MarinLab

Introduction

MarinLab is a hydrodynamic research facility inaugurated in 2016 and located at HVL campus in Bergen. The facility shown in Figure 1 features a 2.2x3 meter section tank of 50 metre length. The tank is fitted with an Edinburgh Designs towing carriage and 6 force-feedback flap-type wave paddles. The purpose of the facility is to serve the research community and can be used for model scale testing of ships, offshore structures, floating platforms and mooring systems, marine energy devices, underwater and autonomous vehicles, and hydrodynamic interactions.

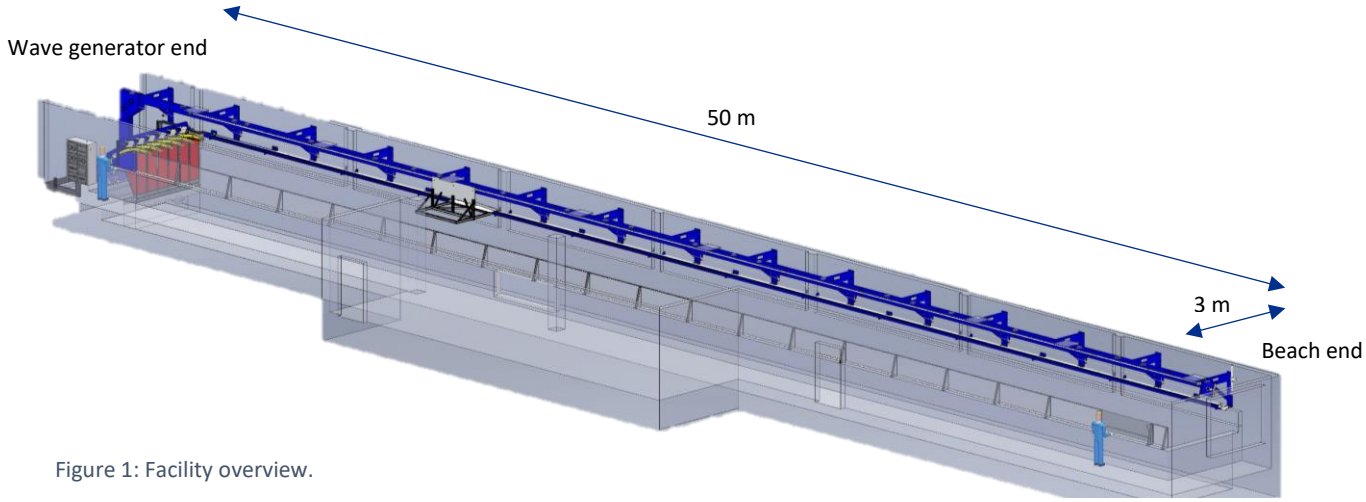

Figure 1: Facility overview.

Wavemaker details

The six hinged wave paddles shown in Figure 2 can generate a maximum wave height of 0.5m at wave periods close to 2 seconds. Directional spreading of ±90° for wave periods above 0.8 seconds is possible, as seen in Figure 4. The paddles are force-feedback controlled, allowing for dampening of unwanted tank wall reflections. Figure 3 gives an overview of the range of regular wave conditions that can be generated. Irregular waves can also be made, with JONSWAP, Bretschneider, Pierson-Moskowitz spectra all feasible. Design breaking waves can be created through wave focussing, with a minimum repeat period of approximately 20 seconds.

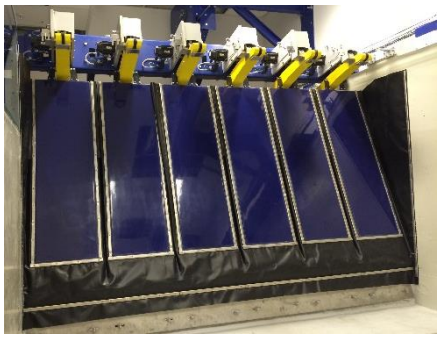

Figure 2: Wavemaker with 0.5m wide flaps.

Many wave types can be generated through the wave synthesis software, so please contact us should you have any special requirements to study.

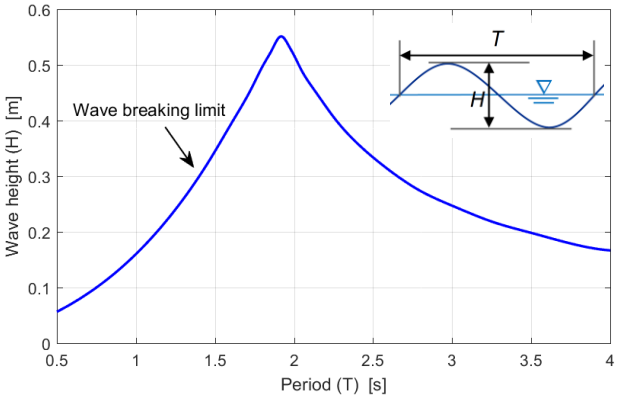

Figure 3: Regular wave generation limits, hinge depth 1.2m.

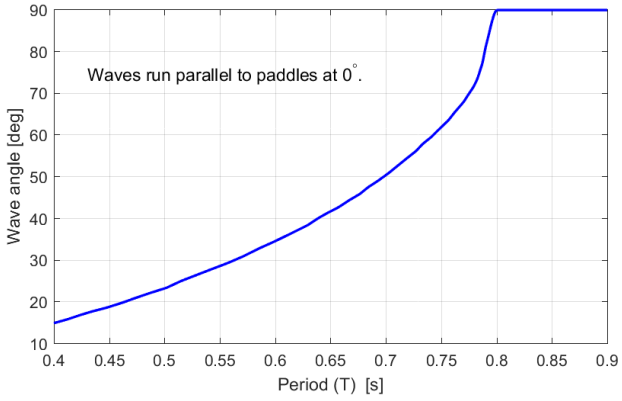

Figure 4: Wave angle limit of long crested waves.

Passive beach

Opposite to the wave paddles, the tank is fitted with a porous passive beach seen in Figure 5. The beach has an exponential profile to allow breaking waves to be absorbed with minimal reflections. The angle of the beach asymptotes to 8° allowing a representative study of wave breaking due to depth change.

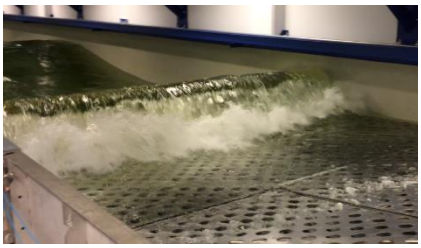

Figure 5: Wave absorbing porous beach.

Measurement apparatus

MarinLab is equipped with the following:

- Towing carriage, u_{max} = 5m/s, a_{max}=1.2m/s^2
- Constant-force towing line
- Qualysis motion capture system
- 8 resistance-type wave gauges
- Load cells 5-500 N available
- Nortek Acoustic-Doppler Velocimeter
- GoPro underwater cameras for video capture

We are constantly adding to this list, so please get in touch if you have specific requirements.

Analysis software

The University College also has licenses and expertise in using the following numerical analysis software, useful for model verification against experiments:

- SESAM (GeniE, HydroD, Wadam, SIMA, etc.)
- MOSES
- Matlab
- LabVIEW
- Star-CCM+
- Ansys
- Abaqus
- Various open-source

Practical information

For resistance testing, ship model sizes of 1.5-2m length are recommended. If the model is to be manufactured at HVL, the model width should be below 0.5m (CNC milling restriction). Motion testing can be done with wider models, however, wall effects need to be considered which are dependent on model length and shape. For circular models a diameter below 1.3m is recommended. Tank cross section dimensions are shown in Figure 6 to determine how the model fits. Motion testing requires 5 visible points on the model where reflective circular markers of 20mm diameter can be placed. The motion cameras are mounted at different heights and behind the model with respect to the incoming wave. For scaling your model, please check out our Froude Scaling Calculator.

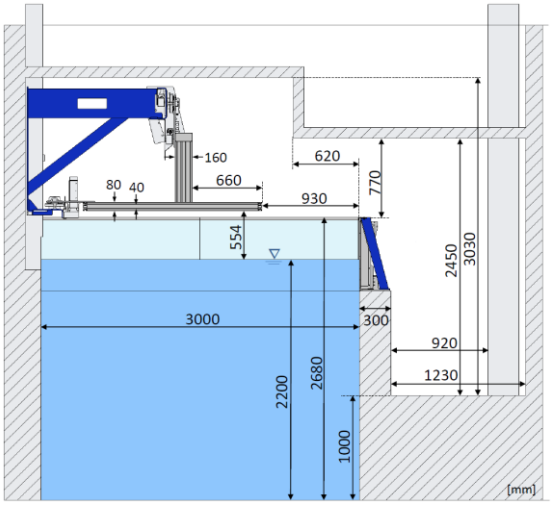

Figure 6: Cross section view with dimensions in [mm].

Contact

Parties interested in using MarinLab for research purposes can contact either Dr David Lande-Sudall or Dr Gloria Stenfelt (details below) to discuss requirements and to arrange for a guideline quote estimation. Bachelor project proposals/ideas for the spring projects should preferably be delivered/discussed before end of August, since the students choose their projects in the period August to October. Master project proposals (for a full year master student starting after the summer) should be discussed before Christmas.

Førsteamanuensis Dr David Lande-Sudall david.lande-sudall@hvl.no Tlf: +47 96 91 44 83
Førsteamanuensis Dr Gloria Stenfelt gste@hvl.no Tlf: +47 97 94 31 00