparison of the traditional aeration technologies and the new Vortex Powered Aeration technology.

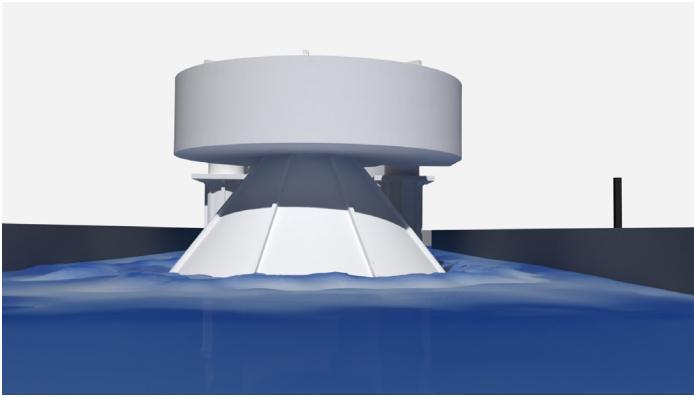


Figure 2. Surface flow around a VPA unit, as simulated in Ansys 2022-R1

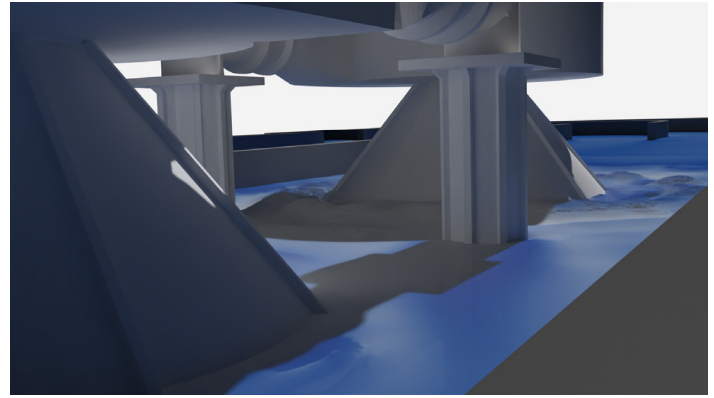


Figure 3. Surface flow simulated around multiple VPA units installed in oxidation ditches. Simulations conducted in Ansys 2022 R1.

/ Technology Used

- Ansys Fluent
- Ansys Mechanical

/ Engineering Solution

Thanks to the Ansys Startup Program and CADFEM UKI, an Ansys Elite Channel Partner, VorTech now has full access to multiphysics software coupled with high-performance computing (HPC) for comprehensive analysis of its water treatment technologies. CADFEM UKI coordinated access to Ansys licenses and on-demand HPC resources via CADFEM portal linked to AWS. This enabled VorTech to quickly adopt numerical methods for its processes and scale up simulations as required, specifically:

- VorTech used Ansys Fluent fluid simulation software for CFD analysis to understand the hydraulics taking place inside its VPA technology, then optimize and demonstrate mixing efficiency during wastewater treatment.
- Fluent-enabled CFD analysis was then coupled with FEA for fluid-structure interaction (FSI) analysis using Ansys Mechanical simulation software, which has become foundational to VorTech's structural design and technology development process.

/ Benefits

- Access to Ansys solvers at an affordable price point via the Ansys Startup Program enabled VorTech to design and develop an advanced aeration solution that is extremely simple, reliable, and efficient for a variety of wastewater treatment applications.
- Using Fluent and Mechanical enabled CFD/FEA-coupled analysis that resulted in a hydraulic vortex-based VPA technology with a single moving component for ease of maintenance. The design also enabled same-day retrofits for existing infrastructure without downtime for the treatment plant required.
- Simulation facilitated VPA structural design optimization around built-in smart technology and control systems that can adapt to exact aeration requirements at any given moment in time, reducing energy consumption anywhere between 30-50% during aeration.
- From structural analysis of entire designs to virtual component-based simulation and testing, simulation has enabled VorTech engineers to scale back a several-cycle development approach to turn around a new, fully optimized unit in a single cycle, saving both time and costs.



Figure 4. A VPA unit operating in an oxidation ditch

- Quick access to compute requirements on the cloud is a scalable advantage in a startup environment prone to sudden growth spurts and stretches toward bigger offices, more equipment, and more personnel, with no real business impacts attributable to disconnection or downtime offline.
- Virtual piloting of new wastewater technology in a simulation environment for site-specific conditions has increased confidence within a risk-averse industry during the decision-making process, helping VorTech grow its business on a global scale.

/ Company Description

Founded in 2019, VorTech Water Solutions addresses the world's water and wastewater challenges by developing and delivering innovative, cost-effective solutions that make a real difference toward improving the sustainability of the industry. The company's core products include sustainable aeration, mixing, and hydropower solutions for municipal, industrial, and aquaculture applications.

VorTech Water Solutions



CADFEM UK and Ireland is an Ansys Elite Channel Partner, empowering digital engineering by providing a complete range of engineering simulation solutions for our customers, including training, mentoring, consultancy and technology transfer services. We help our customers implement their product development digitalization journey, from specific workflow automations to digital twin deployment. As an Amazon channel partner, we also provide tailored AWS cloud computing solutions to enable engineers with easy access to and efficient scalability of their simulation computing resources.

CADFEM – World of Simulation



Sources:

1. *Down the Drain Lies a Promising Climate and Natural Solution — UN Report*, unep.org, August 23, 2023.
2. *ISO Sustainable Development Goals, Goal 6: Clean Water and Sanitation, Ensure Availability and Sustainable Management of Water and Sanitation for All*, iso.org, March 15, 2023.
3. *Greenhouse Gas Emissions in the Water Sector: Let's Uncover the Basics*, waterrf.org, February 16, 2023.

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When visionary companies need to know how their world-changing ideas will perform, they close the gap between design and reality with Ansys simulation. For more than 50 years, Ansys software has enabled innovators across industries to push boundaries by using the predictive power of simulation. From sustainable transportation to advanced semiconductors, from satellite systems to life-saving medical devices, the next great leaps in human advancement will be powered by Ansys.

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