

LABORATORY

# Coastal Wave Generators



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POLYTECH provides for the laboratory needs of Civil & Marine engineering labs customized solution for Coastal Wave Generation and absorbing random piston wave makers. In existing civil infrastructures the solution generally provides a package that includes the paddle, drive motor, control electronics and software as well as and power supply.

The wave generation unit uses a displacement technique that allows perfect flat front piston action without using seals.



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Piston paddles move horizontally and produce shallow water waves for variable depth and coastal engineering tanks where the water is comparatively shallow compared to the wavelength of the waves. Solutions provide for two sizes of piston wave makers for different water depths: 500mm and 750mm.





## General Lab description

Wave generation, control and monitoring system

The wave generator pool usually has a simple standard water circulation system, without filtration and without disinfection, as it is being used for research/studies.

The wave maker meets the following characteristics and the way of composition and configuration of the wave maker is adjustable to the needs and can be provided with as many paddles and variable sizes of paddles as the laboratory requires, provided that it is possible within the physical size of the pool.





## Overview

The wave generator laboratories is capable of producing high and low crest waves for deep or shallow water. The means to create the waves is by means of paddles or pistons which are mounted on the narrow side of the pool.

The propulsion system of the paddles is of wet-back technology, so they can be submerged in water and at their rear.

The whole integrated systems is a sturdy metal structure, above water level of the pool and includes the motors, bearings and all the electromechanical components secured from any water spills.



## Overview

Each paddle or piston is individually operated by an electric servomotor which can supply power motion to a gear reducer/belt drive or mechanical cylindrical gear transmission.

Paddles are located in such a way that they do not create side waves and do not overlap each other.

All system components are constructed of anti-corrosive steel in order to guarantee long life and low maintenance over the years.

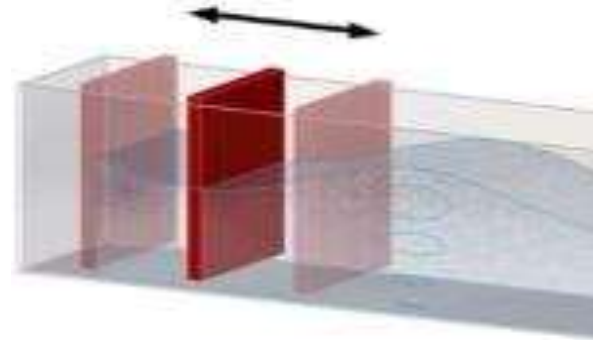
The support structure of the system is stainless steel while the vanes themselves are of lightweight glass material, reinforced plastic or metal.



The wave maker has net zero displacement and as a result produces no back wave.

There are two basic types of scientific wave-makers:

- Flaps
- Pistons



Flap paddles are used to test deep water and floating structures.





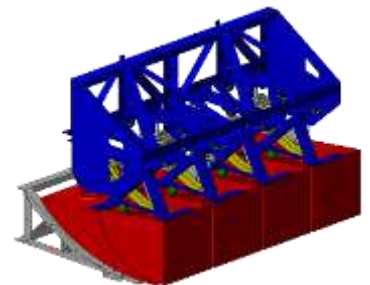
## The control systems

The wave generator offers control of its electromechanical systems as motor motion are controlled by intelligent digital controller.

Controlling the operational parameters as revolutions per minute in order to create the forward-backward movement of the paddles is programmable by the user commands.

The wave generator control system offers also a monitor facility of the main of parameters of the motors such as speed, current and temperature.

The main control panel of the wave generation system is mounted on the metal structure of the system and includes all control and electrical power components of the servomotors. Depending on the type of blades and the metal structure, the project implementer determines a solution for the passage of electrical cables.





## Wave Synthesis software

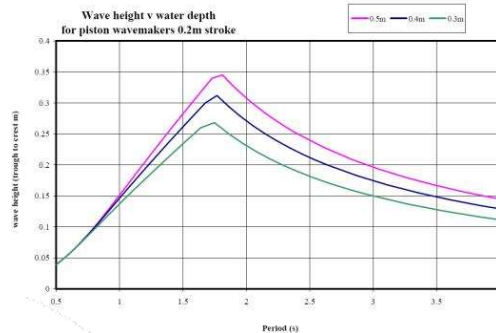
- Users can visualize waves virtually before running in the tank.
- Standard wave spectra provided.
- Equipment synchronization and triggering for data capture.

## Precision Servo Drive

- Highly controllable
- Efficient operation

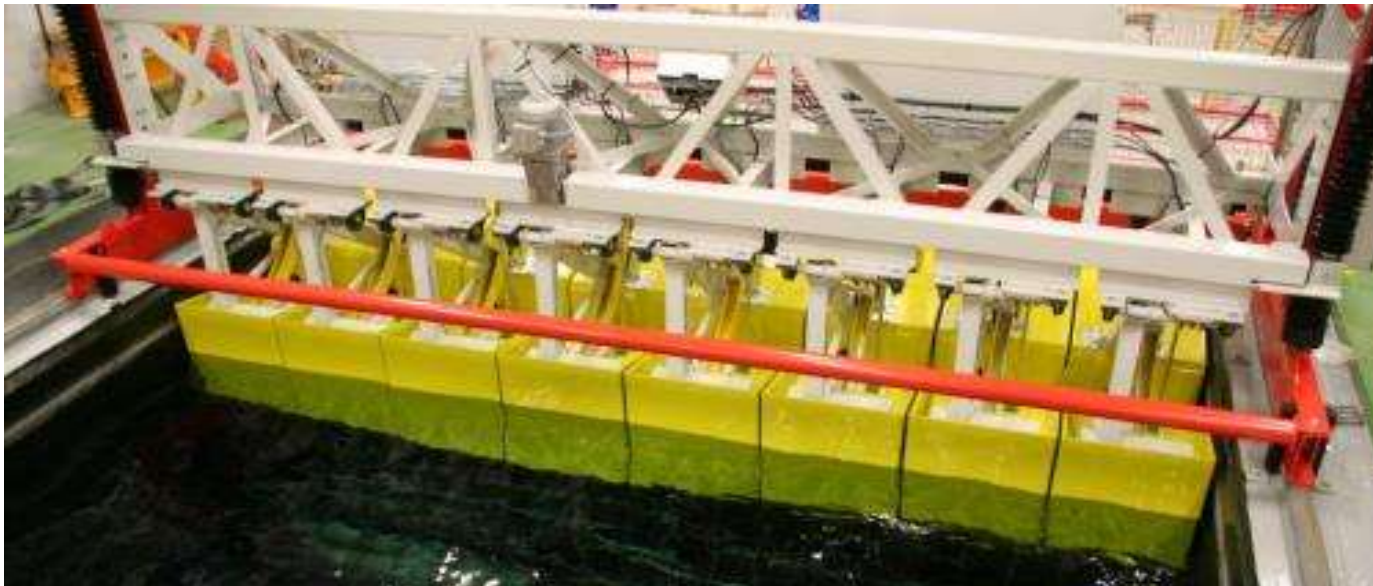
## In Compliance with:

- IEC 62600-10 Part 10
- IEC 62600-30 Part 30
- IEC 62600-100 Ed. 1.0 Part 100
- IEC 62600-101 Ed. 1.0 Part 101
- IEC 62600-102 Ed. 1.0 Part 102





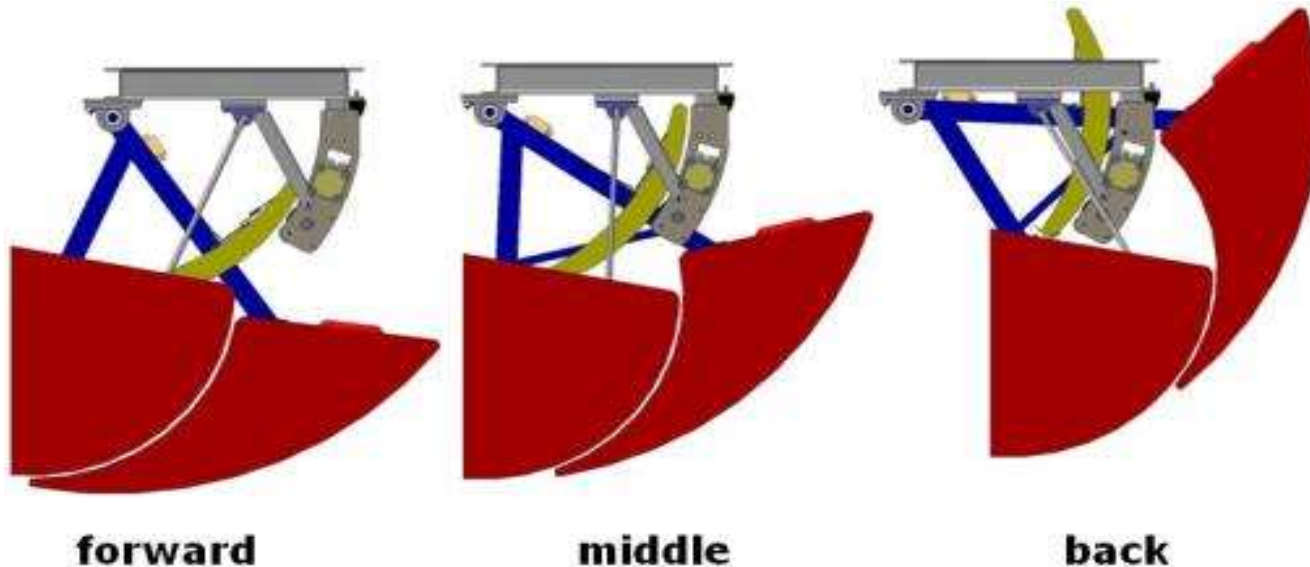
Paddles can be installed in tanks of all lengths and widths. Depth is limited by the size of piston chosen. The piston width can be tailored to exactly fit your tank and satisfy your needs.

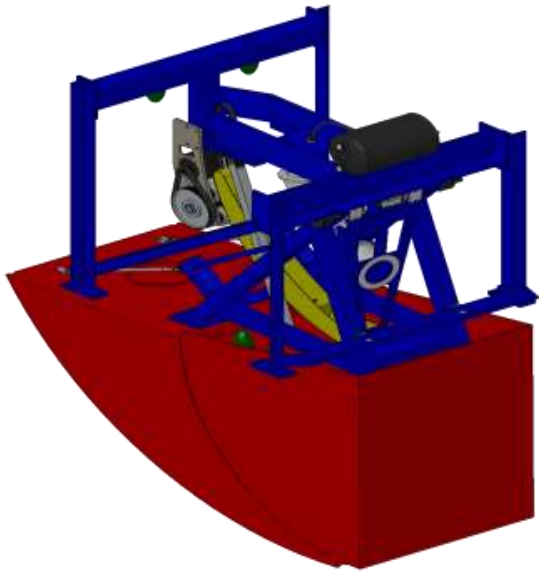




## Net Zero Displacement

- No back wave
- Lower energy use compared to hydraulic pistons
- Easy maintenance access behind paddles





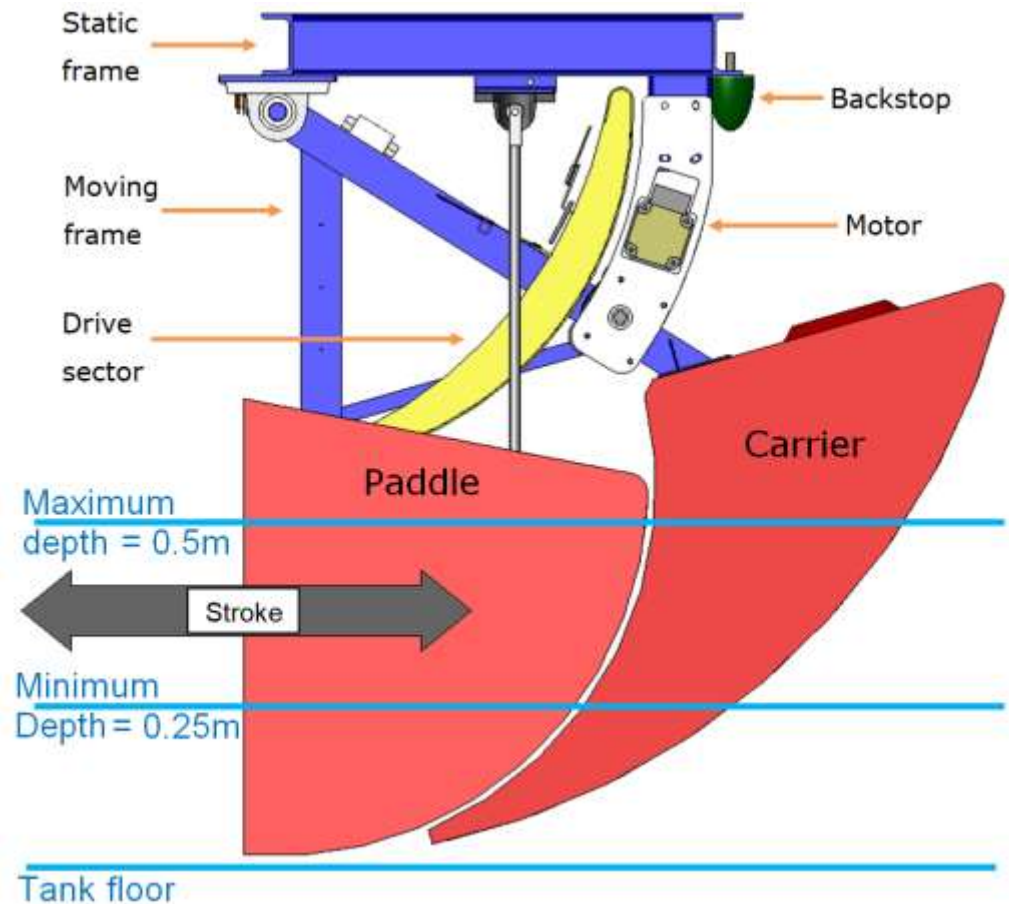
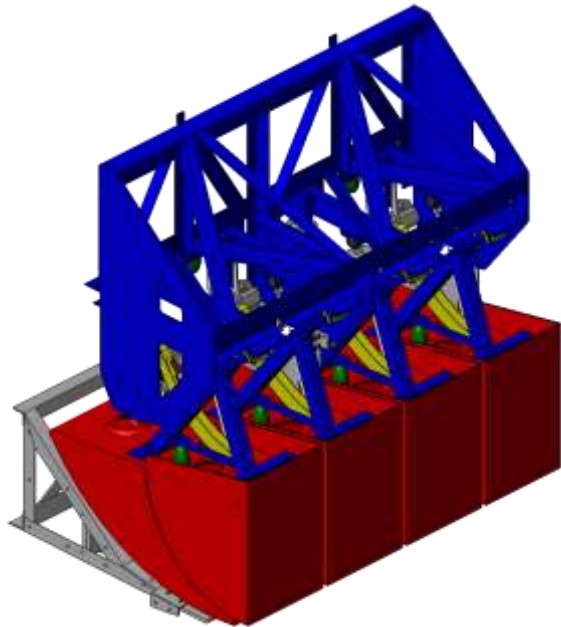
The paddles are controlled individually by a sophisticated digital controller specifically designed for wave tanks. The system is provided with a suite of software tools specifically for running experiments in wave tanks. Waves are designed and analyzed in an intuitive graphical interface.

Wave makers are driven by precision servomotors and a zero backlash belt system.

- Low maintenance and quiet operation
- 20 year design life
- Fiberglass paddles
- Uses standard computer equipment
- High precision force measurement



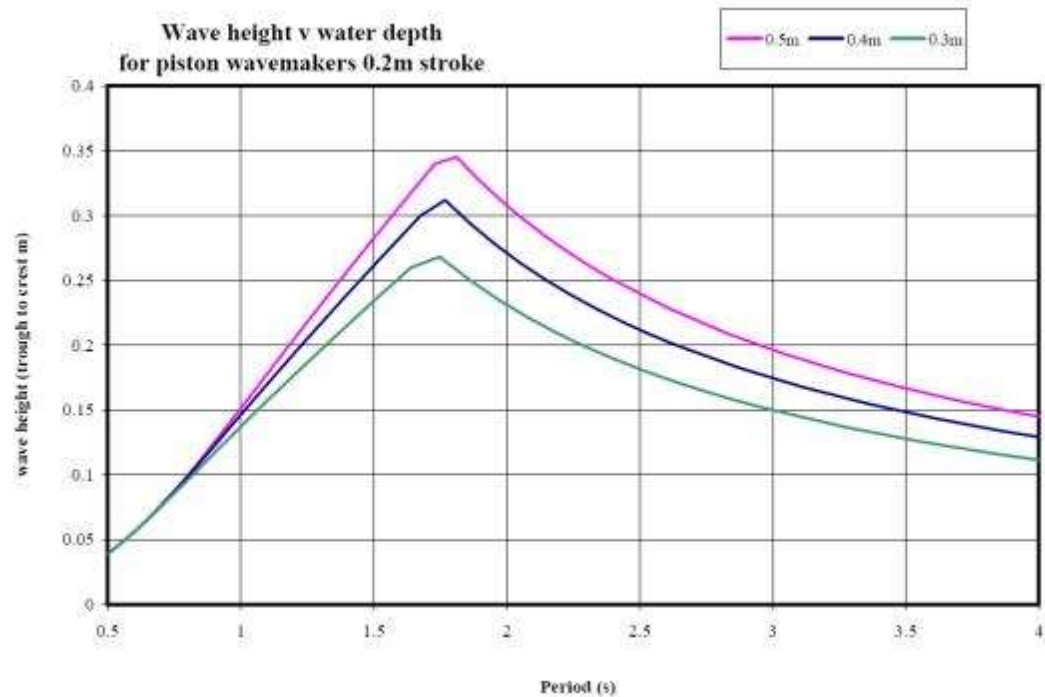
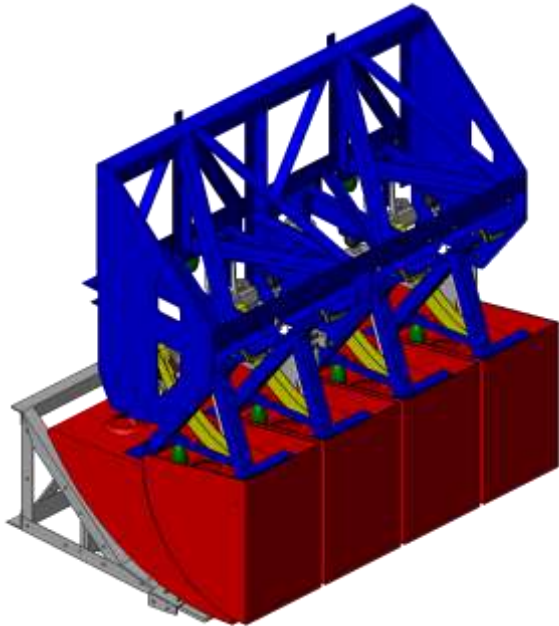
## 500mm Piston Diagram





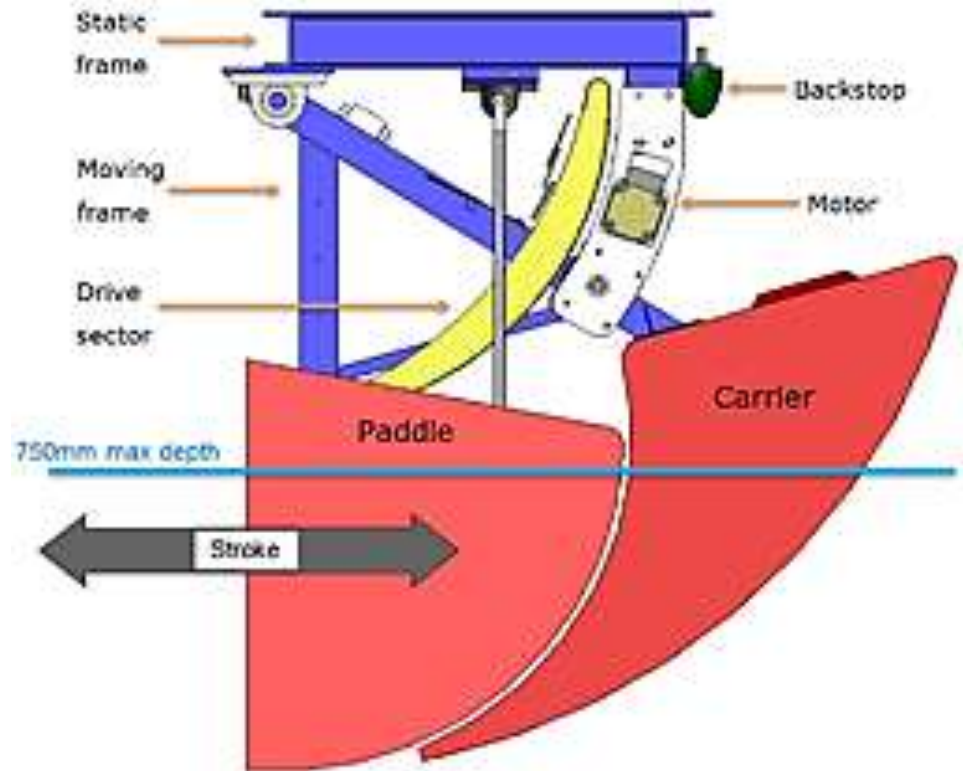
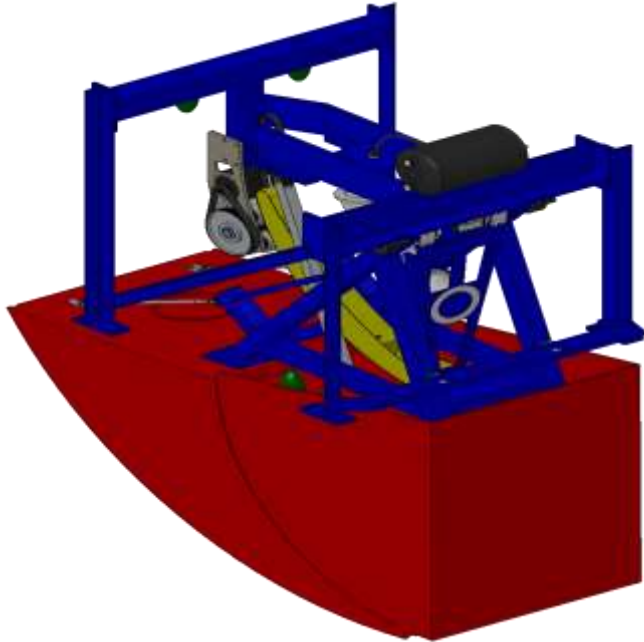
## 500mm Piston Performance

- ❑ Regular wave height: 0 to 0.35m
- ❑ Large frequency range
- ❑ Widths from 0.3 to 1.5m
- ❑ Depths from 0.25 to 0.5m





## 750 mm Piston Diagram

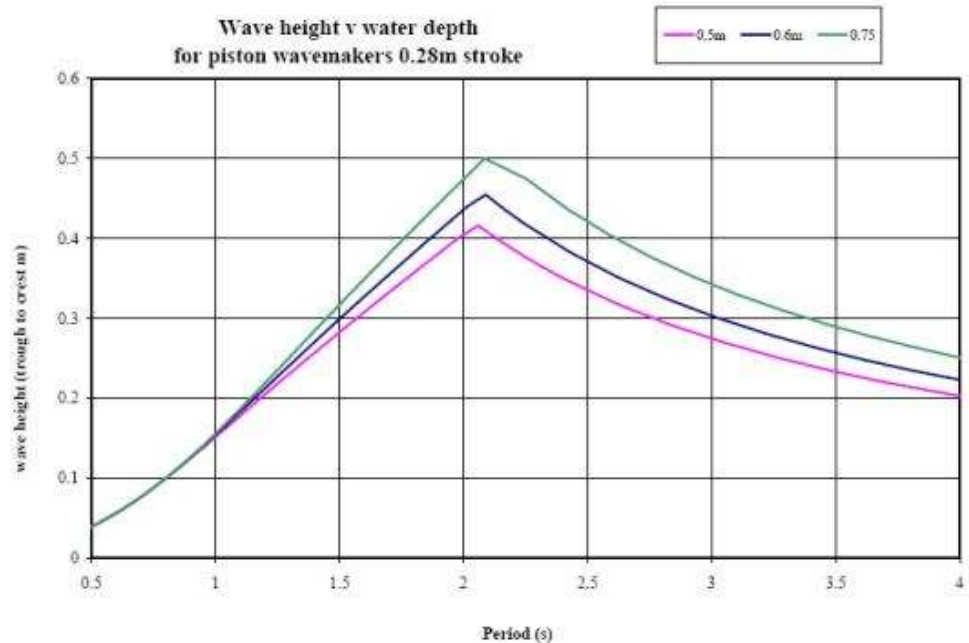
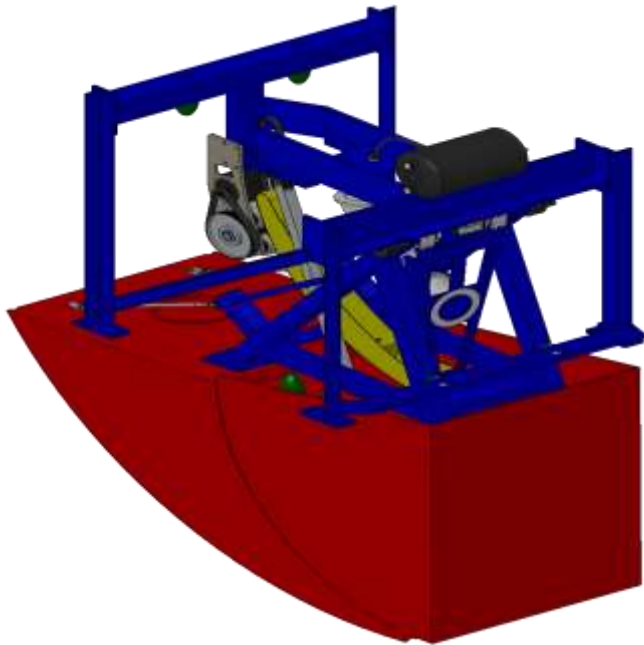






## 750mm Piston Performance

- ❑ Regular wave height: 0 to 0.5m
- ❑ Large frequency range
- ❑ Widths from 0.3 to 1.5m
- ❑ Depths from 0.5 to 0.75m



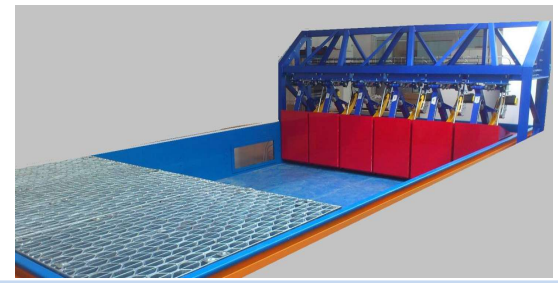
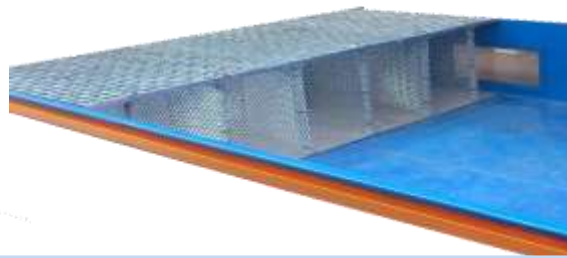


## The Beach side - Wave absorption

The wave damping or absorption module is an integral part of the wave generation laboratory which allows measurements during tests or simulations such as where significant wave reflections which occur when waves re-collide on the paddles or affect the simulation results as the waves become de-stabilized.

The system provides active-dynamic damping of the generated waves, giving the possibility of precise control of the wavelength. The system prevents waves from returning to the paddle by precisely measuring the power/height of the generated wave and modification of the wave generation command signal in real time by calculating the newly generated wave reflected from the beach side of the pool.

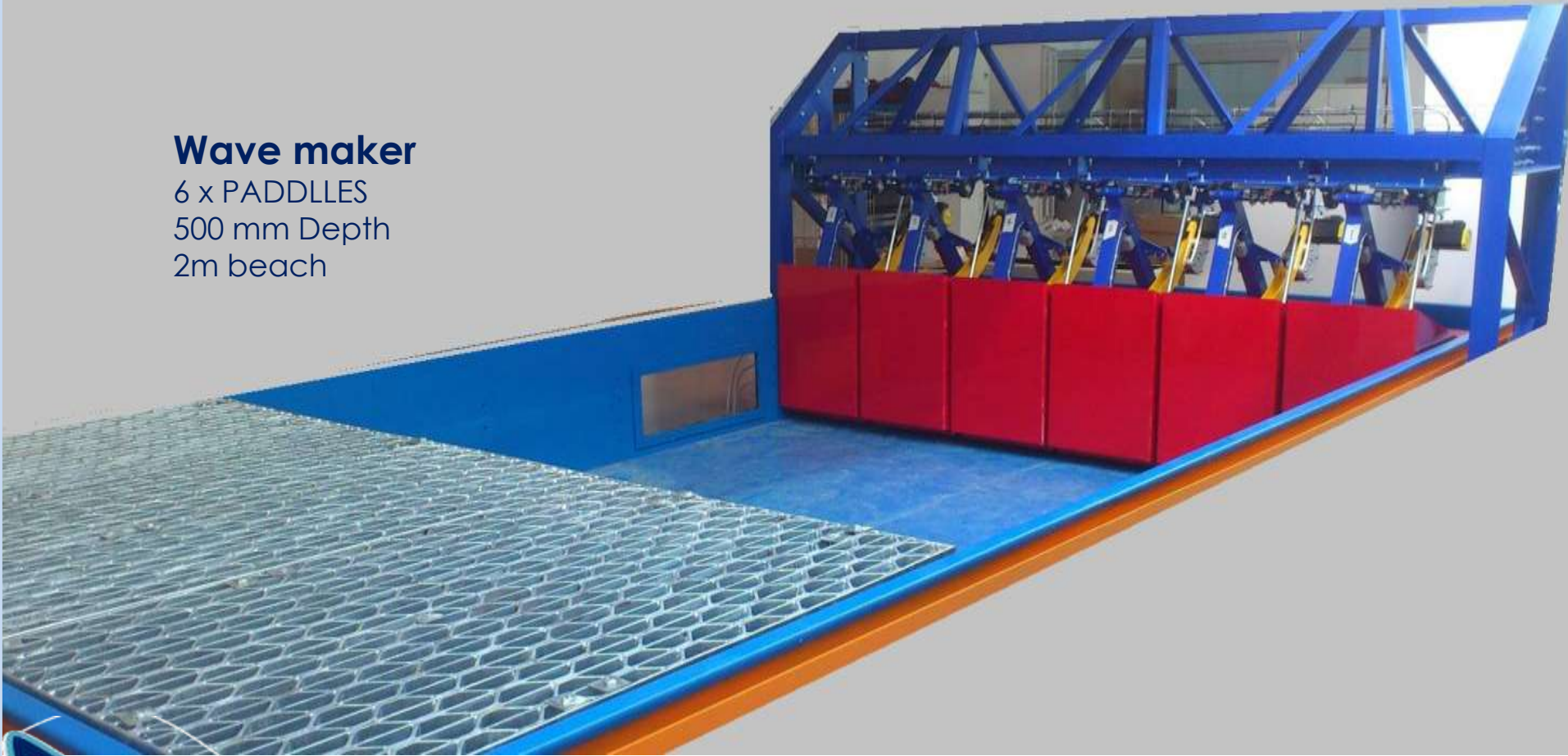
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## Wave maker

6 x PADDLLES  
500 mm Depth  
2m beach



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**Force feedback** wave makers match the energy contained in a wave with little spurious harmonic content.

Force based absorption provides high repeatability compared to wave gauge or position feedback machines.

**Fast settling** times between tests:

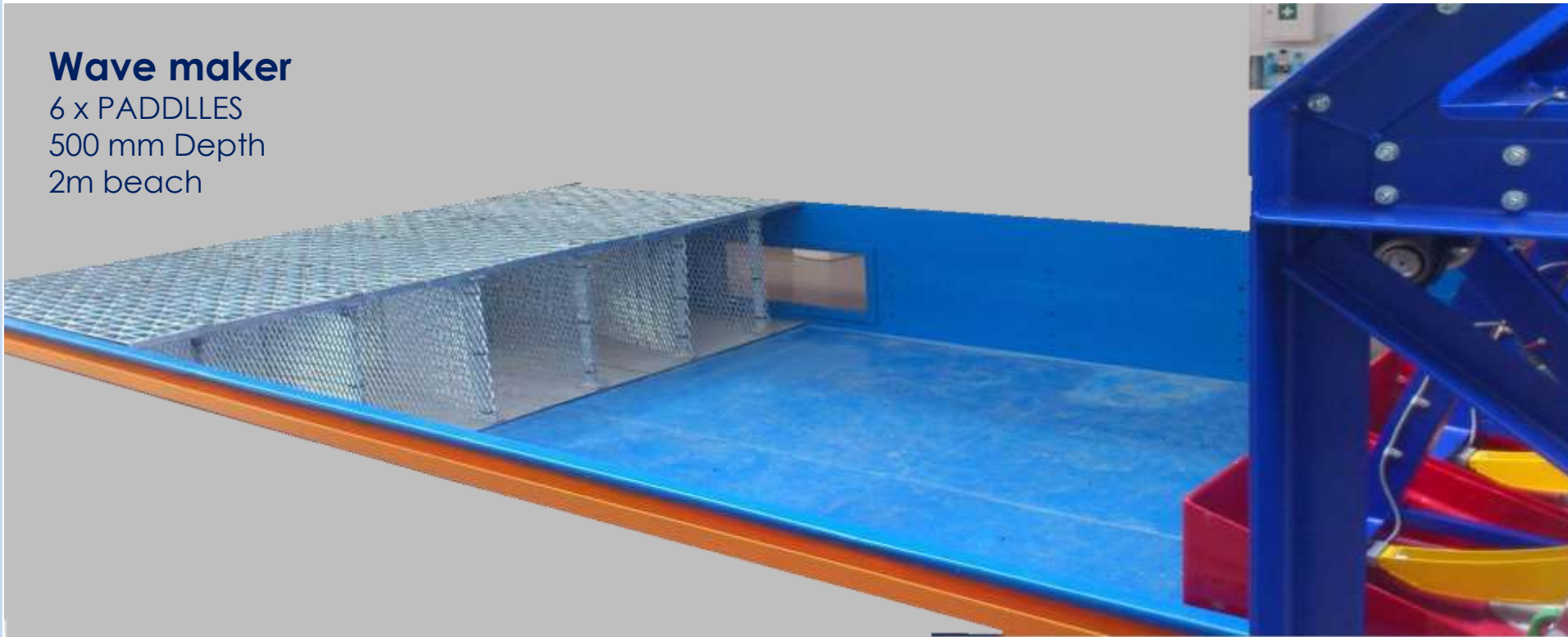
- Reduced build-up of cross waves, seiche waves and reflections
- Superior repeatability than competing systems





## Wave maker

6 x PADDLLES  
500 mm Depth  
2m beach



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## Wave maker

8 x PADDLES  
750 mm Depth  
2m beach

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