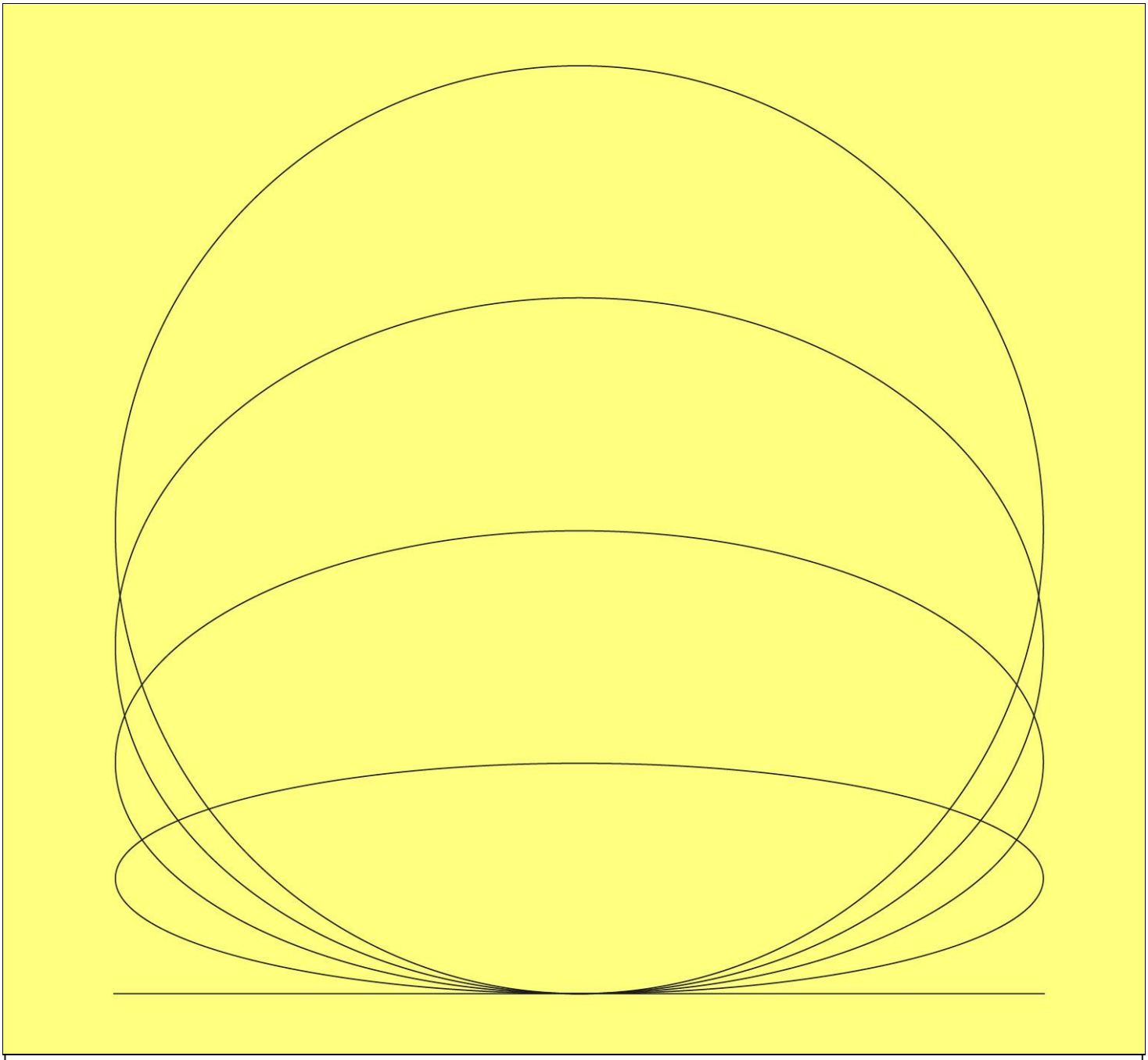

H2UpClose #6: Pankl

Inside the Minds Driving Hydrogen Innovation

Version: 1.0
YYYY–MM–DD
HORIZON-JTI-CLEANH2-2024-03-02

H2UpScale

Clean Hydrogen Partnership

Co-funded by the European Union

H2UpClose #6: Pankl

H2UpScale Project is happy to present the H2UpClose interviews' cycle.
Below the fifth interview with Pankl.

What is Pankl's main focus?

We at Pankl Turbosystems focus on enabling high performance, efficient, tailormade and scalable fuel cell air supply system. We are committed to industrializing compression technology for fuel cell applications that can operate reliably at scale and cost level required for European and worldwide emerging hydrogen infrastructure.

Why does this problem matter now and not in 5 years?

A rapid and large-scale shift toward decarbonization is essential, and hydrogen technologies –especially fuel cell systems – can play a decisive role in enabling this transition. The challenge is that these technologies will only make a meaningful impact if they can be industrialized and scaled now, rather than years from now. Hydrogen production capacity and infrastructure investments are accelerating across Europe. The market is moving now. Europe is entering a critical window in which infrastructure, supply chains and investment decisions are being established. Without mature, scalable Balance of Plant (BoP) components the hydrogen value chain cannot grow at the pace required. It is essential to start now to meet regulatory and economic requirements, strengthen technological leadership and build resilient supply chains.

What is your role and what are your goals in the project?

The Role of Pankl in H2UpScale is the development of the BoP compressor system, a high performance and efficient compressor system that achieves improvements in system integration, weight and packaging. We aim to develop a concept design featuring a high performance electric motor with a dedicated stator topology that minimizes overall length while achieving the required performance targets. The integration of compressor health monitoring into the fuel cell control system will enable longer service intervals for different types of applications. We support the consortium with engineering services and ensure that the BoP Development within the consortium meet real industrial requirements in terms of performance, manufacturability and lifecycle cost.

In your expectation, what added value does your activity bring?

Our contribution delivers clear innovation beyond the current state of the art in air supply for fuel cell systems, where today's technologies are typically limited to 150–200 kW stacks, face accelerated wear during start-stop cycles, and struggle to combine higher pressure ratios, increased airflow, and improved gravimetric density with long service life.
Within H2UpScale, we address these constraints through three key value-adding elements:
1. Efficiency enhancement of the fuel cell system
By developing a next generation electric compressor optimized for higher flow rates and improved pressure ratio, we enable a measurable increase in overall fuel cell performance.
2. Collaborative performance and health-monitoring development
Together with our development partners, we are implementing advanced performance diagnostics and health monitoring methodologies. These tools allow us to predict degradation, reduce wear effects from dynamic load cycles, and significantly extend the compressor's operational lifetime, addressing one of the fundamental weaknesses of current air bearing compressor technology.
3. Seamless integration as a Balance-of-Plant (BoP) component
We focus on the holistic integration of the compressor into the air path and the total fuel cell system to ensure optimized interaction with stack, control strategies, and thermal management. This system-oriented approach ensures that the compressor not only performs well as a standalone component but becomes an enabler for high scalability, improved durability, and cost-effective BoP architecture.

What trade-off did you optimize (performance, cost, reliability, safety) and how?

We optimized several critical trade-offs to balance performance, reliability, and system integration. For the air bearings, we had to find the optimal compromise between load capacity, rotational speed, and thermal stability to ensure long lifetime under dynamic fuel cell operating conditions. The electric machine required careful balancing of power density and installation space, avoiding unnecessary increases in length or diameter that would negatively impact rotor dynamics. At the same time, the aerodynamic design of compressor and turbine stages was optimized to achieve high performance and efficiency without compromising operational stability and while adhering to the specifications of the individual components of the compressor system. Finally, the rotor dynamic layout was tuned to keep critical speeds outside the operating range while minimizing vibration. Together, these optimizations result in a robust, high performance compressor system suited for fuel cell applications.

What is the next big milestone you're trying to hit?

Our next major milestone is the completion of the validated compressor system, including performance testing, aerodynamic optimization, mechanical and electrical integrity assessment, and integration readiness into overall H2UpScale setup for system level testing. This performance verification under real operating conditions is crucial to demonstrate technological readiness and to prepare the transition from development to industrialisation. Building on this milestone, the development will also enable us to derive a product strategy based on a robust, scalable and modular platform, ensuring that future variants can be adapted efficiently to different power classes, applications and market needs.

For more information, feel free to reach out!

Pankl Turbosystems GmbH
A member of the Pankl Group
Rudolf-Diesel-Straße 24
68169 Mannheim, Germany

E-mail: info-turbosystems@pankl.com
LinkedIn: linkedin.com/company/panklturbosystems
Website: www.pankl-turbosystems.com

Acknowledgement
The project is supported by the Clean Hydrogen Partnership and its members.