

#### Wavepiston Newsletter October'22

### Important milestone for Wavepiston – accelerated testing has started.

In October Wavepiston has started the accelerated tests at the testing facility at DTU, the Technical University of Denmark. It is a part of VALID project, which aims to develop hybrid testing platform for ocean energy technology in a cooperation with other wave energy developers. VALID will develop one open and integrated platform for testing of critical components and subsystems, including novel test procedures beyond current testing practices based on hybrid testing methods, combining virtual and physical tests rigs. The accelerated test means that we can speed up the number of iterations of the system and shorten the necessary testing time prior to an offshore installation which reduces the risk of failure.

#### What are we testing?

The Wavepiston PTO system is based on hydraulic pumps sending raw, pressurized

seawater to a land-based turbine. The seals of these pumps are highly loaded due to both the aggressive environment and the fact that the rams operate at approximately 60 bars. Understanding and reducing wear on these seals is key to Wavepiston's success.

Our team has created the first version of a numerical model that simulates the movement and pressure variations in the hydraulic pumps. We have also designed a physical platform for testing hydraulic pumps at realistic speeds and pressures. The platform will feed performance data into the numerical model, including pressure, leak volume and friction. It will significantly shorten time-to-market while also applying more rigorous demands on performance and reliability, ultimately creating a better product in less time and for less money.





Development Engineer Troels V. Lukassen together with DTU Research Technician Troels V. Kristensen and Research Assistant Mahdi Tayyebati

#### What has been the biggest lesson so far?

Actually, I am very positively surprised how smoothly the system runs - points out Martin von Bülow, Chief Specialist at Wavepiston. - When starting such a new venture, you never fully know what to expect. So far, we haven't had any major issues, which tells us that we designed the system in the right way.

Of course, it is a constant development and learning process. - adds Troels V. Lukassen, Development Engineer at Wavepiston. - We are trying to use this time as best as possible to understand the challenges of the system, its limits and parameters for the most effective operations. We are adjusting minor aspects of the device and constantly improving the installation.

One of the experiments tests the percentage of leakage that can happen over time and with different parameters. The Wavepiston device don't use oil on the seals. For that reason, any leakage will simply mean saltwater getting into saltwater.

The test that we are running is crucial for developing the Wavepiston's technology. -

says Martin von Bülow - There are so many variables to the installation. If we observe and test them in a controlled environment, we will be much better prepared for putting our installation in the ocean with more unpredictable factors. During the test period, we will evaluate all elements of the device and find out when and under which conditions it works the best. It will make our technology much more effective and easier to operate in the future.

The video showing the device during the test is available on our You Tube channel: https://youtu.be/9h7vjq-m6lc

VALID (Verification through Accelerated Testing Leading to Improved Wave Energy Design) aims at creating a hybrid testing facility that encompasses several wave energy technologies as test cases, with the final goal of delivering a novel test rig configuration methodology for accelerating wave energy technological development.





## Discussing the future of the wave energy over coffee with Danish parliament members.

In August we had the pleasure to host a special visit at the Wavepiston office. The members of the Danish parliament, the Socialdemocrats Anne Paulin, spokesperson on climate, energy and utilities, together with Henrik Møller, spokesperson on labour market, met with us to discuss the future of the green energy transition.

The team of Wavepiston gave the parliament members an update on the development of the company and together with Kim Nielsen, the chairman of the Partnership for Wave Power, we presented the status of the wave energy sector.

We discussed climate and energy goals and agreed that wave energy can be an important complement to other energy sources and help boost the green transition.



Anne Paulin and Henrik Møller in the Wavepiston office.

Undoubtedly, the energy from waves offers a vast potential, especially in the context of energy islands in construction in the North Sea. In the area already selected for the project, we could increase the capacity by 2 GW and ensure additional green electricity for up to 2 million households.

If we manage to utilize the immense potential of the energy produced from waves, it can provide a good solution for the ongoing energy crisis. Wave energy is a predictable, stable source that is available at most times throughout the day and night. It can work complementary with the other renewable energy sources, stabilizing the electricity production from solar and wind.

We are very glad to have shared these thoughts with Anne Pauline and Henrik Møller. We look forward collaborating with them as well as all the other members of the Danish parliament to tackle the energy and climate crisis together.



Henrik Møller, Anne Paulin, Kim Nielsen and Michael Henriksen



The Danish ambassador in Sweden, Kristina Miskowiak Beckvard, together with the Green Entrepreneurship Panel and participants.

#### Grønt Iværksætterpanel - All hands aboard for impact entrepreneurship

Wavepiston, together with other fellow impact startups and companies, is on the journey to reach a net zero carbon society. This journey will be challenging and sometimes bumpy, but certainly worth all the possible efforts. As we are just marking the trail for green and impact entrepreneurship in Denmark, there is no tested roadmap to follow yet. For that reason, we love every occasion to get inspired by our experienced neighbour country!

Michael Henriksen, the CEO of Wavepiston, was invited to a trip to Stockholm organized by Grønt Iværksætterpanel, Green Entrepreneurship Panel. The 3 days trip took place in September. The purpose was to learn more about the Swedish impact ecosystem and to network with the other actors in the Danish startup scene participating in the study expedition. It was a source of great inspiration that can help us to get the impact rolling in our home country!

The Green Entrepreneur Panel was created to support impact makers and give recommendations on supporting green entrepreneurship to the Danish politicians. The Panel wrote down 4 packages of recommendations, that have been passed to the government.



David Frykman from Norrsken VC, highlighting the large need for impact financing.

What do we need to improve conditions for green entrepreneurs? When it comes to public purchases, it is recommended that one percent of public procurement should be reserved for innovative green entrepreneurs. Besides that, public entities should have the right to choose sustainable products and services over other bidders.

The Panel's recommendations give a lot of importance to the technology testing phase. It has been proposed that entrepreneurs should be subsidised by the government to support better testing. To ensure better technologies' development, the collaboration of startups with knowledge institutions should be strengthened. Better legal framework and public grants can help with knowledge sharing and employment opportunities. At Wavepiston, we strongly believe in the importance of the early technology testing phase. Demonstrating the technical solutions allows not only to validate technology on the early stage, but also to prevent potential failures and higher maintenance costs in the future.

Green transition is a learning process, and we strongly support initiatives that allow synergy and knowledge sharing. As much as we contribute to impact solutions, we have a lot to learn in green entrepreneurship and we are thankful for any opportunity that can inspire us!

More recommendations from the Green Entrepreneurship Panel are available here: https://erhvervsstyrelsen.dk/groentivaerksaetterpanels-anbefalinger-til-regeringen



## Updates from the Wavepiston's installation in Spain: Wet test commenced

After few months of testing and tuning the monitoring instrumentation in dry conditions, Wavepiston commenced a wet test period on the installation in Gran Canaria at Taliarte harbour. The test aims to examine how the instrumentation will perform in the salt water.

The instrumentation consists of the main pod at the top of each buoy (with the IoT solution and the core electronics) and two sets of instrumentation for measuring the two closest energy collectors. Each energy collector has a sail position sensor, a pressure sensor at the pump blocks and two cameras facing top and bottom, recording the movement of the machines. Creating this system was challenging because there is no other solution like that on the market that could simply be bought and installed. We needed to invent it from the scratch. It was challenging, but also very exciting work for us says Alberto Coello, Technical Coordinator of the Wavepiston's operation in Gran Canaria.

There are numerous reasons for developing and testing this solution. Pressure sensors, position sensors and cameras provide full information about the efficiency of the energy collector. It allows to match the video recordings of the pumps with the data from the pressure sensor to analyse how a given energy collector performs in different sea conditions. The system collects data for 20 minutes every 4 hours, giving a thorough knowledge of the operation.

The monitoring instrumentation helps us to evaluate the impact of the system on the environment. We can measure its acoustics, impact on fauna and flora and possible influence on species around the system. At the same time, we can evaluate the condition of the system's materials in the real-life conditions in the presence of marine growth or corrosion. This will give us crucial data to improve the design.

Another part of monitoring appliances provides data on the *health* of the system. Measuring GPS position on the buoys, tension of the shackles anchored to the seabed and the battery status provides information that allows to react quickly in case of any emergency or abnormalities. The data are collected and uploaded online every 10 minutes. At the same time, automatic text messages alarms are sent in case of any critical deviation around the clock.

The test will allow Wavepiston to create the most effective wave to energy and water production system and limit possible failures or shortcomings in the future to the bare minimum.

Personally, I feel fulfilled to see that the system we built from the ground up is working so fine. - adds Alberto Coello - We are still doing a lot of tests, working on better tuning and marine growth control measurements. Thanks to our technical partners and support from the grant from ICEX Invest in Spain, we are constantly *improving the technology to perform in a full* swing. I am looking forward to see it working at a full-scale installation in the future.





Wet testing of the instrumentation in the Port of Taliarte





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## Updates from the Wavepiston installation in Spain: The power module at PLOCAN connected and tested

It works and we have solid proof for that. - says Alberto Coello, Technical Coordinator of the Wavepiston's operation in Gran Canaria. The power module of the Wave to Energy and Water installation in Spain has been connected to the grid in an on-and-off test to check the operation of the device.

That's another step to ascertain the readiness of our system. - adds Alberto Coello. - Of course, there are still elements that we want to improve in the operation, such as configuring the most effective internet connection and communication protocol between two grids. We will be working and improving those and other aspects in the coming months. Connecting and testing the power module in the installation in Gran Canaria is a part of Wavepiston overall strategy to examine the best solutions of the wave to energy and water technology and to prove the readiness of the devices. The early tests period helps us to make sure that we develop the most effective technology for the future and at the same time, it limits any possible failures or surprises.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 831041

### Wavepiston among Nordic Top 50 Companies 2022

Wavepiston was selected to be a part of the Nordic Top 50 Companies in 2022. The group gathers impact startups from the Nordic and Baltic region, assessing them with the criteria of the commercial viability and the impact scalability of their business. Wavepiston was appreciated for the technology solution designed to be in line with the UN Sustainable Development Goals.

The transition to hundred percent renewable energy is necessary to mitigate climate change. We need much more energy than solar and wind can provide. - says Richard Georg Engström, Founder and Executive Director at The One Initiative - Wave energy is a vast, unexploited resource, that also can add variations in electrical grids with a high degree of renewables, and thereby reduce the amount of energy storage needed to balance electricity supply and demand. Hence, Wavepiston was a natural choice as one of the 50 promising Nordic impact startups in 2022.

#### Nordic Top 50 Impact Companies 2022

50 Promising Nordic Impact Startups & International Impact Investors



The Nordic Top 50 Impact Companies 2022 and Richard Georg Engström, Founder and Executive Director at The One Initiative

During the 2 days of the summit, the selected companies were coached with the Impact Business Modelling System and networked with national and global investors interested in provided solutions.

We are very proud to be selected for the Nordic Top 50 Companies 2022 – says Michael Henriksen, CEO of Wavepiston. - Not only were we appreciated for the impact that we strive to create, but we also became a part of the broader community of impact-oriented startups. Nordic Top 50 Companies is a project run by The One Initiative. Since 2017, they have studied more than 7,000 startups in the Nordic and Baltic region, assessing their commercial viability combined with the impact scalability. Using this assessment, each year The One Initiative presents the 50 most promising Nordic and Baltic impact startups.

Thank you, The One Initiative, for this selection and congratulations to all chosen startups!





#### Wavepiston presenting at the ICOE-OEE 2022 – ocean energy conference in San Sebastian

Wavepiston had the great pleasure to present the status, learnings and roadmap from our Wave to Energy & Water project during the ICOE-OEE 2022 conference that took place in October in San Sebastian. Michael Henriksen, CEO at Wavepiston, took part in the session called Tech Showcase – The rise of Wave Energy. It was a very inspiring assembly, that we shared with other ocean energy companies, presenting their technologies and development status. We enjoy every occasion to share our roadmap and get inspired with stories from fellow companies.

ICOE-OEE 2022 in San Sebastian brings together hundreds of people from all across the sector to discuss the future and share ideas on renewable ocean energy. We are glad to observe that ocean energy gains more attention and companies, like Wavepiston, are invited to share their solutions on stage. Now, more than ever, in the need of decarbonization and fossil fuel independence, we need to focus on long-term solutions. We should not forget that innovations and new technologies such as Ocean Energy can provide great benefits for baseload power generation. said Rémi Gruet, CEO of Ocean Energy Europe during the opening session of ICOE-OEE 2022. These words are especially timely in the face of the revised EU target for renewable energy: 45% by 2030.

In the light of the event, Michael Henriksen made an official declaration that the fullscale system will be in operation by the second quarter of 2023.

Top: CTO Steen G. Thomsen and CEO Michael Henriksen at the ICOE-OEE 2022 conference. Bottom: CEO Michael Henriksen presenting at the ICOE-OEE 2022 conference.



# Update on our capital raise

At the point in time, we are working intensively towards finalising the capital raise, and we are in dialogue with potential new investors. We are planning to top the EUR 600k that has been already lifted with a few promising direct investors. Subsequently, we intend to run the equity crowdfunding campaign as a part of the capital raise process. Its timing will be decided upon conclusion of the conducted talks. Feel free to share this opportunity with other potential investors to become a part of our journey.

More details can be found on the front page of www.wavepiston.dk.

