NEWSLETTER II

Welcome to Surewave's second newsletter!

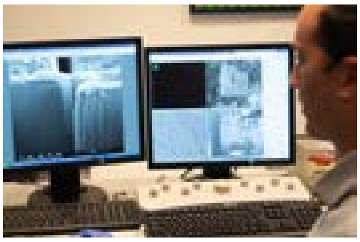
Our oceans have always been a source of wonder and potential.
Through this project, we're tapping into that potential in a fresh, sustainable way.
As we continue our work, we look forward to updating you on our progress and breakthroughs!

SUREWAVE aims to solve the main challenges of offshore FPV by developing a solution adapted to the most critical sea states, being able to mitigate the harsh conditions for the FPV.

The primary goal is to create and test a new and concept for a Floating Solar Power system. This system includes a special floating barrier made of strong circular materials that shields the solar panels from powerful waves. The solar panels can work better and produce more energy, imroving the operational availability of the system.

Our project is represented by seven companies, with professionals from four different countries:

SINTEF, Sunlit Sea, CEIT, MARIN, Acciona Construcción, S.A. Clement Germany GmbH and IFEU



Introducing our project partner - MARIN: 'Bridging the Gap Between Design and Operation'.

Our research will transition deeper into the simulation stage in the upcoming months. This work involves scaled model tests replicating natural conditions, providing invaluable insights into how our technology solution will perform in real-world scenarios. These trials demand state-of-the-art facilities, specialized tools, and expertise in hydrodynamics and nautical engineering- an expertise that resides with our esteemed partner, MARIN.

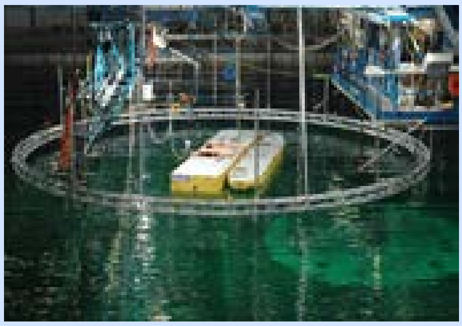


Photo: MARIN

The story of MARIN traces back to 1873 when Dr. Bruno Johannes Tideman, a visionary chief engineer of the Royal Navy and trusted advisor to the shipbuilding industry, embarked on a pioneering journey. He conducted the inaugural ship model tests in the Netherlands, unravelling the secrets of a vessel's resistance and the power its engines required.

Fast forward to 1932, and the 'Netherlands Ship Model Basin' was born, fueled by the same unyielding spirit. Today, it stands as MARIN, a globally renowned independent entity headquartered in Wageningen, boasting a team of over 400 specialists.

Now, MARIN faces contemporary challenges with a fresh perspective. Their experience in hydrodynamics and nautical research contributes to enhancing the sustainability, safety, and intelligence of the Surewave solution.

MARIN offers services encompassing simulators, software, numerical facilities, measurements, advisory tools, and a complete suite of model testing facilities for applied research on ships and offshore floating structures. This distinctive service portfolio empowers them to provide dependable predictions and recommendations for verifying product designs.

From MARIN's specialized perspective, can you elucidate the project's specific challenges regarding the breakwater and Floating Photovoltaic (FPV) structures?

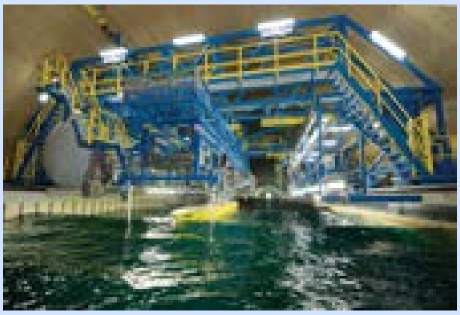


Photo: MARIN

MARIN sees in FPV a market that's rapidly catching up, with many SMEs that have successfully demonstrated pilots in sheltered or inland waters and are now targeting offshore environments. A central challenge for FPV providers is to design a lightweight and competitive structure in production and maintenance. In SUREWAVE, this is resolved by creating a sheltered environment with a floating breakwater ring. It is anticipated that the ring will be mainly effective in reducing short wind waves, which are expected to govern the loads on the FPV module interconnectors.

How does MARIN's expertise in hydrodynamics and nautical research play a pivotal role in ensuring the success of the Surewave project?

The hydrodynamic performance of the integrated breakwater and FPV system is assessed by MARIN through a combination of numerical simulations and physical wave basin testing. MARIN's in-house numerical codes allow to simulate the motions of several hundreds of interconnected modules and to calculate hinge and mooring forces because of wave, wind and current loading. The wave basin tests, scheduled for November this year, are performed as an independent method for design verification and to generate key data for validation of the numerical methods. At the end of the SUREWAVE project, another basin test campaign is foreseen to verify and demonstrate the performance of the final design.

As we eagerly anticipate our visit to MARIN in the Netherlands this November, we look forward to immersing ourselves in their innovative approach and gaining firsthand insights into the intriguing progress on related deliverables. This hands-on experience promises to deepen our collaboration and further propel the success of the Surewave project. More to follow!

zenodo

Our Surewave consortium has committed to complying with the Horizon Europe Open Science requirements, which mandate making scientific and underlying data accessible to the public. To enable knowledge transfer, we adhere to the FAIR information principles: Findable, Accessible, Interoperable, and Reusable.

Zenodo is an open-access data repository widely used in the field of Open Science, and it is available to the public free of charge. Please visit Zenodo to access our public deliverables and datasets. All scientific publications and underlying data sets will be uploaded to the SUREWAVE community on Zenodo. Scan the QR code or type 'Surewave' to access our online community.

Breaking Down Breakwaters: A Simple Overview

As part of recent work, we have dived deep into understanding the efficacy of floating breakwaters and their role in wave transmission. Floating breakwaters are structures designed to dampen the force and energy of waves. We've turned to advanced computer simulations (Computational Fluid Dynamics or CFD) to predict and understand how our breakwaters will perform in the real world. We've also looked at existing research to guide our designs. We're continuously tweaking our breakwater's design, ensuring it's just right. We're keen on finding that sweet spot that offers maximum protection to the floating solar panels while still being cost-effective. Here's a summary of our findings:

1. Fundamentals of Floating Breakwaters:

- Types & Structure: We studied different types and cross-sections of breakwaters, which determine their efficiency in mitigating waves.
- Simulation and Analysis: We analysed complex wave and structural interactions using the software FLOW-3D Hydro, a robust CFD tool. The software catered to our need for a detailed examination of floating structure dynamics and hydrodynamic loading.

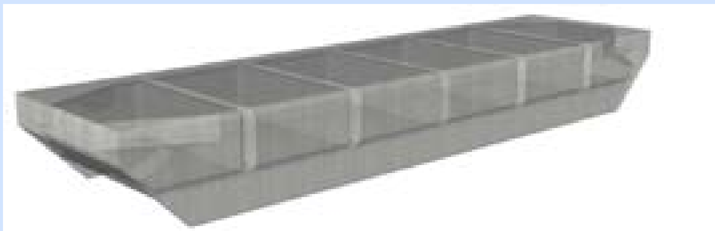


Figure- Rendering of floating breakwater

2. Theoretical Approaches vs. Simulations:

Existing Approaches: Many theories and formulas, such as those by Macagno, Wiegel, and Cox, have been proposed over the years to predict the efficiency of floating breakwaters. Each comes with its assumptions, strengths, and limitations.

- Not all scientists agree on one way to measure how breakwaters work. So, we looked at many methods and found that they might differ in specifics but generally show similar outcomes.
- Numerical Simulations: Using FLOW-3D Hydro, we went beyond the traditional methods to analyse the performance of various floating breakwater designs. These simulations help us understand real-world dynamics better than some older theoretical models.

3. Key Takeaways:

- Diverse Approaches: No single universally applicable method exists for calculating wave transmission of floating breakwaters. This fact emphasises the importance of context in selecting an appropriate approach.
- Efficiency Variances: While all breakwater cross-sections demonstrate some efficiency in dampening waves, specific designs prove more effective. However, practical concerns like production and transportation come into play when evaluating their feasibility.
- Best Formulations: Among the many methods, the one by a researcher named Fousert was the most detailed. But another method by Macagno (with some tweaks from Ruol, Martinelli, and Pezzutto) was also effective for particular frequency ranges.
- Wave Patterns: Breakwaters mostly follow the motion of larger waves. However, for smaller waves lasting 1 to 3 seconds, the breakwaters reduce their height by at least 40%.

What's Next?
For our upcoming work, we're considering a few essential points:

- Handling Big Waves: Larger waves can produce immense pressures. A circular design for the breakwater could help manage this better because it makes waves hit at different times rather than all at once.
- Materials & Design: We've used some new materials in our models. As more results come in, we'll need to recheck our models.
- Connecting the Dots: The way breakwater pieces are combined is crucial. We need to ensure these connections can handle the forces when waves hit.

Conclusion:
Understanding floating breakwaters is not just about knowing the science but also about appreciating the real-world constraints and applications. The balance between theory and practice, feasibility and efficiency, is crucial. As we refine our methods and approaches, stay tuned for more updates on how these insights might shape future coastal and marine projects!

Stay informed, stay ahead!

From the European Council of the European Union: Key Takeaways on Climate Neutrality

In alignment with the EU's 2019 commitment to become climate-neutral by 2050 and building upon the pledges made during the 2015 Paris Agreement, the European Council of the European Union has shed light on some significant strides and objectives related to climate neutrality. Here are five key insights from their latest report.

First in Line: The EU will become the first continent to achieve a net-zero emission balance.
Budgeting for the Future: A significant 30% of the EU's overall budget for 2021-2027 is earmarked for addressing climate change and its consequences.
Nature's Aid: EU forests are champions of carbon absorption, soaking up the equivalent of nearly 10% of all greenhouse gas emissions annually.
The Power of Energy: Energy production and consumption currently account for 75% of EU greenhouse gas emissions. This energy is intertwined with our daily lives, influencing everything from household items to travel and manufacturing processes.
Supporting the Transition: The EU has unveiled the 'Just Transition Mechanism' to back regions requiring additional investment to meet these green objectives. This mechanism will channel over **€100 billion** towards supporting the shift to climate neutrality by 2050.

Content sourced from the European Council of the European Union. Read the full article here.

Join the Wave of the Future!

As the Surewave Project propels forward, we recognize the invaluable insights industry experts can bring.
Join our Stakeholder Advisory Board, play a pivotal role in offshore breakwater and floating solar technology, and make waves in this dynamic field.

Through just a few digital meetings, your feedback will help shape our innovations, enhancing our global impact. While participation is voluntary, the experience and insights gained promise a progressive journey.

What's next?

- In November, the group will travel to Wageningen, Netherlands, for its six-month physical meeting- hosted by MARIN.
- The submission of Deliverable 3.4- Summary of Global System Design- is due M16. This is a holistic design documentation for the full FPV solution, based on metocean conditions and the whole system design.
- As part of work package 4, the consortium will continually refine and enhance the circular material solutions for the offshore floating PV breakwater, ensuring they meet the project's structural integrity, durability, and performance objectives in challenging environmental conditions.
- In WP5, partners will initialize research involving concrete materials properties modelling, coupled aero-hydrodynamic analysis and design optimization, structural integrity assessment, and development of a Structural Health Management System. The system will eventually materialize as an easy-to-use APP that evaluates the structural integrity and reliability of the PV solution in service.
- Mechanical testing and material composition evaluation of the hinge connections between the PV floats will be conducted by SINTEF.

Stay tuned for further updates on this innovative project as we continue to revolutionize the future of renewable energy through offshore FPV systems.

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